Playful Pedagogies in Teacher Education: Experimenting with Making, Design Thinking, and Serious Play in a Flexible Furniture Setting

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Abstract: The paper describes the concept and outcomes of a series of workshops with faculty, staff, and students from a teacher education program specializing in vocational education and training (VET). The authors analyze and reflect upon the conceptual development, facilitation and evaluation of the workshop series. Practitioners and researchers alike will find this article a valuable source for contemplating the effectiveness of design thinking, making, and serious play in teacher education. Although our case study is situated in the particular context of preparing future vocational school teachers within the German education system, the resulting concepts are applicable to other populations.

Introduction

The article describes and analyzes the concept and outcomes of a series of workshops that the authors conducted at Muenster University of Applied Sciences (Germany) in April 2022. The workshops engaged participants in LEGO serious play, design thinking techniques and maker activities to orchestrate pedagogical planning both in vocational schools and for educational teacher courses. It took place in a newly designed room with flexible furniture. The authors evaluated the concept of the workshop by conducting an online survey and three in-depth expert interviews with participants.

Making, LEGO serious play (LSP) and design thinking are distinct, yet connected creative approaches that center the virtue of tinkering, failing, iterating and developing new skills by venturing into unfamiliar terrain. There are many connections between serious play, making, and design thinking. For example, in many cases design thinking activities involve the use of LEGO bricks, and makerspaces oftentimes incorporate design thinking techniques to create low-fidelity prototypes. The shared potential for higher education is reframing campus as a space for students to be understood and grow intellectually instead of being perceived as '*a factory of grades to give legitimacy for governments funding'* (Alayan, 2020).

Maker Movement

Makerspaces are collective places that facilitate design and prototyping for individuals and groups by offering access to technical equipment and material together with expertise, guidance and training. The shared workspace allows engineers, designers, scientists, students, and hobbyists to create, fabricate, tinker, and bring their ideas to life. Alongside the rise in popular interest of the maker movement, makerspaces are visibly on the rise in schools and universities: '*The education community has recognized the potential for Makerspaces as learning environments that can foster interdisciplinary collaboration and self-directed learning.*' (Hynes & Hynes, 2018, p. 867). The use of makerspaces in education has grown over the last decade as public awareness of the maker movement has increased. The 2016 Horizon Report identified makerspaces as one of the key technological developments that will shape the future of higher education.

LEGO Serious Play (LSP)

LEGO Serious Play is a collaborative, creative method that uses Lego blocks and figures to develop scenarios for organizational development, conflict resolution, web design (Cantoni et al., 2009), learning environments (Frick & Tardini, 2014) or research design. The method aims at improving group problem solving, shared learning, listening, and collaborating by making and creating. "*While the method is content-neutral, it is particularly well suited to complex problems that merit examination from multiple perspectives*" (Jensen et al., 2018, p. 265). Robert Rasmussen describes serious play as 'an *intentional gathering of participants who want to use their imagination, agree that they are not directly producing a product or service, and agree to follow a special set of rules'* (Rasmussen Consulting, 2012).

Design Thinking

Design thinking is a practice and mindset that can be helpful to educators when addressing wicked problems. The term wicked problems was coined in the 1970s by planners who realized that the problems they were addressing were beyond complex: They combined a high level of uncertainty and risk with intense disagreement and conflicting objectives among stakeholders and, as a result, had no ideal intervention that would address the issue (Rittel & Webber, 1973).. Design thinking offers an approach to these problems that integrates information across systems and across perspectives. While the concept of design thinking within the academic dialogue of design has been under discussion for more than 30 years, its recent adoption as an innovation method has lead to its popularity in various disciplines (Wigley and Straker, 2017).

Workshop Series

Four days, 22 hours, three formats, 30 participants, 1000 LEGO bricks: Students, faculty, vocational education experts, and teaching methodology specialists engaged in a series of workshops that tapped into maker mindset, design thinking, and serious play. Participants developed pedagogical ideas for using a new teaching space with flexible furniture at Münster University of Applied Science as well as innovative pedagogies for VET in different

subject areas. The workshops took place in a newly designed room with flexible furniture that serves a teacher education makerspace. The three workshop formats differed in length (2.5 hours, 3.5 hours, 2 days) and audiences (faculty, staff, students). Hence, not all exercises were incorporated in all settings.

Love Letter – Break-up Letter

In design thinking empathy is crucial to support divergent thinking in the initial phase of the design process. The love/breakup letters task allows participants to balance different perspectives in a personal way (Molinari & Gasparini 2019). The facilitator used this exercise in both faculty and student workshop settings. It works with a simple prompt that allows participants to reflect on both the strength and weaknesses of their organization in a low-risk, role-play format. Participants were randomly assigned in two groups and asked to write a love letter or a break-up note to their university or to their profession in general.

