

Revealing Agile Mindset Using LEGO® SERIOUS PLAY®: Experience from an Online Agile Training Project

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Abstract

LEGO® SERIOUS PLAY® (LSP) is an effective methodology to enable the representation of abstract concepts and has been applied to teach several Software Engineering topics. However, there is limited evidence on how LSP can be used in training on agile mindset, which is the core and central element of agile methods. This paper demonstrates how LSP can be utilized in agile training to reveal the agile mindset of participants. We describe our experience of utilizing LSP in an agile training project for local software companies. Since the project was run during the COVID-19 pandemic, we adapted the LSP methodology for online settings, which was not straightforward because face-to-face interactions and tangible objects are key characteristics of LSP. In this experience report, we describe the design of the online LSP workshops and explain how to analyze LSP models to reveal the agile mindset of the participants and to tailor the training accordingly. We also provide evidence of the effectiveness of the LSP methodology in our training project. Drawing upon our experience, we synthesize a set of lessons learned and sketch recommendations for educators who intend to apply LSP in their future endeavours.

1 Introduction

LEGO bricks are usually associated with constructing concrete structures such as buildings or cars, but the dynamic nature of LEGO also allows it to represent more abstract concepts: LEGO® SERIOUS PLAY® (LSP) is a facilitated workshop where participants build three-dimensional models using a special mix of LEGO bricks designed to inspire the use of metaphors and story-making [1].

One specific Software Engineering (SE) subject that is frequently taught using LEGO is agile methods (e.g., [2, 3]). It is commonly understood that agile methods are not just about processes, practices, and tools but, more crucially, an agile mindset, including customer focus, iterative and

incremental way of working, fast feedback loop, and continuous learning and improvement [4]. Due to the abstract nature of the agile mindset, it is not surprising to observe that there are limited studies on explicit training for it. The potential of LSP working with abstract concepts could be exploited for this purpose. The objective of this experience report is to demonstrate how to utilize the LSP methodology in agile training that has the agile mindset as a core element, especially how it helps to reveal the participants' agile mindset. We describe our experience of utilizing LSP in an agile training project we run for local software companies. Since the training project has been carried out during the COVID-19 pandemic, we adapted the standard LSP methodology for online settings. It rendered as a challenge because face-to-face (F2F) interactions are key characteristics of the LSP methodology, but limited alternative solutions have been proposed. Thus, our experience report also shows a feasible implementation of LSP in online settings.

The rest of the paper is organised as follows. Section 2 provides more details on LSP and defines the agile mindset. Section 3 is the core of this experience report. After outlining the agile training project as the context, it elaborates on the configuration and online adaptation of the two LSP workshops and explains how to analyze the resulting LSP models to reveal the agile mindset of the participants and to tailor the training. The evidence on the effectiveness of the LSP methodology in our training project is also provided in the same section. In Section 4, we synthesize a set of lessons learned and sketch recommendations for educators who intend to apply LSP in their future endeavours. Future work is outlined in the conclusion section.

2 Background and related work

The idea behind LSP is that building external models that can be examined, shared, and discussed makes it easier to construct internal mental maps [1]. Other key theories behind LSP are the importance of play as a way to learn [5] through exploration and storytelling; the hand-mind connection as a new path for creative and expressive thinking; and the role of the different kinds of imagination [6]. To

be considered as such, LSP workshops must follow the LSP Core Process, which is based on four essential steps: 1) The facilitator poses a challenge having no obvious/correct solution (e.g., “What’s your worst nightmare for this design outsourcing initiative?” [1]); 2) Participants build their answers by assigning a meaning to bricks and develop a story covering the meaning; 3) Participants share their stories; and 4) Participants reflect on what has been shared. A workshop typically takes from half a day to a couple of days. The first part serves to familiarize with the core process; then, each workshop combines a selection of seven techniques (see [6] for details). LSP efficacy has been observed in maintaining student energy, engagement, and concentration [7]. Hence, LSP has been successfully applied in multiple education areas [8], such as information systems management [9], creative arts [10], HCI design [11], civil engineering [12], and industrial engineering [13].

