DRS2016
Design + Research + Society
Future-Focused Thinking

2016 Design Research Society
50th Anniversary Conference
27-30 June 2016, Brighton, UK

Could LEGO® Serious Play® be a useful technique for product co-design?

Julia Anne Garde and Mascha Cecile van der Voort

University of Twente
* j.a.garde@utwente.nl
DOI: 10.21606/drs.2016.246

Abstract: This paper studies the usefulness of the LEGO® Serious Play® technique for co-designing products with potential future users with the help of two design cases. The technique has originally been developed for team and strategy building and its strongest aspects are the fully developed step-by step approach as well as the power of LEGO® to level the playing field and enable all participants to contribute to a group session. While levelling the playing field has been verified in the presented design case studies, the step- by step approach needs adaptions for product design and the participant group constellation needs special attention, as this constellation does not result as naturally from a design project as in applications within organizations. Overall we believe that LEGO® Serious Play® is a very useful co-design tool after adjustments are made as outlined in this paper.

Keywords: LEGO Serious Play®; co-design; product design

Introduction

The main advantages of co-design with future users are rich insights about user wishes and use context, and early validation of user requirements. However, to enable people to contribute in a meaningful way in the *early design phases* (the fuzzy front end), adapted design tools and techniques are needed. Traditional design tools such as (CAD) modelling and sketching are less usable, because their application needs training. This paper investigates the applicability of LEGO® Serious Play® (LSP) in early design phases for co-designing products with potential future users.

1.1 Co-design

The definitions of co-design vary depending on the area of expertise they emerge from. Co-design is overlapping with the more idealistic participatory design (Greenbaum & Loi, 2012)

with respect to the inclusion of users and is related to co-creation from the field of marketing (introduced by Prahalad & Ramaswamy, 2004). Co-design, as it is referred to here, aims at actively including future users as co-designers in the whole design process of products/services. The co-design approach offers benefits such as richer insights into user needs, access to the user knowledge and experience, early validation of use requirements, gaining commitment for prospective products or services and generally developing products or services that are a better fit to the users' world (Steen, Manschot, & De Koning, 2011).

Some believe that it is too difficult for users to articulate their needs for the future. Füller & Matzler describe that users usually can only express "performance factors" for new products (e.g., a car should use less fuel) and that such performance factors merely lead to incremental product innovation (2007). However, this happens only when users are expected to translate their needs to directly applicable product requirements. The latter is not a common skill, but rather a skill that is part of the professional competence of designers. Instead, specific design tools and techniques need to be applied to enable users to actively participate in the designer world and express their visions (see, e.g., Sanders & Stappers, 2008; Sanders & Westerlund, 2011). These techniques help users develop and express their visions. Drawing from their memories, experiences and dreams, users are able to develop visions and examples of how ideal future product experiences should be and what they should feel like. Expressing such visions in a metaphorical way does not force users into to imagining concrete products but rather targets their underlying needs and dreams.

1.2 LEGO® Serious Play®

LSP is a well-developed step-by-step technique that has originally been developed for team and strategy building and successfully applied in many different organizational contexts. LSP facilitates group discussions through LEGO® models in which every participant is able to contribute. It is reasonable to expect that these benefits of LSP also help participants to express dreams or visions for future product use.

The research questions covered are: Can the method support co-design meetings in the early design phase? Are there specific boundary conditions for the application of this method? To answer these questions, the LSP method was applied in two design cases with students. Prior to discussing the cases and their results, the benefits and limitations of LSP will be reviewed.

LSP is advertised as a facilitated thinking, communication and problem-solving technique for organizations, teams, and individuals. It is based on the idea of constructionism by Papert (Papert, 1980) which states that actively building things with the hands improves thinking and learning (www.rasmussen-and-associates.com). In LSP the participants are guided by questions of a facilitator. Participants answer the questions by building LEGO® models and telling the story of the models. As in product development, there is no *one* right answer in LSP.

LSP was developed as a tool for strategy building for the LEGO® company in the nineties. Since Robert Rasmussen brought learning theory to the LSP approach in 1999, it started to become also successful outside of LEGO®. LSP has been improved and refined ever since. Rasmussen recommends to use it when it is important that (a) everyone is able to contribute on a level playing field, (b) a meeting includes honest dialogue and collaborative communication and (c) no participant dominates at the expense of others (RasmussenConsulting, 2013). LSP is typically used for complex and multifaceted subjects, when there is a need to grasp the big picture, see connections and explore various options and potential solutions, and when participants are diverse in age, professional background, training (engineering and marketing, for example), or organizational status (RasmussenConsulting, 2013).

LSP sessions are always guided by a facilitator and proceed according to a step-by-step plan. Before starting with the real ”assignment” participants practice LEGO® building skills with a simple exercise. The core process of LSP consists of four steps: (1) the facilitator poses a question, (2) individual participants build a metaphorical model from LEGO®, (3) individuals tell the story of their model, and (4) other participants ask questions about the models and reflect on them (Schulz & Geithner, 2011). As Gauntlett and Holzwarth put it, it is

> “…a very carefully thought out process, which starts with building skills, gets you making simple things in LEGO® , and then cleverly knocks you onto the metaphorical plane. For example, you’ve built a little creature, but then you’re told to make changes to it within thirty seconds, to turn it into something that bothers you at work. So then someone might give the animal bigger teeth, representing overbearing senior managers; or the creature’s legs might be removed, suggesting that the organisation is slow-moving; or whatever. Simple things like that move you onto a metaphorical plane without you really noticing. It’s challenging too, of course, but in a positive way” (2006, p.85).

Later on in the process, participants are asked to combine their models in a group model. Different approaches to combining are available, e.g., combining parts of the individual models in one shared model or arranging the individual models in a “landscape” that represents a (sometimes chronological) storyline. The total model may represent a current situation or a future vision (Schulz & Geithner, 2011).

