

# Setting Conditions for Learning: Mediated Play and Socio-material Dialogue

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**Abstract.** This study discusses how mediated play support learners' understanding of abstract concepts, through ownership and expression of self. The studies, Design-Learn-Innovate and MicroCulture, are targeted to primary and high school pupils, and are respectively set in a secondary school and in an archaeological museum. The impact of a dialogic setting for learning, based upon mediated play and design activities, on pupils' understanding of abstract concepts as well as active participation to learning are investigated. Results from both studies show that mediated play and design based tasks can contribute to learning in formal and non-formal contexts by setting conditions for children to take possession of their learning process and of the concepts, exploring them through their senses and social interaction. As a result, children can achieve complex forms of understanding, which can be useful in future learning experiences.

**Keywords:** design based learning, playful learning, mediated play, facilitation.

## 1 Introduction

This paper proposes a meta-level reflection, based upon data from two empirical studies, investigating how introduction of mediated play and sociomaterial forms of dialogue affects learning practices in formal and non-formal contexts. Both studies aimed at exploring how mediated play could allow learners to gain ownership over their own learning process, communicating with their teachers on a peer basis, and to achieve deep forms of understanding.

The first study is called Design-Learn-Innovate and it focuses on investigating playful approaches, so as to support primary school pupils to learn from project organised design activities, representing conditions for non-formal (playful) learning, supported by hands-on projects. The project was conducted in cooperation with a secondary school in Southern Denmark, and it involved pupils between 15-20 years of age, teachers (facilitators), and domain experts. The second is a doctoral project, aimed at enriching the practice of guided tours, in particular regarding learning of historical processes. The target group is primary school children, in between 9-12

years old, for whom guided tours may represent their first experience of museums. Play is seen in this project as form of multimodal language, allowing children to break the ice with guides and sharing with them control the learning activity.

The issue tackled in both studies is the static form of interaction emerging between learners and teachers in formal as well as in non-formal contexts of learning. Hence in both cases, learning practice tend to converge towards lectures, in which children act as receiver of the message sent to them by the teachers, resulting into lack of engagement and difficulties for teachers to support the children in gaining new knowledge.

Results gathered from both studies suggest that forms of mediated play elicit an articulated sociomaterial dialogue [3, 26] between teachers and learners. Moreover, it seems to allow learners to make individual statements on themselves and their own interests in learning. In this way, learning is characterized as an emergent experience, for which teachers have to set conditions for, without steering it completely.

In the next section (2) related work is discussed in combination with details that are provided from the two empirical studies; Design-Learn-Innovate and MicroCulture. A critical discussion on the data is conducted in section three, and then, section 4, outlines the conclusions.

## 2 Design-Based Learning

The two projects, on which this reflection is conducted, aimed at enrich learning condition for the learners, so that they could gain a rich understanding of complex concepts in a hands-on way, so as not to oversimplify them and, at the same time, allowing them to gain ownership of their own learning process.

The target group includes primary school pupils between 9-20 years of age, but the two projects were set in different contexts of inquiry. The investigation conducted for Design-Learn-Innovate took place in a secondary school, which means that it focused on a formal context for learning, in which teachers acted as facilitators and the classroom was the main space for learning practice.

On the contrary, MicroCulture was conducted into two settings, the Viking Museum in Ribe and an afterschool facility in a local school, in Oksboel, Denmark. The museum represents the main focus for the project and an unfamiliar learning context, involving new spaces, objects, such as archaeological findings and reconstructions, and new people, the guides, who are supposed to facilitate their learning. On the contrary, the afterschool facility constitutes a familiar environment, such as the school for Design-Learn-Innovate, for everyday playful activities. The design workshops for MicroCulture were conducted in the afterschool facility, as it allowed the researchers to establish a relationship with the children in an environment in which they are confident, it also allowed to see how children relate to play. It was also used as a design collaboratorium [6], in which the children and the researchers had regular sessions including cooperative inquiry based on creative tasks [9], so as the process of making and their artefacts provided probes for reflections, and also testing and co-prototyping sessions.

Both projects were conducted through qualitative methods inspired by design methodologies, involving ethnographic observations, situated interviews and prototyping.