LSP in SE training and education. According to a separate systematic literature analysis we conducted (details are given in Appendix), many studies used LEGO bricks in SE training but only six papers used the LSP core process. The small number seems to contrast with the great success of LSP: more than 10,000 LSP facilitators [14] write white papers/blogs, and dedicated events exist. LSP has been applied to teach the following SE topics: constructing organizational identity [15], requirements engineering and dimension and dependability [8, 16], cross-domain stakeholder-alignment [17], development of a shared vision of the product [18], and team building [19]. However, there is limited evidence on how LSP can be used in training on agile mindset. Moreover, none of the papers proposed online LSP workshops; during the pandemic, limited anecdotes were reported in blogs (e.g., [20]) and validation experiments were suspended (e.g., [17]).

Training on agile mindset. Agile mindset is considered at the core of agile methods and their successful applications, so crucial to the point that Denning (2016) claims: “Agile is primarily a mindset” [21]. It affects all organisational levels and thus needs to be aligned across the whole organisation [21]. Despite of its importance, there is a lack of shared understanding of what agile mindset is. It is an ambiguous term and prone to misinterpretation [4]. Several recent studies aspired to provide a common definition of agile mindset. An opinion survey of 52 agile practitioners [22] evaluated 70 unique agile mindset elements of an effective team. The evaluation results in the top 5 evaluated agile mindset elements for effective teamwork, including searching for a solution to the problem instead of finding the guilty, being motivated, helping each other, mutual listening, and focus on achieving common goal. Based on a systematic review of scientific and grey literature, and semi-structured and unstructured interviews with agile practitioners, Mordt and Schoop [4] consolidate

192 agile mindset elements into 27 final characteristics, and create a definition of agile mindset that comprises the following elements: (AM1) Trust; (AM2) Responsibility and ownership; (AM3) Continuous improvement; (AM4) Willingness to learn; (AM5) Openness and willingness to continually adapt and grow; (AM6) Specific personal attributes, including intent, integrity, honesty, transparency, courage, authenticity, empathy, proactivity, creativity and problem-orientation; (AM7) Enabling environment; (AM8) Autonomy of people and teams; (AM9) Managing uncertainty; and (AM10) Focus on customer value.

The reviewed studies demonstrate that agile mindset is a broad concept and the constituting and interwoven elements cover personality traits, teams, culture, environments, leadership and management, which are all crucial for understanding agile mindset appropriately. Together with the invisible and intangible nature of mindset, it is difficult to provide effective training on agile mindset. This is evidenced by the abundant literature on training either students or professionals for specific agile methods and practices but significantly less literature on training for agile mindset. Many agile training programs have agile mindset training as an implicit rather than an explicit element. For example, Hof et al. [23] use a gamification approach in a multi-week scrum simulation project in an undergraduate software engineering course. Agile values and collaboration are taught to the students implicitly through playing the Scrum Paper City simulation. Often, various agile mindset elements may be considered soft skills and covered by the programs that focus on training professionals on soft skills (e.g., [24]). The power of agile mindset is somehow downplayed when its elements are treated as soft skills, as mindsets are responsible for our behavioral, physiological and psychological responses [25]. LSP provides a unique opportunity for more explicit and holistic treatment of agile mindset in a training program. It inspires workshop participants to create metaphors and make stories with three-dimensional LEGO models that could surface their agile mindsets, which could then help trainers to understand where to focus on for an effective training. As far as the authors are aware of, there are no previous studies that investigated how LSP can be utilized in agile mindset training, let alone in online settings. Our report can be seen as one of the first attempts in this direction, drawing upon our own experience in offering online training related to agile mindset.

3 Revealing Agile Mindset Using LSP

In this section, first, we outline the training project from which we draw the experience report. Against this backdrop, we describe the configuration and implementation of the two online LSP workshops and our analysis of the LSP models in terms of agile mindset. Finally, we demonstrate the effectiveness of the LSP methodology.

3.1 The Online Agile Training Project

The project provided agile training to 31 participants (28 M, 3 F) from four software companies having the following missions: solutions for the integration of IT system and business process (2 participants); solutions to support everyday digital life and complex business processes (7); web solutions for spatial data management (2); business intelligence, ERP, CRM, cyber security solutions (20). According to our survey (26 respondents), most of the participants (38.5 %) had 10-15 years of working experience, 7.7% 1-5 years, 19.2% 5-10 years, 34.6% more than 15 years. 28.0% never used agile methods, and 12.0% used them for less than one year. Most of them (48%) used agile methods for 1-5 years, mainly at the team level (60.9%).

