The Blue Studio: Designing an Interactive Environment for Embodied Multi-Stakeholder Ideation Processes

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ABSTRACT
This paper describes the process of designing the Blue Studio: an interactive space for embodied multi-stakeholder ideation processes. Inspired by *embodied sensemaking* – the way people make sense of things through external expression and interaction with other people – we iteratively designed material, interactive and spatial interventions in the Blue Studio and evaluated them with multi-stakeholder participants in various studies. Thereupon, we analyzed the impact of the design interventions, based on the seven principles to design for embodied sensemaking and highlighted opportunities for refining our interactive space for embodied ideation. Based on the insights gained, a final design of the Blue Studio was realized and evaluated on functionality.

Author Keywords
Ideation; Embodied Ideation; Interactive Ideation Space; Tools for Multi-Stakeholder Ideation.

ACM Classification Keywords
H.5.m. Information interfaces and presentation; H.5.3. Group and Organization Interfaces.

INTRODUCTION
Complex societal challenges, such as sustainability, the refugee crisis and inclusive and affordable health care systems, have gathered multi-disciplinary stakeholders in creative collaborations to ideate on future solutions [4], as these complex challenges often require more than the expertise of a single person or organization. Designers can support these ideation sessions by creating tools for stakeholders to express themselves and to generate future-proof ideas.

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Creative spaces
There have been various attempts at enriching group ideation sessions using interactive technology, e.g., by using vertical or horizontal large, interactive displays (e.g. [10], [24]), sometimes in combination with tangible objects (e.g. [31]; [14]; [7]), or by offering creative and interactive spaces (e.g. [26], [16], [30]). Some of the existing tools focus on representing, storing, searching and retrieving ideas and insights, which is not the same as a technology that would actively, in real-time, support the *process* of collaborative ideation ([1]). Recently, Lucero [17] has made the first efforts towards what he calls 'funky-design-spaces', holistic design studios that support the creation of mood boards. Amongst his considerations for tools for mood board making, he lists involving the senses, flexible and intuitive interaction with provided tools, and the need for a holistic interactive space. A design space should invite exploration and stimulate users to move around the room.

Figure 1. The current version of the Blue Studio

In multi-stakeholder ideation settings, the added value of implementing interactive technology may well lie in making the participants value and coordinate their shared stakes, which, according to van Dijk [28], [29], must evolve through actual, face-to-face contact between the stakeholders in a joint activity, in our case ideation sessions. The development of the 'Blue Studio' (see figure 1), as described in this paper, is an exploration into the design of an interactive space that aims at facilitating this face-to-face process of shared value making and coordination during multi-stakeholder ideation, for which we use the concept of embodied sensemaking. In this paper, we first elucidate this concept of embodied sensemaking. Thereupon, we describe three iterations of design interventions in, and user studies of the Blue Studio, followed by our insights gained in relation to the seven principles of designing for embodied sensemaking [11]. Finally, we describe how these insights have been applied to the final design iteration in the Blue Studio. With this contribution, we hope to feed a conversation and inspire future work about the role of interactive artifacts and environments in mediating ideation in multi-stakeholder groups.

Multi-Stakeholder Ideation through Embodied Sensemaking

The creative collaborative process of a multi-stakeholder ideation session can be seen as an unfolding process of 'embodied sensemaking' ([11], [13]). Embodied sensemaking describes the way people collaboratively create shared insight in a creative and improvisational manner. This is not a special-purpose activity: embodied sensemaking is the normal, mundane way in which people in everyday practices make sense of things. It is to be contrasted with rational, cognitivist models in which an understanding or idea originates and develops completely as an inner, mental process, prior to, and essentially detached from, any following expression of such an idea in an external medium. Instead, theories of embodied sensemaking hold that in the majority of everyday practices people make sense of things *through* external expression and *through* embodied interaction with other people [6]. Embodied sensemaking is thus grounded in the way people use their embodied skills in appropriating, configuring and transforming objects and materials in their environment (including nonverbal expression and posture of their own body), a process by which they develop and express their thoughts [13]. Such skillful, expressive evolution of creative insight is inherently social in nature, because it plays out not in a person's private mind but in the public world [23]. Additionally, drawing on Gibson's notion of affordance [9], Gaver [8] argued that collaboration is affected by the digital and physical media through / in which people collaborate ('media spaces').

