# Children – Computer Interaction: An Inclusive Design Process for the Design of Our Future Playground

Lee Yanki

Royal College of Art (RCA) Helen Hamlyn Centre (HHC), London, UK
yan-ki.lee@rca.ac.uk

**Abstract.** After observing children playing games, two design-engineering students designed a new concept for an interactive playground, the *dot°*. Its basic idea is to shift the computer screen onto the floor. In order to design optimal interfaces (hardware) and game scenarios (software) for everyone to enjoy, the *dot° team* decided to adopt an inclusive design process. This paper starts with a discussion of popularism in design, which critiques the conventional welfare designers' approach to treat 'users' as study subjects. From the design of the design workshops to the final design solution, this paper presents how a group of young design students worked with a design researcher to formulate their first user-involvement design experience in such a way that all participants in the process could engage in the inclusive experience of exchanging knowledge between designers and users. Finally, the paper documents the user-involvement process from the perspectives of different collaborators, including design students, design researcher, high school students and their school education consultant. Hence, this paper aims to advocate the relevance of designing with people rather for them.

**Keywords:** human-computer interfaces, inclusive design, knowledge transfer and exchange, game and urban space design.

## 1 Introduction

One of the main aims of the Postmodernists was to recapture the social aspects in design. They criticised the fact that modernists separated the formality and social concerns. Most modern designers and architects assign their, usually upper-middle class, values to all mankind and thereby typically design for themselves (Venturi et.al, 1977). Postmodernists questioned this modernists' practice in relation with social concerns, which they claimed started with a strong social basis. However, a lot of dominant social patterns were actually rejected by the Modernists who introduced the 'international style', claiming it was relevant for all. This leads to the philosophy of postmodernism to acknowledge users and their 'taste codes'. However, Mitchell (1997: 17-21) criticised that postmodernism, as a challenge to modernism, only takes place firmly within the academic discourse and that the fundamental canons of architectural practice are not questioned: architecture is still created as formal art objects.

C. Stephanidis (Ed.): Universal Access in HCI, Part I, HCII 2007, LNCS 4554, pp. 187–196, 2007.

### 1.1 Popularism in Design

An appropriate reference to address the designer-user relationship is Alexander Tzonis and Liane Lefaivre's 1972 paper, *In the Name of the People; The Populist Movement in Architecture*, which examines the concept of populism in architecture and design (Shamiyeh, 2005:31). Tzonis and Lefaivre (1972) suggested several alternatives to the traditional 'pyramidal' decision-making process in design that emphasise a more free and pluralistic design practice to replace the ideal of 'order' and 'expertise' in architectural values. They based their thesis on the distinction between the Welfare State designers and the Populists in architecture who design with different attitudes towards 'users':

*"…The Welfare State designer (such as Le Corbusier and other associate to Functionalism and the International Style), whether a planner or an architect, was an 'elite' prejudiced by his own private theories against the taste of the 'user'…*

Populists saw designers as a class: a class of experts who, because of a total occupational involvement with pure design, or because of their own middle-class origins, has developed a private way of looking at the manmade environment..."

### 1.2 Design with But Not for People

Populism can be defined into three levels of positions (Shamiyeh, 2005:25):

1. Level 1: Architecture for people - which reflects, so to speak, either the context the vernacular forms are supposed to have been originated in, or the taste in architectural forms and the general public's sensibility with respect to them."
2. Level 2: Architecture with people - which is about "the exploration of possibilities to integrate the client or the public in the design process, and is thus one of an operative nature… the effort is made to develop concepts collaboratively with future users or residents."
3. Level 3: Anarchism - which means "architecture without architects".

This classification of popularism indicates the importance of users' creativity in design process, which can help them to create their own design. However, the most important factor is the changing roles of design experts who can respect and facilitate people's creativity. The aim of this paper is to demonstrate this implication of popularism by discussing a case study from an Inclusive Design[1] student awards programme.