Figure 1: Love-Letter - Break-up Letter Exercise, groups with portable whiteboards

LEGO models

Both students and faculty played through the four steps of the LSP process (challenge, build, share, reflect) in a short and simple pair-share exercise. The prompt was structured into (1) building a tower, (2) placing yourself on that tower, and (3) describing the view from your tower with the goal of depicting a good thing the builders can see in their past, future or surroundings (cf. Anat Shabi, 2022). The most striking observation throughout the use of LEGO models was that participants were immediately engaged and that they interacted quite literally at eye level. Everyone was sitting on the floor, scouring for bricks, and curious to see the work of others.

Figure 2: LEGO model building, different groups

Maker Activities

The highlight of the two-day student workshop was the introduction of maker sets with instructions for short-term making projects of approximately 30 minutes build time. Participants formed three groups and created different microbots (doodle-bot, brush bot, tooth brush bot). The facilitator also provided a makey-makey set with a more open-ended task ('create anything'). Presented with these choices, students gravitated towards the more concrete projects with instructions.

Figure 3: Maker activities, teacher candidates

These small projects effectively illustrated the core principles of maker spaces. All groups initially failed in their design, and, after testing, had to hypothesize potential solutions, and iterate to succeed. All of them had to substitute materials and deviate from the instructions. Interestingly, feedback varied in terms of the necessity of instructions. Whereas some felt challenged, others felt that instructions were too detailed, and didn't leave enough room for their own ideas. For future workshops it will be interesting to increase complexity and openness by using an introductory project, followed by a free design, thus moving from replication to innovation (Holm, 2015).

Personas / Role Play

Personas are a narrative storytelling technique for bringing abstract target group information to life through the presence of a specific, fictional personality. The students were tasked with creating personas of vocational education students for their subject area. Participants used the personas as a foil to talk about challenges in VET classrooms, and as props in a role-playing exercise where teacher candidates assumed the student persona to describe a challenging subject-area from their perspective, and to criticize and challenge the learning design developed by the teacher candidate.

Rapid Prototyping

Both faculty and students engaged in a design thinking rapid prototyping cycle. In both groups, participants formed dyadic design teams. One partner shared a learning problem or teaching challenge, the other designed a solution. This was particularly rewarding with the faculty participants, because many walked away with concrete ideas for changing classroom practices. Students used the personas they created to role-play the learner perspective. For this group the main benefit was that the design partners were able to practice teacher thinking.

During the exercise participants cycled rapidly through a series of tasks that prompted them to observe, brainstorm, synthesize, prototype and discuss. Each participant worked in a dyadic team that went through four design sheets with structured prompts.

Table 1: Rapid Prototyping Prompts

Phase	Prompt	Duration
DEFINE & FOCUS:	Pick one of the personas / listen to your design partner. Specify the teaching / learning challenge you want to solve for this person / persona. Remember that how you describe the problem affects the solution, so pay attention to precise, concise and action-oriented language. Present description to your partner to check for correctness and completeness.	14 minutes 7 minutes per person to interview the design partner
GENERATE & DEBATE	Generate 3-5 ideas to address the problem with novel solutions or disruptive technologies. Aim for a large effect, broad reach and replicable results. Present to your partner.	20 minutes 10 minutes for individual ideating 5 minutes per person to get feedback from the design partner

SELECT & SKETCH	Choose one of your ideas and sketch it out in more detail (literally). Select the best-received, the most interesting to you, the most likely to be implemented, the most unusual or the solution with the most options for collaborating with others. Present to your partner.	2 minutes individual
BUILD & PRESENT:	Design a prototype or three-dimensional representation of your solution with the materials in the room (card board, paper, tape, clay). Let your partner / the group react to the prototype. Both express and receive positive and negative feedback, ideas for improvement or extension, and open questions.	18 minutes 10 minutes for individual building 5 minutes per person to get feedback from the design partner

Figure 4: Rapid Prototyping Cycle

Results

The workshops produced many creative ideas for making the most of the flexible furniture setting, addressing teaching and learning challenges for students, and for student-centered learning in VET classrooms, for example:

- Training precise communication in nursing during shift changes by using a room barrier to give instructions without visual clues. Flexible furniture can create visual barriers that allow teachers to focus on critical concepts for communication and documentation in healthcare.
- Mobile / web app for study organization: VET students struggle with organizing their studies that span two campuses. The design idea for the app included a visual timetable that showed conflicts and allowed students to register for classes.