When designers create tools for collaborative ideation sessions, these tools function as external media that enable participants to develop and express their thoughts in a way that allows for other people to join in on the sensemaking process and contribute to it. To support designers in creating such tools (artefacts), Hummels and Van Dijk [11] have translated available theory on embodied sensemaking into seven concrete principles, shown in table 1, to take into account when designing for embodied sensemaking.

Social Situatedness	Insight emerges as co-constituted in the interaction between people and against the background of a social setting in which people always already relate to one another [23].
Scaffolds	Physical objects and spaces serve as binding anchors, both for individual reflective conversations as well as for fusing individually sensemaking efforts into a collective, participatory phenomenon [28].
Traces	Evolving traces of creative expressions can themselves come to function as scaffolds [30].
Interactive Imagery	The ambiguous, sensuous nature of our creative expressions, for example in sketches collages or moodboards, may empower our capacity for imagining new, unthought-of possibilities [16].
Dialogical System	Expressions of thought are not "*communication [... in the sense of] the transmission of information but rather [function in] the co-ordination of behavior between living organisms through mutual structural coupling*" [3].
1st person perspective	As said people do not contribute as detached 'generators of information' but engage in the meaning-making process while interacting with their whole, embodied selves [18]. This calls for a design that acknowledges the importance of personal engagement, empathy and maybe even intimacy.
Catalyzing Engage-ment	Bodily involvement e.g. by using body storms, tinkering sessions or enactment [2], [22] elicit a direct engagement and a (pro)active, empathic and responsible attitude propelled by personal experiences. Moreover, bodily encounters seem to lower the threshold to merge the perspectives from people with different backgrounds [12].

Table 1. Seven principles to design for embodied sensemaking based on Hummels & Van Dijk [11].

In the current project, we have applied these principles in the design of the "Blue Studio" to enhance embodied sensemaking during collaborative ideation in multi-

stakeholder teams. In the section *Insight*, which is placed after the description of the approach and design iterations, we reflect on our design iterations using these principles.

APPROACH

The design-research project took place in one of the meeting rooms in Sliperiet. The meeting room, named the "Blue Studio", was initially a meeting room with dark-blue painted walls, a grey vinyl floor, a white suspended ceiling and no windows. The furniture consisted of a round table with several chairs and a blue dry-erase board integrated in the wall. The ambition of the project partner was to transform this room into a creative place where the visitors of Sliperiet - multi-disciplinary stakeholders of innovative projects - could gather to spark new ideas and inspiration.

We used an ongoing Research through Design process [33] to transform the Blue Studio from a dark meeting room into a space that mediates embodied ideation. The final Blue Studio space was iteratively designed: over the course of 10 months, several (interactive) design interventions were integrated in the meeting room and subsequently evaluated in user studies with multi-stakeholder groups. We obtained insights for further iterations through an analysis of video recordings of the entire ideation session and a semi-structured interview conducted after each user study. Ultimately, the process resulted in the final design of the Blue Studio, which has been evaluated in three sessions.

DESIGN ITERATIONS IN THE BLUE STUDIO

In this section we describe three iterations of design interventions in the Blue Studio, as well as the user study setup of each iteration, and the findings from the observations and interviews.

Figure 2: The first design interventions the Blue Studio

Iteration 1: Objects and Landscape

The following design interventions (see figure 1) were developed and implemented in the space: the Embodied Ideation Toolkit (EIT) [21] (1 in figure 1) designed to boost imagination and explore scenarios through enactment, a flexible surface suspended from the ceiling by fishing wire (2), serving as a dynamic landscape for the participants to build on; a time indicator placed on the wall (3) to be started by participants themselves, that could inform them of the time left. Finally, the 'Voice Commander' (4) (or 'VC'): a voice transformer that allowed the researchers to instruct the participants during the session without physically being present in the Blue Studio.