## 2 Case Study: Designing an Interactive Playground for Our Future Selves

Over the years, the Helen Hamlyn Centre (HHC) has worked with RCA design students and help them to integrate Inclusive Design methodologies and reflect on

[1] The new British Standard BS 7000-6 (2005) defines Inclusive Design as:
"Design of mainstream products and/or services that are accessible to, and usable by, people with the widest range of abilities within the widest range of situations without the need for special adaptation or design."

their own practice through adaptable and flexible mechanisms. One of them is the 'Design for Our Future Selves' (DFOFS) awards programme. DFOFS is a three-term programme for all Master students in their final year at the RCA. This programme is divided into three stages: Define, Develop and Delivery. In the first stage, students from different art and design disciplines can submit design proposals to address social changes. Fifty to sixty students are then short listed and invited to join the develop stage, where groups of 'critical' users, with different disabilities, ages and occupations, will challenge the design briefs and encourage the students to stretch the creative envelope in unanticipated ways. Finally, in the delivery stage, twenty-five to thirty are selected for the final challenge. They need to prove to an international panel of judges how they have transferred the user research data into creative design solutions.

### 2.1 Define Stage – Winner of a Design Concept Competition

Realising that physical interaction in playing is vanishing rapidly as a consequence of the increased use of digital games and computers in everyday life, two RCA Industrial Design-Engineering students decided to develop a new interactive and physical playground with children. The key idea was to 'enlarge' and 'rotate' the computer screen from the desktop onto the floor. Instead of sitting on a chair, looking at a screen and controlling the game with only fingers, the concept called *dot°* (fig. 1), aimed to introduce a new human-computer interface that would get children or any other player, to run and physically interact. In order to trigger the unlimited scope of children's imagination with the best available technology, the *dot°* team developed an interactive playground that can be unrolled like a carpet. It can be easily installed onto any outside space and uses interactive pressure sensors and lighting to illuminate game interfaces onto the surface of the playground. Different games can be uploaded and started at any time. The first result was that *Dot°* has won the Innovate to Educate Award[2] from Futurelab[3], and was supported by Cambridge Assessment and the BBC (UK).


**Fig. 1.** Concept diagram of *dot°* developed by Clara Gaggero and Sabine Fekete, Industrial Design-Engineering students from the Royal College of Art, London

[2] Innovate to Educate was an award run by Futurelab (in association with Cambridge Assessment), available to students doing final year degree and postgraduate (or similar) projects in multimedia, ICT or related subjects, encouraging them to work with a teacher/educator to focus their final year project on a novel digital resource to assist learning, in school or out of school.

[3] Futurelab is a UK-based not-for-profit organisation that is committed to sharing the lessons learnt from our research and development in order to inform positive change to educational policy and practice (www.futurelab.org.uk).

### 2.2 Develop Stage – Conducting Creative User Research Workshops

This design concept was inspired by personal childhood experience and further elaborated through interaction with children. The *dot°* team also consulted many other experts in different related fields, such as curators from the Science Museum and installation artists. After winning the award, the *dot°* team decided to develop their project further by adopting an inclusive design process. They wanted to involve future users into their design process to further develop the new playground idea for everyone. With the advice of an inclusive design researcher, the *dot°* team engaged in an inclusive design process that created a mutual benefit relationship with those who participated in the user research.

The process started with a school visit (fig.2). Originally, the team wanted to work with a group of eight to ten year old children but without any experience of working children, the inclusive design researcher advised and helped the *dot°* team to set up collaboration with the Villiers High School. An education project manager and five high school students (fifteen to sixteen years old) got involved. Three of these students became team assistants to facilitate the design workshops with the primary school children, and the other two were appointed as the reporters of the process. They filmed the workshops and interviews with the participants, and edited a short film that documents the process.

**Fig. 2.** The *Dot°* team presented their projects and ideas of the workshops to all the collaborators: education project manager (the first one) and high school students (three girls sitting on the right of the photo) from Villiers School, West London

The first workshop was called the Preference Workshop, in which the team observed children play with some conceptual games in order to find out what the children would wish for their future playground. A class (25 children) of seven to eight years old was invited to draw their dream playground and to explain their ideas afterwards. They were then divided into three groups and participated in three different games (fig. 3) that represented different elements of the game design the team had in mind. Game 1a was about finding how children play in teams. They were given the task to follow paper dots that their classmates were distributing. The other two games (1b and 1c) used different patterns of predictability, i.e. one randomly moved the dots and the other was pre-programmed. All the games were designed to observe how children interact with each other and with objects in the games. The games were all task-oriented and created a competitive situation for the children.