Working with LEGO® bricks and models to represent stories has the benefit that bricks are used as common language that does not emerge from the specialist field of only one of the participants (as, e.g., architectural drawings or CAD models would). Furthermore, since discussions must be focussed on the bricks, the sessions can become intense but typically stay focused on content as any potential criticism is aimed at the “the models”, not at the participants. In addition, coherent stories are generally better remembered than loose bullet points, and because the LEGO® models function as physical reminders of the created stories, memorizing the stories becomes even easier.

LSP also circumvents a number of basic pitfalls in creative group work. Studies show that when individuals pool their ideas during brainstorm sessions they come up with more results

than a group working together from the beginning (Mullen, Johnson, & Salas, 1991). First sorting one's own thoughts and creating an individual model, before going into a group discussion is an essential element in LSP. Furthermore, starting with an individual assignment requires everybody to participate and therefore also increases commitment to the session results.

Another benefit of LSP is that it emphasizes reflection by participants. According to Gauntlett and Holzwarth, spontaneously talking in, e.g., interviews about one's views, opinions, or motivations is difficult, yet such responses are typically treated in social research as truthful data (2006). Creative methods such as LSP however, do not elicit instant responses, but provide time for reflection, and therefore lead to responses that are more likely to contain rich information.

Proven application areas of LSP are knowledge sharing, problem solving and decision-making within organizations. Several of the challenges described above are also well-known to the product design process, e.g. the pitfall of one individual emphasising his/her ideas over others within product design teams, and that the best ideas are typically generated by a group but only after individuals generated their own ideas first. In particular, when co-designing in multi-disciplinary teams there is a strong need for an open, level playing field that provides participants with a common language.

1.3 LSP for product co-design

Including users as co-designers in early design phases (the fuzzy front end) calls for design tools that enable users to express their needs and visions. This paper investigates whether LSP could be such a design tool. Currently, only few co-design techniques exist that (1) aim at determining visions for future products *together with stakeholders*, (2) can be applied in an early phase in the design process, and (3) aim at developing a vision before the actual product.

There are approaches for the early design phases that emphasize the development of a design vision (see, e.g., VIP (Hekkert & van Dijk, 2011)) or determining measurable effects, a design should deliver (effects-driven design (Hertzum & Simonsen, 2011)) before developing concrete products. However, these approaches do not provide a specific technique for co-design or even advise against co-design with future users (as in VIP). Most co-design techniques that do actively involve users, e.g., with tool-kits (Vaajakallio & Mattelmäki, 2007), role-playing (Pedersen & Buur, 2000; Urnes, Weltzien, Zanussi, Engbakk, & Rafn, 2002), task-analysis (Lafrenière, 1996; Tudor, Muller, Dayton, & Root, 1993), props (Brandt & Grunnet, 2000), card sorting (Johansson & Linde, 2005; Nielsen & Sano, 1995) or virtual reality (Jimeno & Puerta, 2006) aim either at immediately developing *concrete* future use scenarios or product solutions, or at getting insight into the current use situation. They do not aim at creating the ideal experience before looking into concrete manifestations of a new product or service. An exception is the co-design approach of Sanders (Sanders & Stappers, 2008; Sanders & William, 2001) that includes four stages in which participants (1) are stimulated to engage with their thoughts, feelings, and ideas and document them for an

extended period of time (one to several weeks) in the context a future experience should take place (e.g., at home or at their work); (2) are asked to do an exercise with mainly two-dimensional, visual tool-kits designed to evoke memories and feelings; (3) are invited to dream about their future or an ideal experience with similar tool-kits; and (4) finally are invited to express their (product) ideas with abstract and ambiguous, three-dimensional tool-kits. In other words, this approach to the co-design process starts with engaging with the current situation, proceeds with visioning a future, and then developing (more concrete) design ideas. Unfortunately, this approach is time intensive and it is unclear which steps have to be done individually or in groups.

LSP is expected to be a promising approach for Sanders' stages two and three - evoke memories and feelings and express dreams or visions for the future. LEGO® could be seen as a specific type of tool-kit, but LSP also comes with a fine-tuned step-by-step technique that has been developed and refined over the years. The LSP technique facilitates group discussions by letting participants express their knowledge, thoughts, issues, or opinions through LEGO® models. The use of LEGO® models ensures a balanced (i.e., everyone is equal) discussion in which every participant is able to contribute knowledge and opinions. LSP could therefore provide a more detailed, step-by-step approach for either engaging with the current situation or the dreaming and visioning. In this paper we focus on the visioning of future experiences.

There are only few studies describing the use of LSP for product design, yet. Swann (2011) , who agrees that LSP is seldom applied in product design, describes the successful use of LSP with care workers to initiate a co-design process for the development of nursing tools. However, it is difficult to get a good impression of the outcomes of the LSP application in their case study. Another application study addressing product design consisted of a workshop for the conceptualization of future enterprise information systems with experts (Møller & Svejvig, 2012). However, the participants are experts in the field of development of such kind of systems, not potential "users". As outcome of the LSP application the participating experts came up with seven challenges for future enterprise information systems. The authors of this study considered LSP as a promising tool due to its combination of verbal, visual, and kinaesthetic modes. Other studies applied LSP to the traditional application areas (team building, organizational strategy development) and aimed at discussing the current situation in a team or an organization, pinpointing strengths and developing challenges (see, e.g., Dempsey, Riedel, & Kelly, 2014), rather than developing a vision for a desirable future situation.