- Teaching typography with pipe cleaners: One faculty member stated: ‘You can take everything else out of this room, all I care about are these [pipe cleaners]’. She talked about how to use this to work through typographic characteristics in a haptic form so that students can more easily grasp basic concepts of typography.
- Introducing honesty in student team work: Students often struggle with team members not contributing during project work, so that often last minute efforts are needed to save the project (or the grade). An introductory meeting that discusses individual workloads and goals can lead to a more realistic assignment of task within student teams.
- Experimenting with LEGO bricks and stackable furniture: One of the strength of the room furniture are the stackable bricks that allow instructors and students to rearrange the room within minutes. One faculty member pointed out that this setting is ideal to teach students about room settings as part of the learning environment. Students can create models with LEGOs and then test their designs in the room.
- Makerspace for teaching materials: Turn the room into a makerspace for teaching materials where students can produce podcasts, handouts, infographics, exercises, quizzes and other learning materials in a self-directed, self-organized, fab-lab type environment.

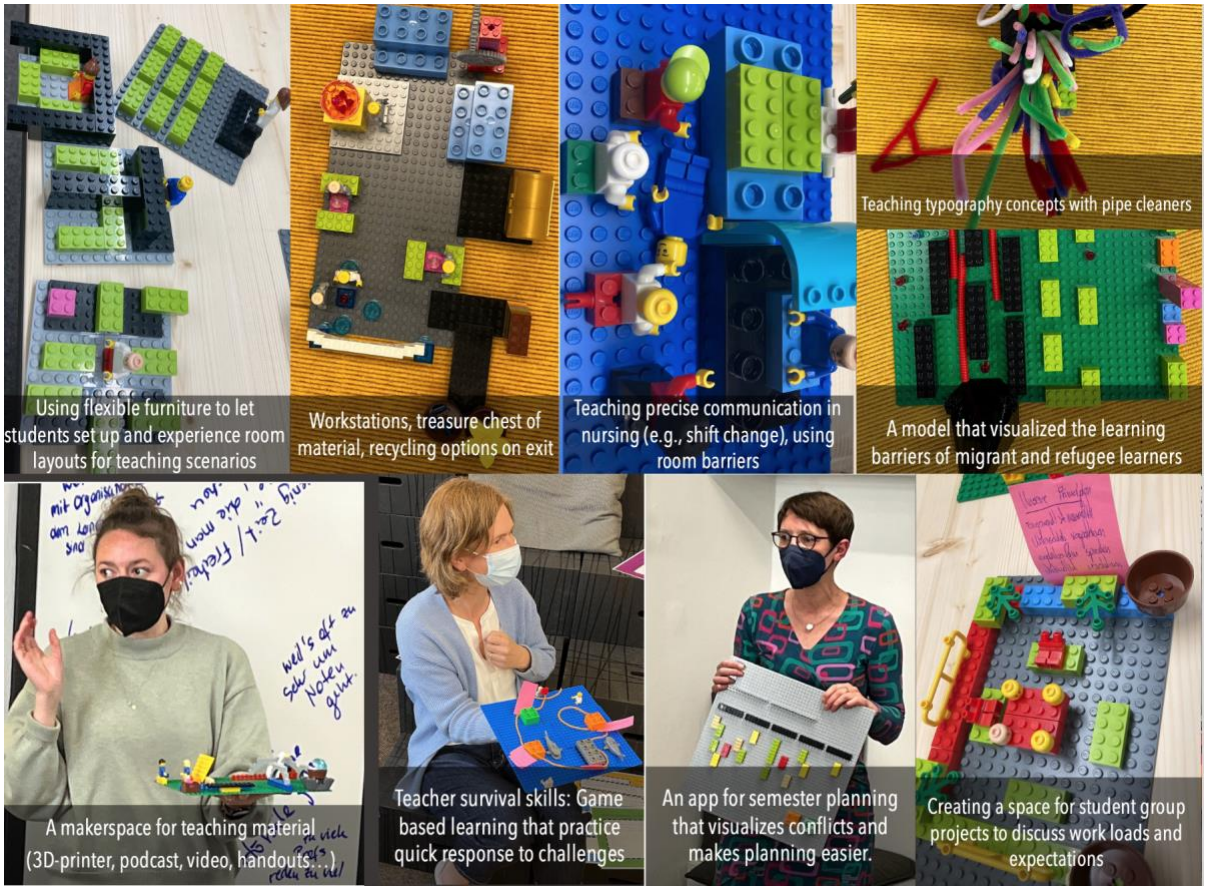

Figure 5: Selected models and ideas

Evaluation

In the week following the workshop series, the authors distributed an online survey with the questionnaire tool Qualtrics that comprised of mostly open-ended questions. A total of 20 of the 30 participants answered the survey. The respondents were distributed as follows: 40% faculty, 25% staff, 35% students (n=20, answer to the question prompt 'What best describes your role?').