After an hour, all the children had tried all the three games. Three groups were shifted from one game to the other after fifteen minutes play time. The observed interactions helped the design team to evaluate the design document of their series of games (software) for their future playground (hardware).


**Fig. 3.** Preference Workshop. Three conceptual games represent three elements of game: team leading (1a), predictability (1b) and interactivity (1c). All games designed and produced by the *Dot°* team. Photos by Yanki Lee.

Two weeks later, three game prototypes (fig. 4) were developed with the information from the first workshop. The aim of the second workshop, the Perception Workshop, was to find how children would react to these games. The same group of children was invited to join this workshop. They were invited to interact with the prototypes and to perform several tasks with tangible interfaces. Game 2a was an extension of Game 1a, where the children were asked to follow dots made by their classmates with torches. In game 2b, called the 'Interactive Buttons', the children needed to switch buttons on or off by using any part of their bodies. They were divided into two teams to run to the 'Buttons' platform, and the winning team was the one who got more buttons on and was also quicker in turning them all off again. Game 2c was a programmed projection on the floor with some three-dimensional objects. The task given to the children was to move the objects while the projection of dots were on them. All these new games and prototype helped the design team to understand how children interact with the hardware and software.


**Fig. 4.** Perception Workshop. Three physical games represent three elements of game: team leading, predictability and interactivity (from left to right). All games designed and produced by the *Dot°* team. Photos by Yanki Lee.

### 2.3 Delivery Stage – Developing a Creative Solution for All

The design solution of the project was shown in an exhibition with detailed proposal and feasibility study (fig. 5) of the new concept for the interactive playground. Based on the experience of working with the future users, the team described their project as a vehicle for children to interact with people and the environment. It also aims to help participants to improve themselves by stimulating and changing games. Its main application is suggested to be in urban space such as a public square or park where this interactive platform can encourage teamwork and group building.

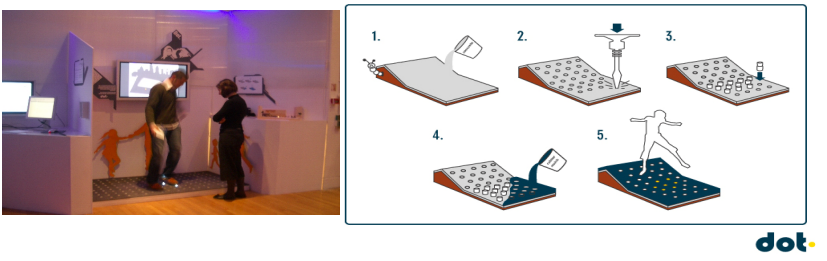


**Fig. 5.** (Left) The Industrial Design-Engineering department's work-in-progress show at the Royal College of Art, London, Feb 2007. (Right) Diagram to show how to install the hardware of the Interactive carpet. Photo and diagram provided by the *Dot°* team.

## 3 The Lessons: Participants' Perspectives

Starting from working with children, the *dot* ° becomes a thinking space for all of us to imagine, interact and play within an urban area (fig.6). During this creative process, there were three groups of participants involved:

1. User groups:
    a. A class (25) of primary school children from Blair Peach Primary School, West London;
    b. A class teacher and a few teaching assistants, who may be parents of the children;
2. Design team:
    a. Two Industrial Design-engineering students who initiated the project *dot* °;
    b. A Interaction/ game designer who was invited to join the team;
    c. Five Villiers High school students (four girls and one boy, all British Asian).
3. Facilitator team:
    a. An education project manager of Villiers High School who aimed to link external agencies and universities to aspects of the curriculum, focusing on specific cohorts of students in specific subject areas;
    b. The author, a design researcher and user research tutor who co-ordinates the 'Design For Our Future Selves' inclusive design awards at the RCA.