LSP cases

2.1 Case 1: Coffee experience

Six student design teams of 3 to 4 members (all Master students Industrial Design Engineering) participated in a half-day LSP workshop that aimed at developing future product experiences. The workshop was facilitated by licensed LSP facilitators. The provided

(fictional) case was described as follows: “A large coffee company wants to enter the student market with a new product or service. This could be a coffee machine, a new sort of coffee, a service or a combination of these. You, as members of the target group are invited to develop ideas for the ideal coffee experience within a student house in a LSP workshop!” The case was chosen to ensure that the student participants were prospective “users“ of the future product. The LSP workshop consisted of three major phases:

1) The first phase was familiarizing with LSP. Students were instructed to first build a tower of 12 bricks each and then to modify the tower to tell a story about what they love about student life, adding as many bricks as they wished (see Figure 1 and 2).
2) The second phase aimed at individually identifying key aspects of a great coffee experience in a student house. Every student built a model regarding a key aspect of a great coffee experience, and then used a small red brick to identify where in the model this key aspect is represented (see Figure 3).
3) Third, students were asked to consolidate their insights into the coffee experience by grouping models according to similar aspects, make a shared model for every aspect category, combine the shared models in a landscape model, and co-develop the story complements the landscape model.

Figure 1 Video still from the student LSP workshop in Case 1, showing how a student explains her metaphorical LEGO® model about what she loves about student life (phase 1). She has built a model with a straight tower, representing organized life at the parents’ home and a tower with wild extensions, symbolizing the free and self-guided student life.

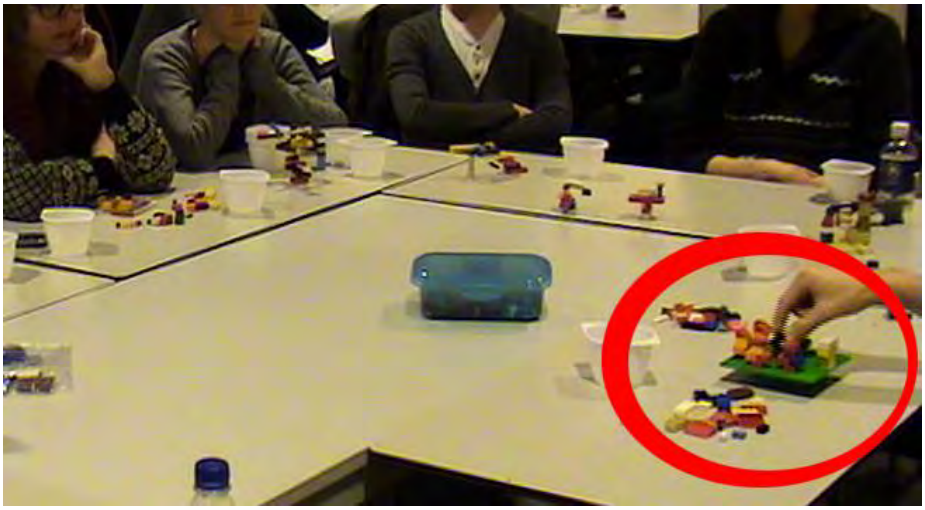

Figure 2 Video still from Case 1, showing how a student explains his (less metaphorical) LEGO® model of a group of figures playing football, representing the enjoyable, shared social life of students.

Figure 3 Video still from Case 1: In phase two a student has built a scene from student life, depicting students who are all busy with different things in the social room of a student house (talking on the phone, preparing a chicken in the oven, etc.) while the coffee machine is running all day to provide them with a caffeine kick.

2.2 Case 2: Biking experience

In the second case, three student teams of 5-7 participants participated in a LSP workshop of half a day facilitated by licensed LSP facilitators. The aim was developing a new biking experience. The case description was: "A large bike manufacturer wants to introduce a new product particularly focusing on the student market. The new product could be a new bike, an accessory, a service or a combination of these. The new product should contribute to the ideal biking experience for students. You, as members of the target group and designers, are

invited to explore and define the ideal biking experience that this new product contributes to by means of a LSP workshop!"

A step-by-step approach slightly different from Case 1 was chosen:

1. Students were instructed to build a tower of 12 bricks each. Next they were asked to modify the tower to tell a story about a nightmare bike riding experience (instead of a story about something they loved), adding as many bricks as they wished.
2. The second phase aimed at individually identifying what an ideal biking experience encompassed. Every student built a model representing the ideal biking experience, and then used a small red brick to identify the key aspect of the experience in the model (see Figure 4).
3. Third, students were asked to consolidate their insights into the biking experience by grouping models according to similar aspects and were then directly asked to make a combined model (either shared or landscape) for the overall biking experience. This, instead of making a shared model for every aspect category as in the first case. The final step was co-developing the story that complements the model.

Compared to Case 1, another modification was made regarding the availability of bricks, in order to stimulate the use of metaphors in model building and thereby a focus of participants on vision generation instead of (factual) model building. While in Case 1 the participants had direct access to a number of special bricks, such as ready products, animals or accessories for the LEGO® puppets, in Case 2 these special bricks were (physically) set aside, creating a barrier in their selection.

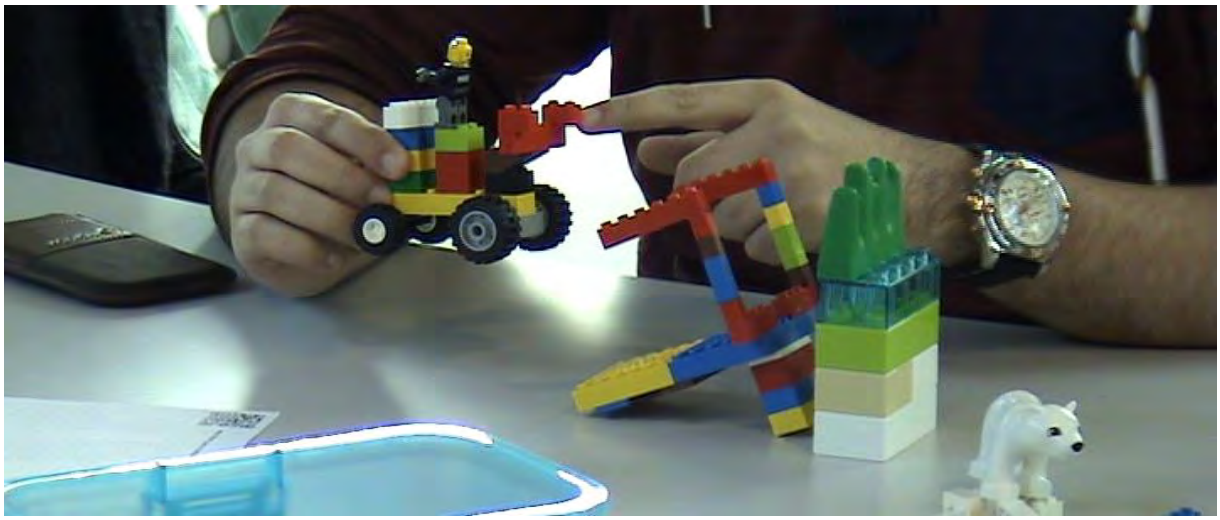

Figure 4 Video still from student LSP workshop in case 2: In phase 2 a participant tells the story of his individual model, consisting of a vehicle and a ramp.