Study setup 1

The first user study was a 15-minute pilot test with a group of four university lecturers (1 male 3 female) of different disciplines, whose motivation to participate was that they were looking for ideas for a new educational program that they were working on. We invited the participants into the Blue Studio for an ideation session without disclosing any information about the space or the process of using it. While in the Blue Studio we only used the VC to instruct the participants on a few steps: how to start the timer; to inform them they could pick objects from EIT that were of interest to them; to ask them to explain why they had picked an object; and to ask them to build a storyline of their ideas with the objects they had picked.

The session was monitored from a separate space and video recorded for later analysis. After the session, we briefly interviewed the participants about their experiences. Finally, we instructed the participants to record their generated ideas in a *Future Narrative*: a one-minute video, based on One-Shot-Video technique [TII website Stockholm] and performance theory, in which participants use the space and the objects in it to act out a scenario that demonstrates the ideas they generated during the session ("twice behaved behavior", [20]), as a means to preserve, enrich [25] and reflect on their collaborative sensemaking process.

Study setup 2

The second user study was a 30-minute session with three (male) participants from different professions: mechanical engineering, software engineering and academia. They had recently become the new management team of the local FabLab, but were not yet familiar with each other. Their motivation to participate was that they had the shared task to develop a vision for the FabLab.

Before entering the Blue Studio, the participants collectively defined and recorded their challenge in five minutes in the Grey Room, a small room adjacent to the Blue Studio. After that, the participants entered the Blue Studio, where they were given a minute to explore before the VC reminded them to keep their challenge in mind and to set the timer to 20 minutes. The participants used that time to create ideas using the objects from the EIT in combination with the flexible surface in the space. After finishing the ideation session in the Blue Studio, the participants moved back into the Grey Room, where they reflected on their challenge and the session's outcomes. Following this reflection, they recorded the Future Narrative as a short video conclusion. Finally, the participants were interviewed about their experiences.

Findings

The space and tools influenced the embodied sensemaking process in several ways. When looking at the physical aspects of the space, the round shape of the surface triggered

the participants to stand around it in a circle and they hardly moved from their positions, focusing all their attention on creating ideas in the center of the room while forgetting about the other objects in the corner. Moreover, because the VC introduced the flexible surface as a 'landscape', it led to a very direct translation in its use, i.e. a literal landscape with roads, mountains and roundabouts. The participants did use the EIT objects in their ideation: they attributed meaning and behavior to objects or related them to a representation of the elements of their ideas. However, they mentioned that the objects from the EIT did not feel like they were 'part of the room'.

Considering the aspect of time, it became clear from the interviews after both sessions that time played a crucial role in embodied sensemaking. The awareness of having little time to ideate and the presence of a timer stimulated the participants to not overthink their ideas and instead share them immediately with each other. They indicated that it felt safe to do so, in the playful rush of the space. In the second study, participants appreciated the opportunity to take some time to reflect on their ideation session.

Even through the instructing researcher was not physically present in the room but connected through a remote VC, participants were very willing to follow instructions from the VC. While it only intervened four times, the participants noted that the VC supported them in remaining focused and oriented on completing their challenge. Another contribution to their focus was the dark color of the walls and the lack of windows. Day-to-day hassle felt far away while being in the space, as the participants indicated.

Design Directions

The first iteration gave useful insights for further iterations. The space requires more interventions outside of the center of the room to stimulate movement and embodied exploration of the space. The objects need reconsideration both in spatial terms (size, expansion qualities, interaction possibilities in the room) and in material terms to function as an integrated part of the room. Participants appreciate a form of guidance in the space, e.g., time pressure or a commanding voice, while at the same time we should remain the element of surprise to stimulate participants to step out of their comfort zone and share new ideas.