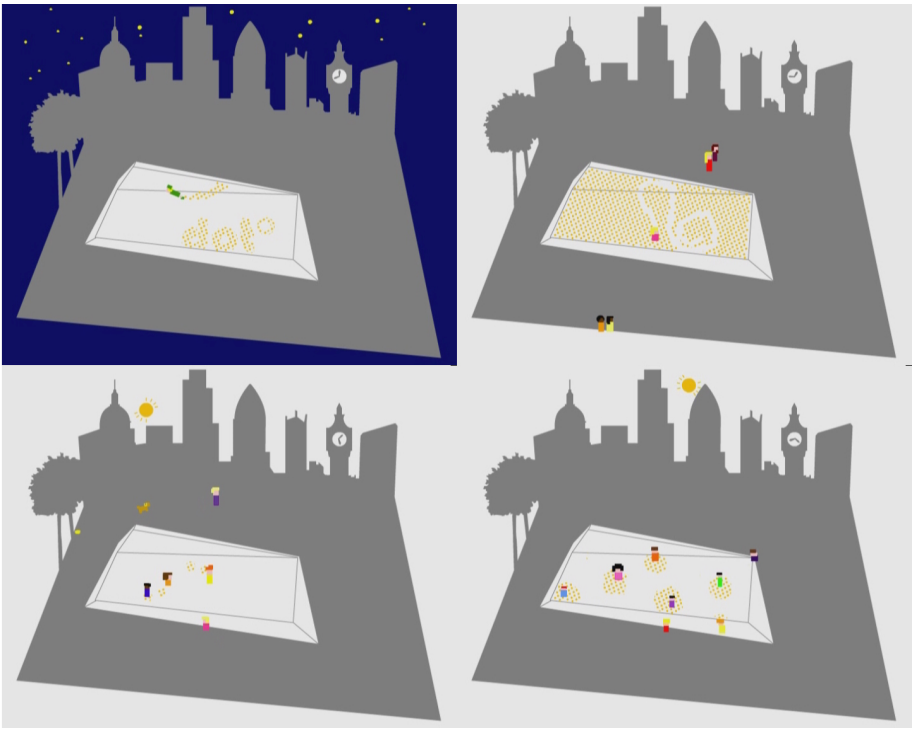

**Fig. 6.** The three games design of the *Dot°* project: People can 'draw' on it moving to turn the lights off. They can also follow the lights and turn them off by stepping on them. Finally, they can also create their light pattern with other people. Diagrams provided by the *Dot°* team.

Many people-centred design projects such as inclusive design and human-computer interaction design aim at improving people's lives by involving specific users in the process of creating better design for all. However, there are many possible interpretations of the appropriate methods and applications of such a 'bottom-up' approach. This paper documents the *dot°* project, which constituted a process of collaboration between different facilitators, such as the education consultant and the design researcher working intensively with children, teenagers and teachers. The main goal of this project was to contribute to the discussion on the involvement of people in design processes, by suggesting a multi-level knowledge exchange model between designers (design and research knowledge) and users (usage and everyday life knowledge).

### 3.1 Users' Perspectives

The first and direct knowledge exchange cycle was between designers and users. Design students designed and executed a series of design workshops for a class (app. 25 pupils) of seven to eight years-old children from a local primary school (Blair Peach Primary School, West London). The workshops aimed to demonstrate and explore the design of the future playground. They were constructed as a series of

design exercises to help children to engage in and understand design language, and gradually become co-designers of their future playground. The primary school teacher and teaching assistants were around to make sure that the communication between the designers and the children went smoothly. *'Just to say thanks so much for involving us in your project. All the kids loved it! Do remember if you want to trial any further prototypes either here or at Blair Peach primary, just say', was written on* a thank note from the education manager on the behalf of both schools. This shows how welcome the collaboration with both schools was. It was an inspiring experience for them to explore an alternative teaching environment outside their normale classroom and to meet different people.

### 3.2 Designers' Perspectives

The design team consisted of design engineering and interaction design students. Their involvement with the children helped them to better understand the activity of playing, and inspired more user-responsiveness in both the design of the physical and the digital interfaces in their future playground design. '*The children's opinions are more important than our tutors' ones,'* said one of the design students. They expressed that the interaction with target and end users provided evidence to support their design development.