The project participants were divided into four groups based on their roles in the companies: project managers (8, 2 F), program and middle managers (6), software engineers (14, 1 F), and other roles (e.g., marketing, CEO, human resources) (2). The central part of the training included different topics for each group (e.g., *Advanced SE Techniques* for software engineers), while beginning and ending segments were the same for all the groups. The beginning segment focused on fundamental agile concepts, principles, and practices. The goal was to provide the participants with a common knowledge foundation that could be applied across different contexts regardless of their roles and responsibilities. Understanding fundamental agile values and principles was also crucial for the participants to take part in the final part of the training (i.e., *scaling agile/agile transformation*), which allowed them to understand the agile/lean approach from a broader organizational perspective, and understand the challenges and success factors to scale agile methods to the whole organization. A retrospective session followed the training: all participants of the same company (who were previously in different groups) confronted what they learned and consolidated the acquired knowledge.

3.2 Online LSP Workshop Implementation

We conducted two four-hour LSP workshops, WS1 in the first part (during the *agile fundamentals and mindset* session) and WS2 at the end of the training, seven months later. The detailed description of how the agile mindset was taught is out of scope in this article, which focuses on how we used the core LSP process to collect data on agile mindset (Figure 1). Each LSP workshop was repeated for the four groups; in total, participants were 25 in WS1 and 22 in WS2. The time used for building, sharing, and discussing respected the indications of the LSP methodology and, as expected, varied by group depending, for example, on familiarity with LEGO bricks and the length of discussions.

The facilitator (one of the authors is a certified facilitator for LSP) faced the main challenge of recreating the LSP mood and learning experience (based on “thinking in

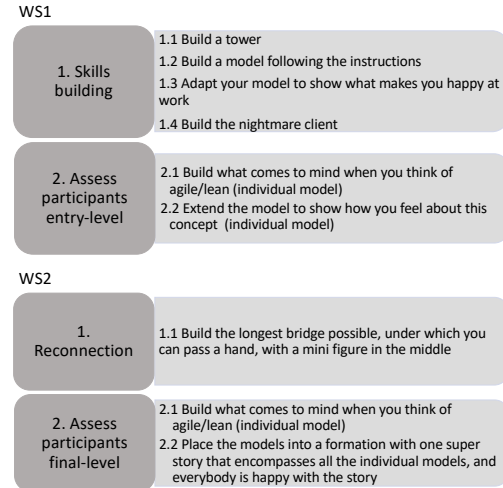


Figure 1: Goals and activities of WS1 and WS2.

3D” [10]) in the online environment (using Zoom as video conference software). We encouraged and motivated [26] camera and mic constant usage to facilitate communication and to hear the “sound of bricks”. To guarantee the same learning experience, we distributed the same official LEGO *LSP starter kit* to each participant.

Group work is a key component of F2F LSP, for example, for building shared models. In the online workshops, we created super stories that encompassed the individual models, which could be achieved by using the available bricks and did not require having one single builder. The participants uploaded to a shared document the pictures of individual models. Then, to create the super story, they organized the pictures in the document. During story sharing, the facilitator annotated each model in a visual booklet to record how the participants interpreted the elements of their LSP models, and observed the participants’ reactions and perceptions. These notes, together with the LSP models, are the input for the analysis of the agile mindset of the participants, which is explained in the following sub-section.

3.3 Utilizing LSP Models to Reveal Agile Mindset

The authors reviewed all the collected materials to surface the agile mindset of the participants by mapping the LSP models and their interpretations to the Agile Mindset (AM) elements. Table 1 shows the mapping of the four examples shown in Figure 2. The story of Model 1 was “agile means reaching the goal by taking decisions to adjust the sails to the wind”, which shows *Willingness to adapt* (AM5) and *Autonomy of people and team* (AM8).

To obtain an overall picture of the participants’ AM, we thought to create a dashboard to supervise the learning process of a group of learners [27] through an effective and intuitive means [28] to visually display levels of presence

Table 1: Models in Figure 2 mapped to agile mindset elements.