Iteration 2: Constructional Puzzle Pieces & Integrated Dry-Erase Board

In the second iteration (see figure 3), we removed the flexible surface from the middle of the room. We decided to preserve the EIT objects and extend them with triangular wooden 'puzzle pieces' (1 in figure 3) fitted with slots and magnets, that could connect to each other and be constructed into bigger 3D structures. Some of these 3D structures were already built, while the remaining puzzle pieces were scattered throughout the room. Participants could use the prepared structures and the remaining pieces as a multi-faceted stage for their ideas, as an alternative to the 'landscape' in the first iteration. The dis-embodied VC was removed from the set-up all together. Instead, participants received a brief at the start that informed them about three phases of the ideation session in the Blue Studio. Moreover, the timer was replaced with a lamp (2) that was slowly dimmed throughout the session as a more indirect yet continuous indication of time passing. Finally, the space was equipped with a video-recording tablet (3) and a spotlight (4) that illuminated near the end of the session as an invitation to start recording their future narrative.

Figure 3: Second design iteration & third user study in the Blue Studio

Study setup

The design interventions of the second iteration in the Blue Studio were evaluated with three (male) participants: a manager, a student volunteer and a PhD researcher. Their motivation to participate was to generate ideas for their shared task of promoting and maintaining the FabLab. The ideation session in the Blue Studio took thirty minutes. At the end of the ideation session, participants used the tablet to record a Future Narrative to summarize their ideas. The study was concluded with an interview.

Findings

Upon entering the Blue Studio, the participants were immediately drawn to the integrated dry-erase board (figure 3, left wall) and neglected the other materials. We then realized that we had forgotten to remove the markers, as we had done in the first iteration, and we removed them halfway the session (after 15 minutes). After seven minutes, the participants spontaneously started to include the physical materials in the Blue Studio to act out their written ideas and explore them further. They also used the prepared 3D structures in the room as a stage for their ideas, but they were hesitant to build new structures using the remaining puzzle pieces. In the interview, the participants mentioned that they were unsure 'where to start' in the Blue Studio and began using the dry-erase board and markers because these were familiar to them, as opposed to the other materials in the space. However, the use of these other materials helped them to create shared understanding by overcoming the limitations of language and jargon. The participants indicated that while using the objects to talk and explore, they figured out that they oftentimes meant the same things, but expressed them differently. The participants also positively experienced the removal of the markers, as the focus on building shifted their ideation from divergent, explorative ideas to convergent,

concrete ideas. Finally, the spotlight, used to highlight the tablet at the end of the session, was immediately recognized by participants as an indicator to conclude their creative session and they quickly picked up the tablet to film their Future Narrative.

Design Directions

Altogether, the second iteration shed light on the opportunities for more interactive materials or triggers in the space to seduce participants to overcome the hurdle of physically engaging with the space, its objects and each other, and not gravitating towards the known dry-erase board, the affordances of which are less supportive for embodied sensemaking [28]. Consequently, we permanently removed the markers from the Blue Studio. The use of directive lighting (spotlight on tablet for filming) appears to be effective in guiding participants in the space without being as intrusive as a VC. Further design opportunities for embodied sensemaking may lie in explorations into interactive technology as mediator of ideation, which was done in the 3rd iteration.

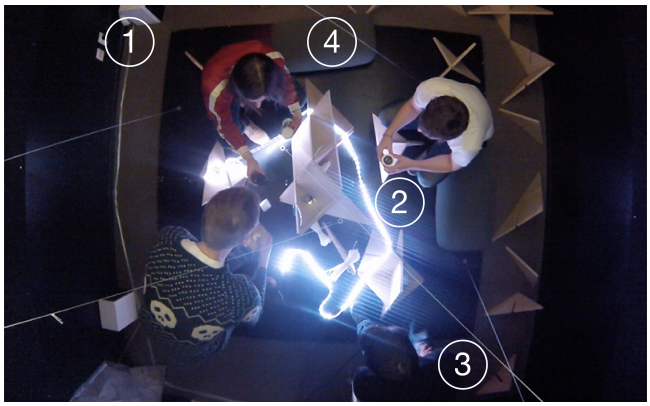

Figure 4: Third design iteration & user study in the Blue Studio

Iteration 3: Interactive Ambient Effects

In the third iteration (see figure 4) of the Blue Studio we kept the EIT objects, the puzzle pieces and spotlight of iteration 2, but expanded their connection possibilities with spatial interactions and ambient effects, as to explore the effect of interactive materiality [22] as mediator for embodied sensemaking in ideation. The ambience of the space was influenced by dynamic light and sound. A soundscape (1 in figure 4) increased in intensity and volume throughout the session to build up a climax and make the participants aware of the approaching end of the session. The interactive light that was offered consisted of an RGB lamp in loop mode and a controllable RGB LED strip (2). Additional spatial interactions were created with diagonal wires from the floor to the ceiling (3) that would influence the soundscape when manipulated. The final intervention in this iteration was the addition of pillows (4) to allow for sitting while interacting with the puzzle pieces and EIT objects.