Design is a central aspect to both projects, as they explore the application of design tasks into learning practices. Within the Design-Learn-Innovate project, the students participating in the project were asked to develop prototypes of innovative solutions for specific problems, using different materials and based on lectures, given by specialists from relevant fields. The students had to put into practice the content of the lectures they attended, elaborating it in a creative way and taking decisions on their own. In this way, the concept of design thinking as an approach to learning was introduced, targeting a transformation of the learning environment to a creative and innovative practice. Our definition of design thinking is process oriented emphasising design actions [21]. In this way, we consider the classroom setting as a design-like practice, which, in line with [21], is learnable but not teachable (p. 157).

In the case of MicroCulture instead, participatory design was adopted, in order to involve the children as co-designers and gather insights about their interests and needs regarding play, learning of history, and museum experience. During the design workshops, children expressed interest for creating their own tools and toys for themselves or to share with their playmates, also when playing with a low-fidelity prototype, engaging in a form of playful play [23]. The same designerly form of play supported individual as well as social play, according to children's preferences. Individual players preferred to focus on creative exploration of new items and their use, not communicating with other players very much. Some of them explicitly made items for other players and simply placed them close to them. On the other hand, social players engaged in a competitive form of play, challenging and teasing each other [17]. This interaction form was concretised through the creation of weapons or military ships, and other similar artefacts.

Data from the projects were gathered through ethnographic observations, field notes, and video recordings from the observations conducted during the process and the final evaluations, and from interviews with children/students and teachers or guides. In the following subsections, results from the empirical studies are discussed in details in relation to how mediated play affected learning in the different contexts, focusing on the emergent dialogue.

## 2.1 Design-Learn-Innovate

The main focus of the Design-Learn-Innovate project is to apply design thinking as a resource for non-formal learning by implementing project-organised design activities in order for the students to learn from specific project themes. The students select the themes themselves, for example: "Future green transportation"; "How to improve the everyday life for people with disabilities"; and "Human-Computer Interaction". This is to create conditions for ownership, creativity and innovation in learning situations that normally have a formal lecture format [2].

Learning in secondary school is not just about acquiring knowledge, but also about the way students handle that knowledge through a sequence of activities; the learning process. Dewey [8] addressed this question by stating that education should offer a

generic understanding of how knowledge is created. Through hands-on activities students are offered opportunities to create generic skills possible to transfer to different conditions and situations. Dewey [8] is aware that there is always a danger when teaching remotes from everyday life and thereby becoming technical and artificial.

Besides contextual attributes related to the physical setting, this project takes into account students' prior knowledge, enjoyment, and interest. This is to reinforce non-formal-based experiences and achievements; a process which we have termed non-formal learning [18, 21, 1]. Having enjoyable experiences means being engaged and that the individual is offered possible choices of action. This kind of interest can be characterised as persuasive and associated with increased knowledge and desire to learn more [15]. Dewey [7] emphasises the importance of individual interest in learning situations characterised by having high personal meaning.

Starting from these theories and methods, we defined a learning scenario for secondary school students. The intervention took place over three days and was based on the model of an iterative design cycle, specifically focusing on the phases of discover, design, sketch and prototype, and thoughtful reflection [21, 16]. The primary tools for the design thinking approach were expert presentations related to the chosen project theme, brainstorming, sketches, and low-fi prototypes. The students' choice of project theme was based on their interest, which constituted the base for the creation of project groups. This means that the groups were mixed in terms of age and education line. Each group was designated two facilitators to facilitate the process (Figure 1). The task for each group was to create a concept idea of a product, service or process related to their specific project theme.



**Fig. 1.** Dialogue between facilitator and student

Empirically this specific study was based on a field study including 116 students (89 females and 27 males) between 15 and 20 years of age. The students were divided into 12 groups of various size (between four and twelve participants in each group),

where the data collection was based on video observations, interviews, follow-up questionnaires to students, photos and sketches from the learning situations. The results from the Design-Learn-Innovate project showed that design thinking is a way to create conditions for creativity and innovation in the form of participatory in-action learning. However, these conditions are dependent on idiosyncratic tendencies. The question of how to use and overcome such possible constraints is a crucial facilitator consideration.