Case Results

The LSP sessions were video-taped. The story that was told for every model was analysed by discerning the type of LEGO® model, the LEGO® model parts and their associated meaning.

Special attention was paid to the type of models, and whether they were representations of metaphors in the sense that

> "a word or phrase for one thing that is used to refer to another thing in order to show or suggest that they are similar" ("Merriam-Webster online dictionary," 2015).

3.1 Results case 1: Coffee experience

In the workshop six groups developed six shared models. Overall design results were that there are several types of coffee experiences in student life. One is the social experience in a student home, when students (often after dinner) sit together, enjoy a cup of coffee and talk. Another experience unfolds around the first cup of coffee in the morning that helps students to wake up and start their day. The third is the individual enjoyment of high quality coffee or coffee specialties as a treat.

During the workshop, we noticed that the majority of the students (both individually and when working in teams) initially had difficulty with working with metaphors. Instead, they used the bricks to build actual products rather than representations of feelings, thoughts or emotions that usually facilitate storytelling. After a facilitator intervention, most of the participants were able to eventually create abstract models and tell richer stories. Nevertheless, all final group results still contained a lot of 'concrete models' of products and settings (see Figure 5). For example, rather than describing the 'ideal coffee experience' in terms of emotions and experiences, students modelled an entire living room and coffee machines (see Figures 6 and 7).

Though the aim was to put students in the role of possible user in the fictive case, the participants did not show strong engagement. This might be a general problem, when "users" are consulted with LSP about a future product experience; client stakes in a project are much lower, than when using LSP for strategy building within an organisation. Moreover, the realization, that the case was fictional might have demotivated the students.

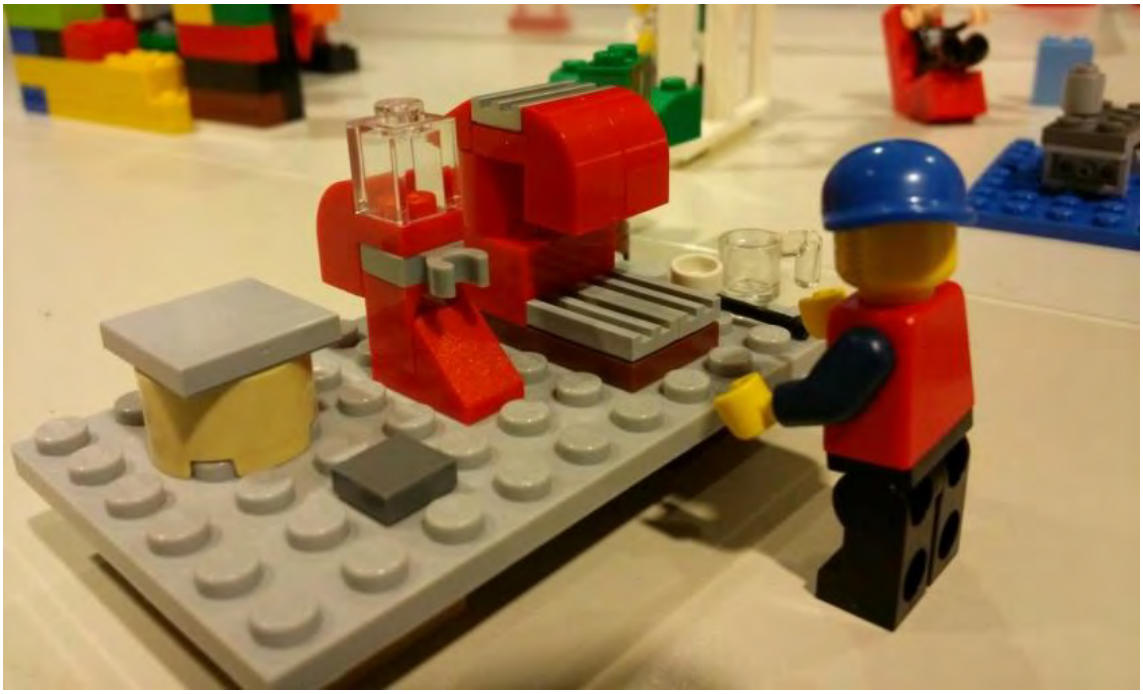

Figure 5 Photo from case 1: Literal model of a coffee corner with coffee machine and accessories.