Model	Agile mindset elements									
	1	2	3	4	5	6	7	8	9	10
1					x			x		
2					x			x	x	x
3				x	x			x	x	x
4										x



Figure 2: LSP models created by the participants to answer the question “what is agile?”.

of different AM elements revealed by the LSP models. As a first step, we used a heatmap for visualization. Figure 3 exemplifies our approach. Lines and columns represent the two LSP workshops and the AM elements, respectively. Each square represents the percentage of participants who mentioned an AM element in the LSP model, with larger values represented by darker squares. This way, the two lines of the heatmap reveal the AM in the group of participants of the two LSP workshops.



Figure 3: Agile mindset revealed by the LSP workshops.

The proposed visualization would help the trainer to focus on the training on the critical agile mindset elements. A closer examination of the heatmap of LSP WS1 helped us to understand where the presence of AM elements is weaker or even not present, so that we could tailor our training plan to focus more on those elements. For example, as shown in Figure 3, in comparison to other agile mindset elements in the WS1 line, *Trust* (AM1), *Responsibility and ownership* (AM2), and *Enabling environment* (AM7) are least shown in the LSP models from the first workshop. This indicated that we should focus more on these elements in our training. Instead, relatively less attention could be paid to *Openness and willingness to continually adapt and grow* (AM5),

Autonomy of people and teams (AM8), *Managing uncertainty* (AM9) and *Focus on customer value* (AM10). In addition, the comparison of the two heatmap lines in Figure 3 helped us to understand whether the participants’ AM was enhanced through the training project and which elements were enhanced. Most squares in the WS2 line are darker than the counterparts in the WS1 line, which shows stronger presence of those AM elements in the models built in the second LSP workshop. We interpret this as the enhancement of the AM elements. It is reassuring for us to observe that no element in the WS2 line shows reduced presence, which can be interpreted that our training regarding agile mindset did not produce any counter effect, even though we could also see that two elements, *Trust* (AM1) and *Willingness to learn* (AM4), did not show improvement.

3.4 The Effectiveness of LSP to Review Agile Mindset

The LSP models allowed us to compare the participants’ AM in the beginning and at the end of the training project. Our experience is that they are more effective in revealing AM than traditional text input. During the project kick-off meeting, we divided all project participants into pairs, and asked them to write down their answer to the question “*what agile means to you?*” and to discuss their answers with their pairs. This provided us a good opportunity to compare the expressiveness of text versus LSP models in terms of revealing the participants’ AM. Indeed, most of these participants participated in LSP WS1, and there was no training session in between the kick-off meeting and the first LSP workshop; thus, the AM of the participants were supposedly not changed, and there is sufficient time lapse between these two sessions so any potential influence of pair discussion in the kick-off meeting on the LSP model building in WS1 was minimised. We analysed the text input against the ten AM elements, in the same manner as we annotated the LSP models. A heatmap similar to Figure 3 was generated that compares the revealed AM items between text input and the models from WS1, as shown in Figure 4.

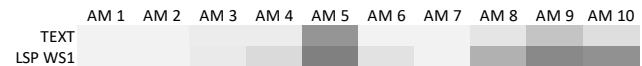


Figure 4: Agile mindset revealed by text input and by the models from LSP WS1.

For the same group of participants, the LSP models produced by them revealed stronger presence of most AM elements (except AM1, AM2 and AM7), especially for AM8, AM9 and AM10 where sharper contrasts can be observed. Figure 4 is a good illustration that LSP models can help educators better surface the invisible AM of the participants.

It is also worth noting the intangible results of the LSP workshops. Based on facilitator’s notes on participants’ reactions and perceptions, the LSP method helped to keep the

participants engaged, which was an issue in the online setting, and the participants of both workshops were eager to build their models. Of course, some participants were less enthusiastic than others; we did not push them hard, and left them enough freedom and ease to build their own models as they wished. During the workshops, an open atmosphere was created and the LSP methodology helped the team building task. Our experience confirmed what was observed in [18]: even though team building was not the primary goal of the LSP workshops, the *camaraderie* effect was pronounced. Finally, and perhaps most crucially, the participants had fun.

4 Lessons Learned and Recommendations

Drawing upon the experience reported in Section 3, we summarize a set of lessons learned and corresponding recommendations of utilizing the LSP methodology, especially in online settings. We hope they could be useful for other educators for using LSP in.