The authors were particularly interested in transfer from workshop to teaching practice. Hence, the respondents were prompted to name techniques or results they found particularly interesting and considered using themselves as well as results that they remembered particularly well after the workshop. Making deliberate use of flexible furniture, ideas for leveraging LEGO blocks to create effective metaphors, specific design thinking techniques and, for faculty, an integration into their existing teaching repertoire emerged as themes.

Table 2: Benefits of Playful Pedagogy Workshops

Theme	Mentions / Responses
Flexible furniture	• *Use/create space deliberately* • *Resolving different skill levels in a class by learning through teaching with a visual barrier between groups. Someone who is already familiar with a circuit diagram or a component, for example, explains to someone else how to proceed when wiring, building, or repairing.*
LEGO	• *LEGO in general* • *LSP* • *LEGO tower icebreaker exercise* • *'Serious Play - Ask open/small questions and prompt individual models',* • *'Use at outset and for end-of class feedback'.* • *Lego 'Serious Play can be an opportunity to create access to certain abstract or difficult topics, and offer a concrete starting point at the outset of a teaching unit'. '* • *Green brick as a metaphor for disgust (in model about bacteria in canteen kitchens)'.*
Specific design thinking techniques	• *Crazy 8* • *Prototyping* • *Writing love and breakup letters*
Connection to existing teaching repertoire	• *Some creative micro-methods that have been used in teaching for a long time are similar to the design thinking approach.* • *In my opinion, making and design thinking are hidden in many existing teaching methods.*

The authors included two Likert-scale questions that haven been asked across all design thinking workshops, pertaining to the effectiveness of design thinking in general and prototyping in particular.

Responses document an overall positive experience with design thinking, in particular as a generative technique, as a format that increases empathy and encourages collaboration. The lowest score was given for the capacity to evaluate ideas and concepts, with 31% of responses indicating the workshop format as somewhat or hardly effective in this regard.

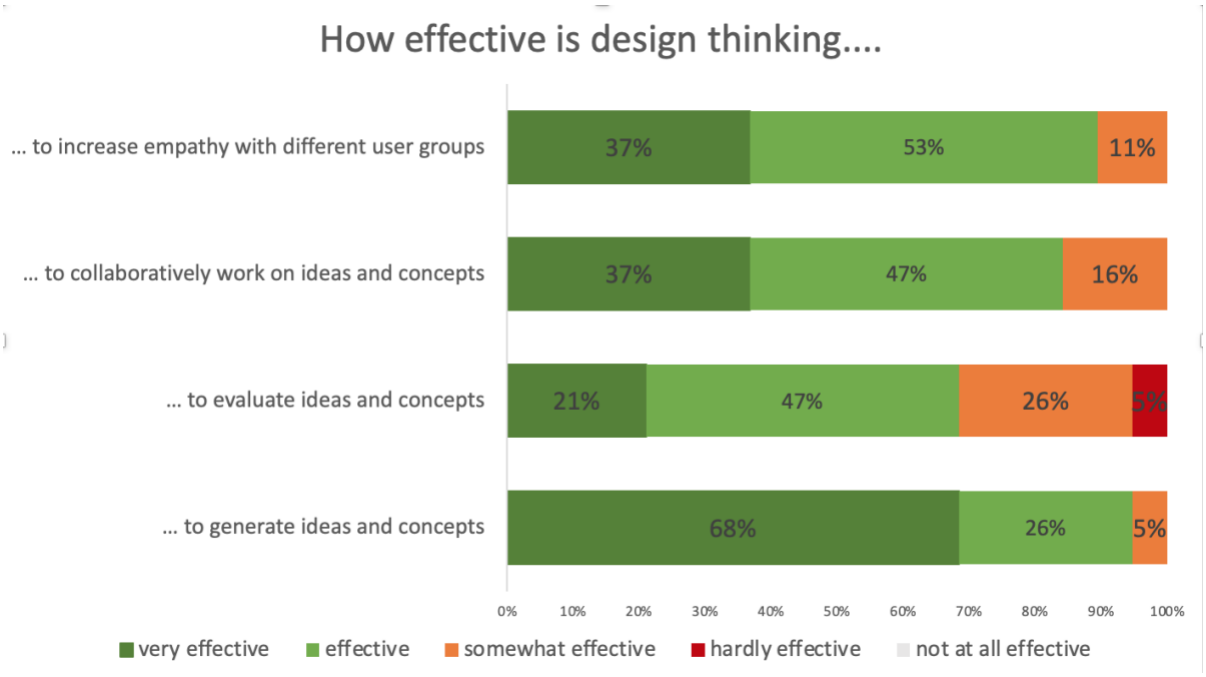

Figure 6: Effectiveness of design thinking (Please rate the effectiveness of design thinking based on your workshop experience. n=20)

Similarly, the aspect of prototyping that is a central component of design thinking was mostly seen as effective to appreciate the ideas of others and as a presentation aid. 26% of responses indicated prototyping as somewhat effective to further develop their ideas.