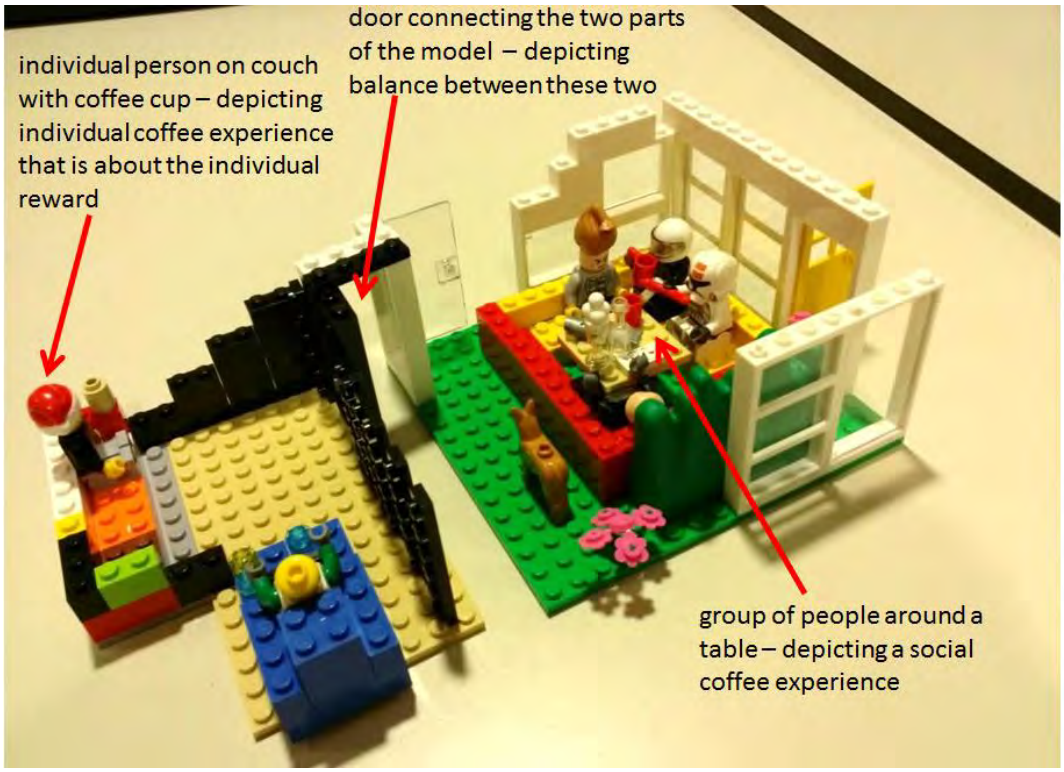

Figure 6 Photo from Case 1: Shared model depicting the most relevant user experiences that the future product should address.

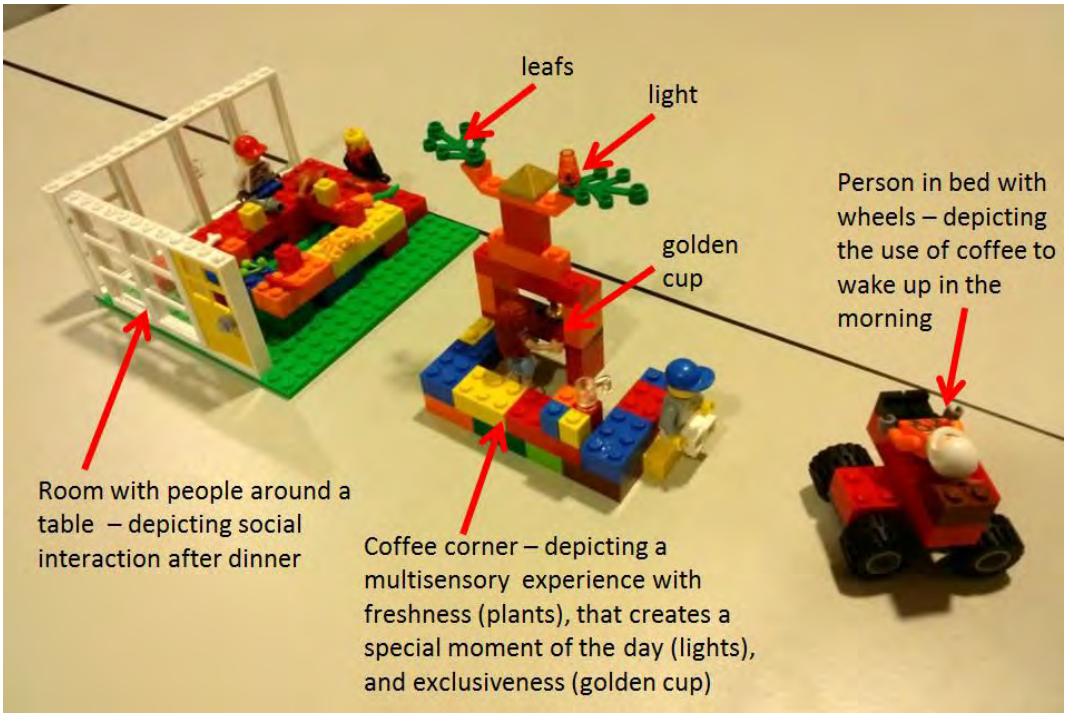

Figure 7 Photo from Case 1: students could not consolidate their views in one shared model, but made three different ones.

3.2 Results Case 2: Biking experience

For the second case the topic was changed to "biking experience" to investigate whether the problems with engagement and the difficulty to build metaphors in the first case study were caused by the topic. The three groups developed shared models, one of these was presented by an animated video in which a LEGO® puppet encountered different situations while biking (see Figures 8 and 9), the second depicted a biker and a biking route with various qualities that enriched the biking experience (see Figure 10), and the third consisted of two separate models depicting two different aspects of good biking experiences (see Figure 11).

Overall design results uncovered that there were two types of ideal biking experience, i.e., one that relates to effortless, worry-free riding, in some cases preferably as a social experience, and the other that considers biking as an exciting challenge. Additional results related to details with respect to parking the bikes, bike repair, and safety. Some of the metaphors in the models were still closely related to biking or even not distinguishable as metaphor (e.g., a broad road, sun and clouds). However, all models also had elements that were metaphors from a different context, e.g., a "butler in a helicopter" depicting "not having to worry about puncture or failure of a bike".