Running LSP workshops.

- LSP workshops require considerably more time than traditional text-based surveys; however, LSP can better surface participants' invisible agile mindset.
- LSP facilitators need to be aware of the difficulties that the audience might have with building. For example, we had a color-blind participant who had difficulty following the building instructions in WS1. We explained to the participant that instructions were needed only in that specific activity and allowed as much time as needed to complete the construction. We recommend collecting the necessary information about the participants to plan the workshop carefully.
- We recommend gathering participants' feedback to collect tips for replication elsewhere [16].

Running LSP workshops in online settings.

- To ease the workshop execution, we recommend providing each participant with the same LEGO set (as in F2F workshops). However, we recognize that this may be difficult in the case of global participant groups.
- We recommend asking participants to keep cameras and mics on to obtain spontaneous interactions and more realistic environments. We could observe that the *show-and-tell* nature of the exercises with LEGO bricks facilitated this request.
- The time needed for each online activity depends on several factors (e.g., familiarity with LEGO bricks and the length of the discussions). We recommend having backup activities to keep the fastest builders engaged as, in our case, they tended to disengage quickly (e.g., switching windows to read emails).

- We recommend keeping the 12 participants limit per facilitator as in F2F workshops: if the group is larger the LSP Core Process takes too long and it is hard to keep everyone in flow.

Running LSP workshops when training for agile mindset.

- LSP methodology is effective in training for abstract and complex concepts such as the agile mindset. It is helpful to have a concrete definition of the abstract concept, and build a mapping between LEGO pieces and the components of that concept before running LSP workshops. This could greatly help the educators to better grasp the participants' understanding of the concept.
- We demonstrated how to surface the presence of an agile mindset in a participant group. To enable more *personalized* training, we recommend to keep the mapping between participants and the LSP models they build in different workshop sessions in order to compare their initial and final mindset.

5 Conclusion

LSP is an effective methodology to enable the representation of abstract concepts. In this experience report, we described our adaptation of the LSP methodology for an online agile training with local software companies during the COVID-19 pandemic time. We focused on how the LSP methodology could help to reveal the agile mindset of the participants. We also explained how the models produced in LSP workshops could be analysed to provide more focused and targeted training to participants and better understanding of the training effect. The approach presented in our experience report can help educators in agile training for organizations, because it shows a concrete means to understand the presence and level of agile mindset in the organization. Drawing upon our experience, we summarized a set of Lessons learned and recommendations that could help other educators utilize the LSP methodology in a meaningful manner in their training.

Through our experience, we demonstrated the effectiveness of LSP models to reveal the agile mindset of people. However, to establish the effectiveness of the LSP methodology in training for agile mindset, more rigorously designed studies are needed. For example, as in the papers [8, 16], controlled experiments can be used to compare the learning outcome of one group (treatment group) using the LSP methodology and another group (control group) using conventional approaches such as pair/group discussion or questionnaires. Potential interesting aspects to explore include the usage of *show-and-tell* activities (e.g., LSP) as a potential solution to let people keep camera on during

online sessions, how LSP works for different backgrounds (disciplinary, gender, etc.), which would be important because agile mindset is relevant to all the roles in an organization, and whether/how LSP could be used in training for other types of mindsets or abstract concepts as well as concrete skills or knowledge. A follow-up study could examine whether the participants implemented the studied principles in real-life. Finally, the proposed approach could be compared with other approaches to judge the extent to which agile mindset has been developed.

Appendix

In the systematic mapping study we conducted, we retrieved existing works on *LSP in software engineering training and education* in November 2021 by using the following search strings in all metadata: (*lego OR brick OR LSP OR “lego serious play”*) AND (*“software engineering” OR agile*). We found 186 works from three digital libraries: IEEE Xplore (126), ACM DL (25) and Scopus (35). After duplicates removal, based on title/abstract we excluded: 1) Studies dealing with programming/robotics; 2) Studies with no focus on SE education; 3) Studies not presented in English; 4) Summaries of conferences/editorials; 5) Studies not accessible in full-text; 6) Replications; 7) Books. We excluded one of the six remaining papers after full-text reading because it did not use the LSP core process. One paper was then added through backward snowballing [29].

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