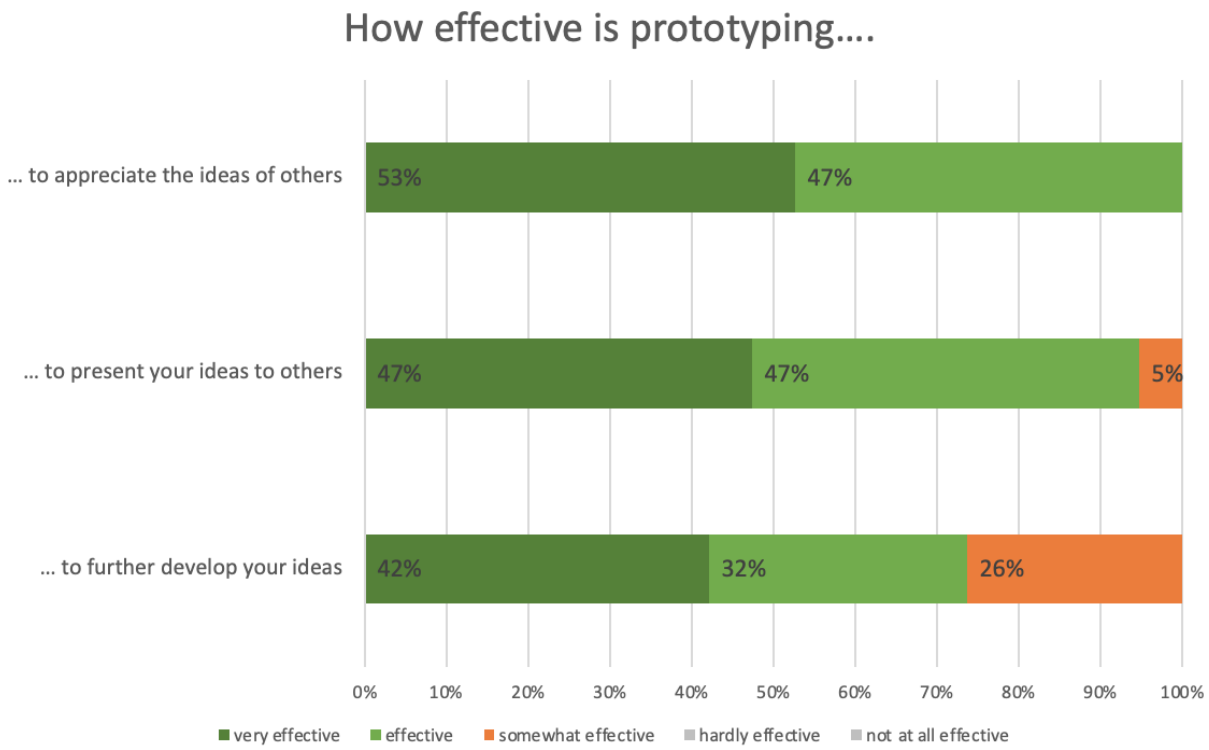

Figure 7: As how helpful did you perceive the prototyping? Please rate the effectiveness. (n=20)

Summary & Outlook

The purpose of this article and the applicability of our observations can be characterized as exploratory and intrinsic following the typology described by Baxter and Jack (2008). The authors provided practical examples that practitioners can re-use, repurpose and adapt. The article hopes to inspire the application of play and making in teacher education, based on the central learning outcomes that were documented for this workshop series: Perceiving students as individuals, perceiving oneself as a teaching professional, extending the instructional repertoire, recognizing the importance of learning environment factors such as flexible furniture, developing agency and experiencing the value of prototyping.

To make further use of the makerspace for teacher candidates, the author team plans a follow-up course that is centered around the production of learning material. Teacher candidates will go through an agile production process of learning material that is directly applicable in vocational schools. Aligning design thinking and making, the new workshop format is intended to expose students to an agile mindset that will help with bridging the transfer gap of pedagogical theory and classroom realities.

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