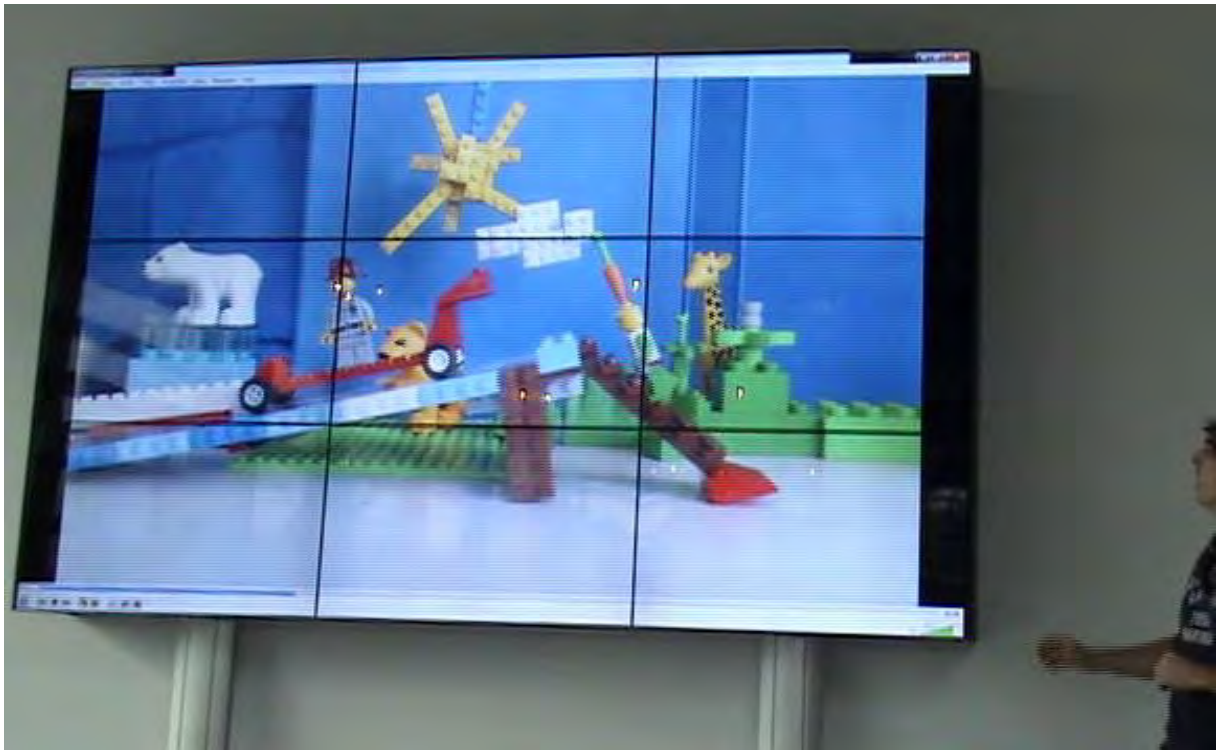

Figure 8 Video still from student LSP workshop in Case 2: LEGO® animation telling the story about the biking experience of John the snowboarder.

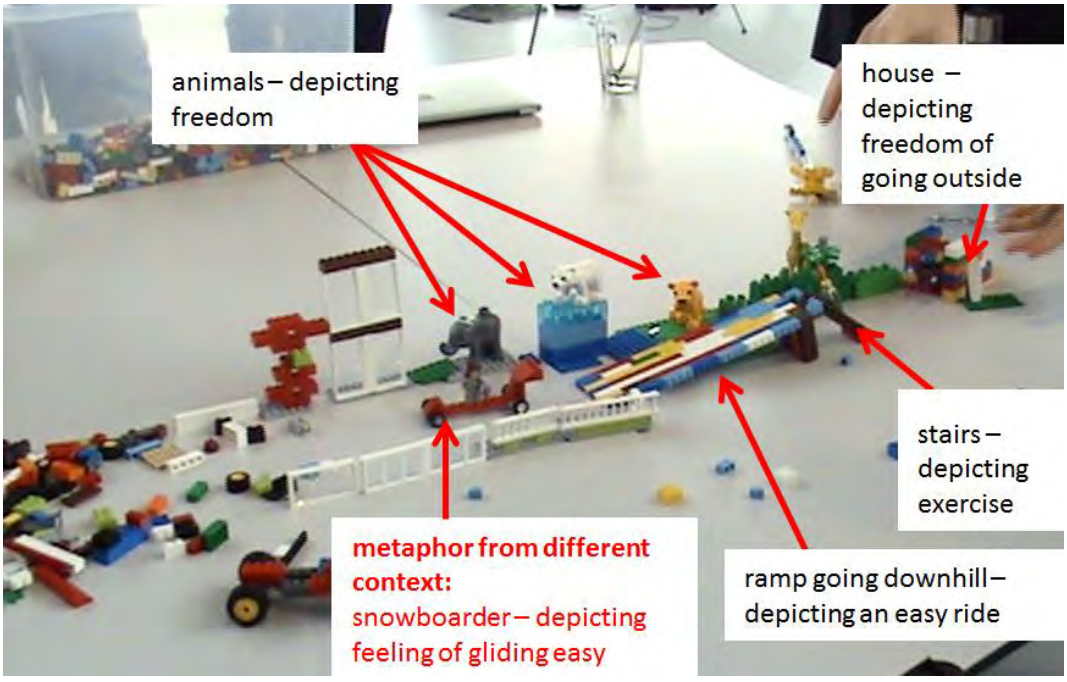

Figure 9 . Video still from student LSP workshop in case 2: Shared model representing the ideal biking experience of John the snowboarder.