## 2.2 MicroCulture

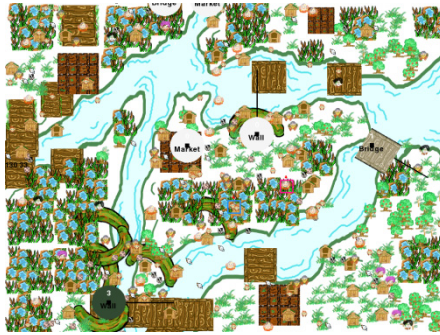
The main focus of MicroCulture was to explore how to transpose historical processes in to playful interactions, so as to elicit an understanding of history from a sociocultural perspective, at the same time allowing children engaging on a dialogue with the guides, so that they could gain more ownership over their learning process.

The outcome of the design process is a tabletop digital game, illustrating how kings affected urban development, through placement and maintenance of infrastructures. The set up includes a flat TV screen, a laptop, a webcam, and a set of paper tangibles, with which the children are supposed to play. The system is implemented in Python and ReacTIVision [14], an open-source software application that allows to create tangible user interface, exploiting tracking of a set of predefined markers through a regular webcam (Fig. 1). The children play with a set of tangibles, representing each a different infrastructure: bridge, wooden paved street, market place, and defensive rampart. The screen displays a simulation of a village and its population, the players are supposed to develop the settlement into a town, by placing infrastructures, which allows the inhabitants growing in number, establishing new households, and overcome natural obstacles (Fig. 2 and 3).



**Fig. 2.** Children playing during final evaluation in the museum

The project focuses on introducing mediated play as a communication resources, so to turn guided tours a typical museum learning practice, which has been little studied [6], into a playful apprenticeship in thinking. The theoretical framework is based upon the studies conducted by Rogoff [20], which refer to the theory of play formulated by [24], and [4]. According to Rogoff [20], children learn new skills and



**Fig. 3.** Strategic use of ramparts and bridges

knowledge, by engaging in goal directed activities with fellow adults, who already master the given activity. The role of adults is fundamental, as they provide support, adjusting the activity according to the needs of the children, when they reach their zone of proximal development, defined as the boundary between what they already know and what they can learn, according to their developmental stage [20, 24]. In this learning scenario, that is called by Rogoff [20] “apprenticeship in thinking”, children are supported by adults, in the coordination of the shared activity, but are active participants to their own learning process. Moreover, play is vital for the development of abstract thinking in young children, who playing with toys learn to reflect upon the implications of their actions projected upon a fantasy world.

Furthermore, play is also seen as a state of mind, allowing the participants to explore possibilities in a self-motivated way [23] and also to become more daring in relation to normal social rules. In this sense, play is used as a mean to allow the children to explore abstract knowledge through mediated manipulation, at the same time forgetting about the hierarchical relationships they with teachers and guides, so as to become able to ask questions to the guides.

Final evaluations with a working prototype of MicroCulture, show that through mediated play, children were able to acquire a playful state of mind, expressing themselves ours, verbally and non-verbally, in a more playful and spontaneous fashion, than observed during regular guided tours [17]. Moreover, it was noticed that presence of an interactive game elicited a need for information in the children, so that they asked questions, regarding playing modalities and meaning of the items represented, which could be used by the guides to provide individually meaningful information, grounded on play.

Four different stages were identified, in the way the children interacted with the guides during the final evaluation:

1. Technical.
2. Collaborative play.
3. Role-play.
4. Competitive play.

During the first stage children's main interest is to explore the digital solution offered to them, so that they ask questions on how they can play. For instance they asked if they could place more tangibles at the same time or what specific items were. The emergence of questions is considered a main result, as children do not ask direct questions to the guides. Shortly afterwards the children moved towards the second stage, Collaborative play, in which the children focused on the game and its narrative elements, so that their talk dealt with the settlement and their actions in relation to its development. A form of collaborative play emerged, in which they focused on a particular area of the landscape (screen) and exchanged tangibles, in order to help each other in developing the different areas. At this stage, the guides can start to use MicroCulture to talk about sociocultural dynamics within urban development, linking them to the features of the game and to the children's actions. Collaborative play quickly evolved into Role play, expressed through utterances, such as: "We need more streets for our settlement!" or "We have to set up a bridge here for our people!" However, some children did not join these forms of social play, exploring possible configurations for their territory on an individual basis. The children developed an attachment to the portion of the landscape they played with; in so doing they acted as kings reflecting upon the impact of their actions on the territory and its population. This is an interesting result, as it shows that MicroCulture allows children to understand through play, the dilemmas landlords faced in engaging in urban development. Finally only one group engaged in Competitive Play, which represent an evolution of the stage of collaborative play. Some children started to tease each other, for instance a girl placed a series of circular rampart, so as to block the characters populating the land a boy close to her was playing with. She directly addressed the boy saying: "You are stuck!" and as an answer the boy acted angry in an exaggerated way and joined a series of bridges in order to allow the character to pass anyway. In the other groups, this stage was mostly represented by laughs and expressions of teasing in relation to unsuccessful placement of infrastructure, for instance: difficulty in placing bridges, which require a specific orientation for the character to cross the rivers.

In terms of learning, playing with MicroCulture allows the children imagining how it could have been to be a king in the past and having to deal with the development of rural areas. Furthermore, through play the children were able to engage in a polyphonic dialogue [4] with the guides, in which the multiple voices of the participants could express themselves freely, and not simple by non-verbal implicit cues. In this way the children were able to participate in steering the discourse emerging during the guided tour, as by addressing questions the guides had the opportunity disclose information that the individual children found interesting. On the other hand, the game was also adjusted according to the guides suggestions, so that sociocultural elements they assign priority were represented in the game.

In conclusion, it is possible to conclude that playful design activity can significantly contribute to learning in non-formal context, so as to allow learners participating actively and gaining more ownership over their learning process, through free, creative exploration supported by both play and design.

### 3 Discussion

Results from both studies showed that mediated play and design based tasks can contribute to learning in formal and non-formal settings, allowing children/students to gain ownership of their learning process and of their knowledge, through independent exploration and play. In this way, the children/students took possession of the concepts and formulated questions that derived from in-action reflections. In this way, the participants in the both projects explored abstract concepts through participation, creative expressions, their senses and social interaction.

Results from the MicroCulture project emphasized the emergence of questions and interaction with the guides; the guide as king or as nobleman advisor; children's understanding of strategic use of infrastructure in warfare in collaborative and competitive play

A major concern in the Design-Learn-Innovate project was the experienced gap between the creative (open-ended and chaotic-like) character of the design thinking based learning situation and students' expectations on a more lecture-format-like structure of teaching and learning. Many of the students experienced that the situation was unstructured, chaotic, and sometimes too challenging. Schön [21] underlines that students learn to fill this gap by engaging in such a design activity. This is to say, that the experienced lack of structure does not necessarily emerge from misunderstandings or from an imprecise introduction to the learning activity, but from the creativity inherent in the design thinking actions and interactions. This, according to Schön [21], cannot be taught but has to be learnt. We argue that the facilitation as a reflective design practice might improve learning conditions generally applicable to several kinds of learning situations. Cross-disciplinary and age-mixed groups where interest was the unifying factor, elicited experiences of ludic engagement and collaborative learning.

### 4 Conclusion

In conclusion, we claim that introducing design thinking to encourage innovation can turn learning situations into creative action and participatory based opportunities to generic skills and competencies. This participative way of learning and create was in many ways based on dialogues between peers and individuals/peers and facilitators/guides. Halliday [13] terms such turntaking activities as speech acts and emphasizes:

An 'act' of speaking /.../ might more appropriately be called an 'interact': it is an exchange in which giving implies receiving, and demanding implies giving in response. [13]

### References

1. Aderklou, C., Fritzdorf, L., Petersson, E.: *Pl@yground: Pedagogical Innovation and Play Products Created to Expand Self-development through Child Collaboration through Computer-Mediated-Communication (CMC)*. Socrates, Leonardo & Youth, Project No.: 91893-CP-1-2001-1-SE-MINERVA-M. Halmstad University, Sweden (2001)
2. Arminen, I.: *Institutional Interaction. Studies of Talk at Work*. Ashgate, Farnham (2005)
3. Bakhtin, M.M.: *Speech Genres and Other Late Essays*. University of Texas Press, Austin (1986) (Trans. by McGee, V.W.)