The second, indirect but long term, knowledge exchange cycle for the designers was triggered by their close collaboration with a technology high school[4]. The design students worked with five high school students, with a mix of gender and nationality, and treated them as part of their design team. Working closely with post-graduate design students enabled these local teenagers from an enclosed community to explore not only their own culture (traditional Asian culture in Southall[5] area in London), but to seek to understand the culture and design practice of others as well. The teenagers also acted as 'middlemen' to bridge the age and nationality differences between the *dot°* team and the children.

### 3.3 Collaborators' Perspectives

For the education manager, her work is to expose her students to the 'real world', where many of the parents from the local area will not. This realm of possibilities

[4] Secondary Schools in the UK will apply to the specialist schools and academies trust for funding to become specialist in a specific subject area. In the case of the Villiers Hign School, this is technology, which includes science, design/technology and math. The aim is to provide the best possible education within this specialist, with state of the art facilities, meeting its deadlines, developing its staff, and demonstrating improved performance and motivation in all students.

[5] Southall is the most economically and socially deprived part of the London borough of Ealing. Almost 100 % of its residents are from minority ethnic backgrounds from countries including India, Pakistan, Somalia, Afghanistan a and a number of middle eastern countries and more recently eastern Europe. There is high unemployment resulting in significant percentages of free school meals for it's socially and economically disadvantaged young people in its schools. The religious split is Hindu, Muslim, and Sikh in this order. Crime is high in the area, and aspiration low in terms of considering further or higher education.

and opportunities is important for children's development. Through the *dot°* project, a creative collaboration between tertiary and secondary education through design was demonstrated. At the same time, this project also links the high school with other local feeder schools and helps to extend the local network.

Working with RCA students is a crucial part of the practical application of Inclusive Design and provides a model of how to integrate key principles into mainstream design education. The annual student awards scheme provides chances for graduating students to explore Inclusive Design methodologies and best practices, which they can later diffuse outwards into industry. This project provided a good case study of inclusive design in a multi-disciplinary collaboration between different design fields and different levels of the education system. It also demonstrates the co-design model of user research and how this can transform design and create new design thinking.

## 4 Conclusions: Knowledge Exchange of Inclusive Design

*'We don't need your patronising help, you designers. If you've come here to help us, you're wasting your time; we don't want to be helped, thanks just the same. Yet we do have some interesting observations to make about our daily lives, about our lifestyles, about our communication, and about all of their attendant dysfunctions. If you could kindly change your attitude and help us explore how we will live, then perhaps we can do something together.'*

Thackara's (1995) quote reflects the urgency for a change of the welfare approach in people-centred design. The user-involvement process applied in this project is designed to develop the Populists' approach, by merging the Inclusive Design process with a human-computer design project. The key point is not about the terminologies or ideologies, but about the attitude; i.e. designing with people and not for them.

**Acknowledgments.** I would like to thank Sabine Fekete and Clara Gaggero from Industrial Design Engineering and Jonathan Bishop Department of Design Interactions, Royal College of Art for their hard work. They have put a lot of effort into the two design workshops, which were additional to their normal course work. Special thanks to Karine Waldron from Villiers High School, Middlesex, UK who was an amazing adviser, coordinator and facilitator throughout the process. The last and most important thank is to the children, and their teachers and parents, who participated in this project.

## References

1. Mitchell, C.T.: Redefining Designing: From Form to Experience, Van Nostrand Reinhold, New York, USA pp.17–21 (1997)
2. Shamiyeh, M. (ed.): DOM Research Laboratory What People Want<< Populism in Architecture and Design. Birkhäuser, Switzerland 31 (2005)

3. Thackara, J.: 'An unusual expedition'. In: Presence: New Media for Older People, Netherlands Design Institute, pp. 7–9 (1995)
4. Michalewicz, Z.: Genetic Algorithms + Data Structures = Evolution Programs. Springer, Berlin, Heidelberg, New York (1996)
5. Tzonis, A.C., Lefaivre, L.: In the Name of the People; The Populist Movement in Architecture. In: What People Want<< Populism in Architecture and Design. Birkhäuser, Switzerland pp. 289–305 (1972)
6. Venturi, R., Brown, D.S., Izenour, S.: Learning from Les Vegas. The MIT Press, USA (1977)