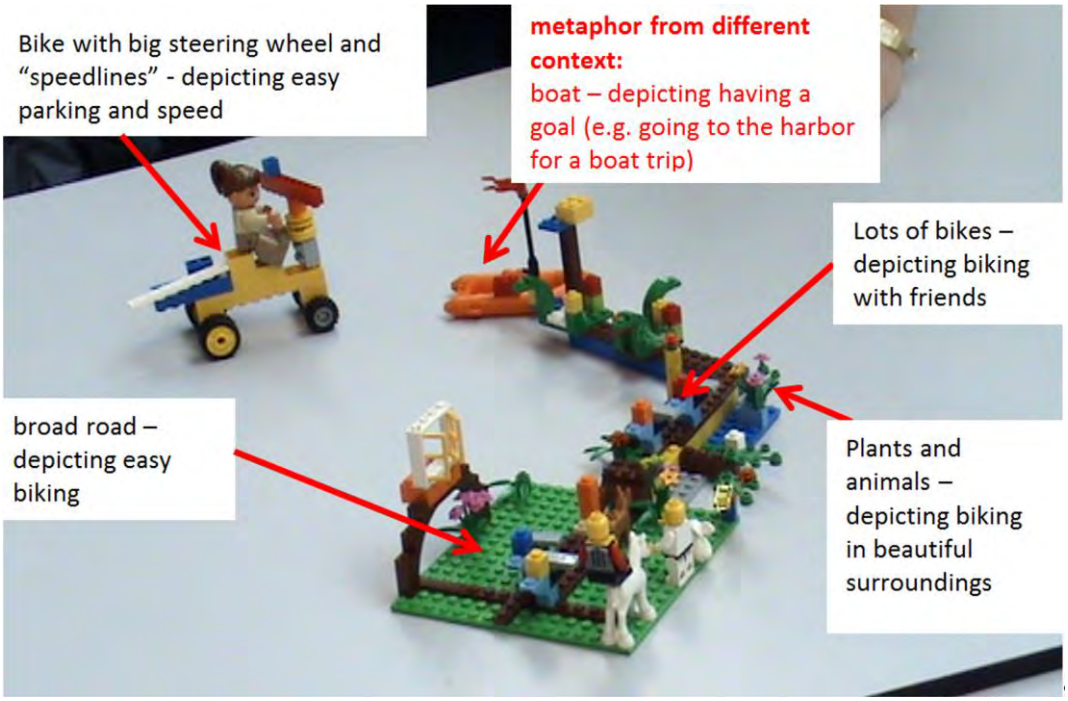

Figure 10. Video still from LSP workshop in case 2: Shared model representing ideal biking experience.

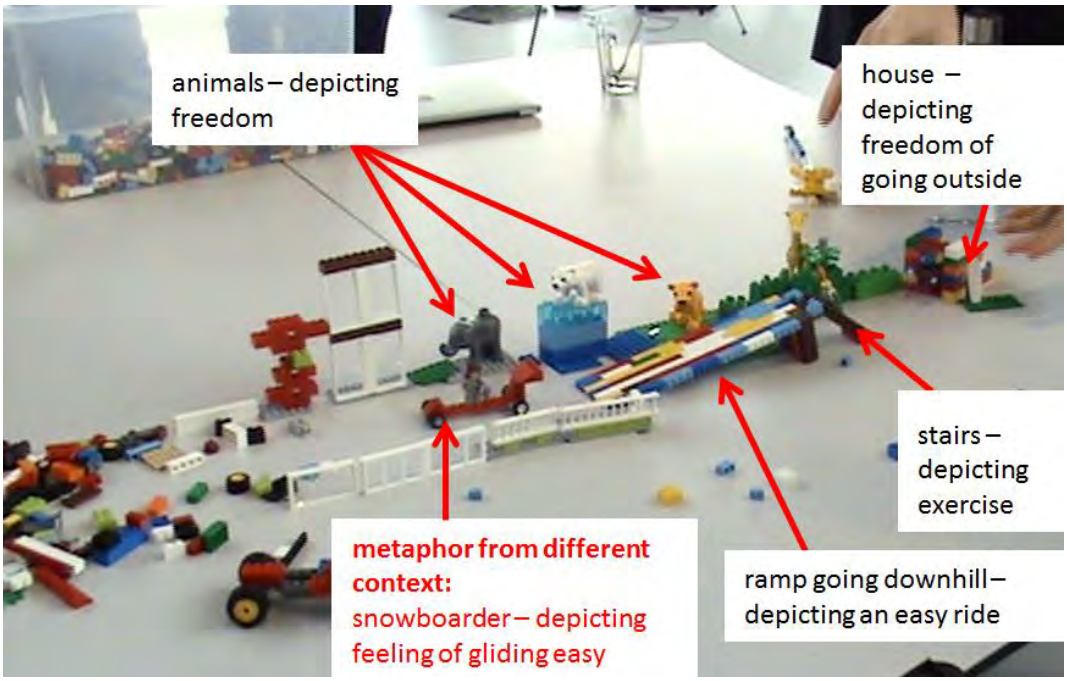

Figure 11 Video still from LSP workshop in case 2: Shared model representing ideal biking experience.

Discussion

4.1 Original LSP vs LSP for product design

This study explored whether LSP could be successfully applied within product design to reveal visions of (ideal) future product experiences together with potential future users. LSP

has originally been developed for team and strategy building, mostly applied within organizations. This means that participants from these organizations have a good frame of reference about the current situation and stakes in the process, and maybe even emotional involvement. Working with students, the relations between the future product and its potential users as well as their stakes regarding the future use experience were unknown.

Usually, the LSP process starts with metaphorically representing a current situation. In the described cases however, participants were, after only a short warming up, asked to directly engage in building an ideal situation.

Main contributions of LSP are building mutual understanding, pinpointing challenges in the current situation, and formulating simple guiding principles. The presented workshops resulted in general representations of desirable use situations for the future product. This was the type of outcome aimed for by the workshop. Due to the lack of stakes of participants one can however debate about the validity of the envisioned desirable use situations.

Furthermore the participants tended to focus on detailed, factual description of the use experience instead of its deeper emotions and underlying aims and desires. The richness of the gathered design insights is therefore less than hoped for.