4. Bakhtin, M.M.: Discourse in the novel. In: Bakhtin, M.M. (ed.) *Dialogic imagination. Four Essays*, 1st edn. (1981), 10th edn. (1996). University of Texas Press, Austin (1981)
5. Best, K.: Making Museums Tours Better: Understanding What a Guided Tour Really is and What a Guided Tour Really Does. In: *Museum Management and Curatorship*, vol. 27(2), pp. 35–52. Routledge, London (2012)
6. Bødker, S., Buur, J.: The Design Collaboratorium—a Place for Usability Design. *Proceedings of ACM Transactions on Computer-Human Interaction* 9(2), 152–169 (2002)
7. Dewey, J.: *Interest and Effort in Education*. Riverside Press, Boston (1913)
8. Dewey, J.: *Democracy and Education: an Introduction to the Philosophy of Education*. Cosimo Classics, New York (1916/2005)
9. Druin, A.: Cooperative Inquiry: Developing New Technologies for Children with Children. In: *Proceedings of CHI 1999, Pittsburgh, USA*, pp. 595–599 (1999)
10. Dysthe, O., Bernhardt, N., Esbjørn, L.: Dialogbaseret Undervisning. *Kunstmuseet som læringsrum*. Skoletjeneste (2012)
11. Ewenstein, B., Whyte, J.K.: Knowledge Practices in Design: The Role of Visual Representations as ‘epistemic objects’. In: *Proceedings of EGOS 2005, Unlocking Organizations*, Berlin, Germany (2005)
12. Fallman, D.: Design-Oriented - Human Computer Interaction. In: *Proceedings of CHI 2003, Human Factors in Computing Systems*, Fort Lauderdale, Florida (2003)
13. Halliday, M.A.K.: *An Introduction to Functional Grammar*. Edward Arnold, London (1985)
14. Kaltenbrunner, M., Bencina, R.: reactIVision: a Computer-Vision Framework for Table-Based Tangible Interaction. In: *Proceedings of TEI 2007 the First International Conference on Tangible and Embodied Interaction*. ACM (2007)
15. Krapp, A., Hidi, S., Renninger, K.A.: Interest, Learning and Development. In: Renninger, K.A., Hidi, S., Krapp, A. (eds.) *The Role of Interest in Learning and Development*. Erlbaum, Hillsdale (1992)
16. Löwgren, J., Stolterman, E.: *Thoughtful Interaction Design. A Design Perspective on Information Technology*. The MIT Press, Cambridge (2004)
17. Marchetti, E., Petersson Brooks, E.: Playfulness and Openness: Reflections on the Design of Learning Technologies. In: Brooks, A.L. (ed.) *ArtsIT 2011. LNICST*, vol. 101, pp. 38–45. Springer, Heidelberg (2012)
18. Petersson, E.: Non-Formal Learning
19. Petersson, E.: Ludic Engagement Designs for All. *Digital Creativity* 19(3), 141–144 (2008)
20. Rogoff, B.: *Apprenticeship in Thinking. Cognitive Development in Social Context*. Oxford University Press, Oxford (1990)
21. Schön, D.A.: *Educating the Reflective Practitioner*. Jossey-Bass. A. Wiley Imprint, San Francisco (1987)
22. Star, S.L., Griesemer, J.R.: Institutional Ecology, ‘Translations’ and Boundary Objects: Amateurs and Professionals in Berkeley’s Museum of Vertebrate Zoology 1907–39. *Social Studies of Science* 19(3), 387–420 (1989)
23. Sutton-Smith, B.: *The Ambiguity of Play*. Harvard University Press (1987)
24. Vygotsky, L.S.: *Mind in Society. The Development of Higher Psychological Processes*. Harvard University Press, Cambridge (1978)
25. Vygotsky, L.S.: Play and its role in the mental development of the child. *Voprosy Psikhologii* 2, 62–76 (1966)
26. Wertsch, J.V.: *Voices of the Mind. A Sociocultural Approach to Mediated Action*. Harvester Wheatsheaf, London (1991)