Table 1 Case overview

	Traditional LSP	Case 1	Case 2
Participants	members of organization	potential future users (students)	potential future users (students)
Design Phase	none	ideation/front end	ideation/front end
Topic	various	coffee experience	biking experience
Aim	teambuilding/new strategy	envision new product/service experiences	envision new product/service experiences
Participant stakes	yes	unknown	unknown
Outcomes	simple guiding principles	general representations of desirable situations	general representations of desirable situations

4.2 Stakes

To engage participants without stakes in the LSP sessions, personal considerations or emotions could be selectively targeted (e.g., the nightmare biking experience). However, the low level of emotional engagement and low intensity of the discussions might indicate a general problem for co-design with LSP in product design: LSP works very well when

personal stakes in a project or problem are high, due to its ability to give every participant a voice and to focus the discussions on the models instead of a personal level. However, stakes for participants are usually not high when users or other stakeholders are recruited in a "consulting" role for LSP sessions. This however does not apply to LSP only, but is a general problem in co-design for consumer products.

4.3 Outcomes: current vs. future situation

It is easier to work on concrete problems than imagining ideal future scenarios/visions from scratch. To prevent participants from engaging with fixing small current problems, it was decided to omit building shared models for the *current* situation during the sessions in the two cases. Only models depicting the ideal experience were built. However, directly starting with future visions posed a challenge for the participants. This might indicate that the first step in Sanders & Stappers co-design process (2008), in which familiarizing with the subject stands central (see also Section 1.3), should always be a part of the co-design process to gain richer insights.

4.4 Metaphor building

The necessity to thoroughly follow the steps towards metaphor building and keeping a strict regime on this should not be underestimated in any application of LSP. While in both case studies the part of modifying the tower to tell a personal story was done to familiarize participants with metaphor building, in hindsight this step could be extended.

In the second case, the use of special bricks was discouraged, because the direct availability of these bricks was believed to have contributed to building real life environments instead of metaphors in the first case. This assumption appears to be confirmed, as in the second case, more metaphors and also metaphors from other contexts were used.

4.5 Outcomes: simple guiding principles

In LSP for strategy building, the complete approach including all phases ends with the formulation of "simple guiding principles" such as "keep asking questions to understand" or "stick to the values". This step forces participants to reach a consensus on a number of concrete statements. In the presented cases, this phase was not reached in the process. It would however be possible to formulate consolidated insights for product experiences. In the next steps of the product design process, it would then be the designers task to translate these principles into concrete product features. In traditional LSP, the people who later apply the guiding principles are often in the workshop (especially in LSP for teambuilding). To enable designers to translate the guiding principles into a product design, it is beneficial that designers participate in the workshop to witness the workshop discussions, before all stories become condensed to "simple guiding principles".

4.6 Participants

A limitation of both case studies was that participants were design students as the latter ("designers in the making") could potentially perform better as co-designers than non-designer users. However, the contrary appeared to be the case: the design students had difficulties to focus on metaphorical representations of dreams and feelings. They were prone to use LEGO® as a product prototyping tool and to immediately translate their ideas into product solutions. It is possible that their design background just stood in the way to participate in LSP as it is supposed to.

Participants preferably have stakes in the issue discussed in the session. For product design, these could be potential future users, who are interested and engaged with respect to the use situation of the future product or experience. Additionally, product developers/designers could participate in the LSP session to test their own ideas in discussion with participants. This potentially could generate friction and hereby lead to discussions that could propel the design process.

4.7 Boundaries

The assignments in both case studies were formulated in very general terms (identifying "key aspects of a great coffee experience" and "what an ideal biking experience encompassed"). It is possible that by applying more specific boundaries to the assignment (e.g., key aspects of a great coffee experience at the university") more specific results could be obtained.

Conclusions

In order to test the applicability of LSP for co-design in the early phases of product design, LSP was applied in two design cases. The LSP sessions and outcomes were analysed to evaluate the application and find boundary conditions. This led to useful reflections on the application boundaries of LSP. The strongest aspects of LSP are the fully developed step-by-step approach as well as the power of LEGO® to level the playing field and enable all participants to contribute. While the second aspect has been verified in the presented case studies, the step-by-step approach might need adaptions for product design.

Furthermore, the participant group constellation needs more attention as this constellation does not result as naturally from the chosen case as in applications within organizations. LSP is very engaging, but this might not always be enough to overcome a low level of motivation of participants due to a lack of stakes in a project. With respect to the group constellation, it seems advisable to keep the "co-" in co-design, and have the professionals whose job it is to translate the future experience visions into concrete reality participate in the workshop. This provides them with full access to the discussions that boil down to "simple guiding principles" towards the end. The stage of "simple guiding principles" was not reached in both case studies. This step is considered important to reach consensus in team and strategy building and can be filled in for product design as well.

The communicated objective in both case studies was to develop insights for a future situation. Not much time was spent addressing the current situation. That is in conflict with Sanders & Stappers (2008) co-design approach that always starts with a phase in which co-design participants engage with the current use situation. Hence, it could be tested, whether including such a step in the LSP approach leads to richer insights. Furthermore, the cases indicate that the use of special bricks might lead to participants building real life environments and prototypes instead of metaphors, and should therefore be discouraged. Yet another way to achieve more specific and richer results, could involve assignments with more specific boundary conditions than used in our two case studies.

Future research could involve a closer investigation of mechanisms for engaging participants when conducting LSP sessions, studying ideal composition of the participant groups, and studying the type of design cases LSP is most useful for.

Acknowledgements: We gratefully acknowledge the support of Robert Rasmussen, main architect of the LSP methodology, who encouraged us to explore the applicability of LSP within product design. Furthermore we are thankful to the students who participated in the workshop for their active contribution and valuable feedback.

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About the Authors:

Julia Garde is an assistant professor at the Human-Centred Design group at the University of Twente. She applies digital and analogue design games in healthcare projects to engage people with different backgrounds and develop solutions that contribute to improving healthcare.

Mascha van der Voort is professor Human-Centred Design and co-director of DesignLab at the University of Twente. By developing design methods for co-creation she aims to translate science and technology into meaningful solutions to the challenges we face as society.