Study setup

The third iteration was evaluated with a group of four (all male): three students from creative programs and one software engineer. Their motivation to participate was to develop a business plan for the local FabLab. The study had the same structure and timing as the study in iteration 2.

Findings

The participants built a high structure with the puzzle pieces and used all artifacts and the LED strip to build a story around it: e.g., the LED strip illuminated the 'desired situation' and some secluded puzzle pieces represented 'each project partner being on its own island'. After ten minutes the participants discovered that they could influence the soundscape by manipulating the wires. They also related the RGB lamp's changing colors to their own actions, while it was, in fact, in a standard loop. The pillows were not used by all participants, but some used them to sit or lie down and take a break. As in iteration 2, the directional spotlight proved to be very effective: within a minute after the spotlight illuminated the tablet, the participants were filming their future narrative.

The participants indicated that they were intrigued to discover their effect on the space and that they enjoyed exploring the interactivity. They indicated that they felt free in exploring, because the space reacted to them - this felt like a reward. At the same time, they felt in control of what was happening, as they attributed the space's behavior to their own actions and appropriated the effects in their Future Narrative. The soundscape was described as 'a subtle indication of time passing by', and was experienced (both positively and negatively) as an element of a 'gameshow' in which a puzzle had to be solved within a set time. The participants explained that being able to sit or lie down on the pillows provided them with a (literally) new perspective on their built structure, and brought them to new ideas. Some felt that the pillows and the dim lighting gave a 'cozy' atmosphere to the space.

Design Directions

The implementation of digital effects to the participants' actions (e.g., manipulating wires) contributed to the playful character of the space, inviting the participants to try things out and explore other effects throughout the space. The EIT objects were still a separate element in the space and in order to integrate them they should not only be bigger but also be able to actuate effects in the space. The inspiration and added value of embodied sensemaking for ideation seems to lie in the interplay between the objects, the space and the participants. We concluded that the final design of the Blue Studio requires refinement of the design interventions: careful implementation of connection possibilities and effects (sensors and actuators) between the objects, space and people in it. We used a more careful analysis of our iterations based on the seven principles of embodied sensemaking to steer these refinements.

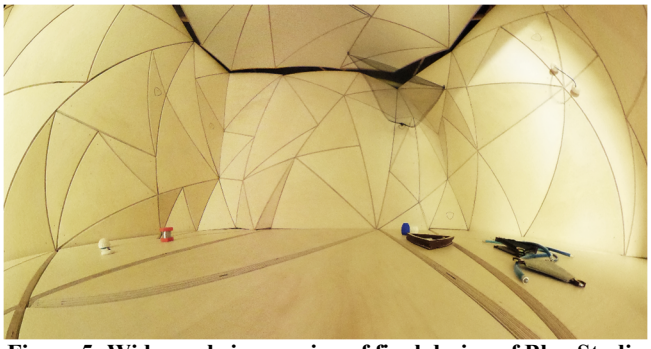

Figure 5: Wide-angle impression of final design of Blue Studio

INSIGHTS

Over the course of the development of the Blue Studio, we observed several strengths of the Blue Studio and its effect on the people using it for their ideations. The gained insights are clustered by the seven principles to design for embodied sensemaking [11] that inspired the design interventions. These insights were the guideline for the final design of the Blue Studio.

Social Situatedness

The evaluations showed that, due to the unfamiliarity of the space and its materials, people who normally took the lead in meetings did not necessarily take the lead in the Blue Studio. Individuals who had never met before felt free to share their ideas with each other in the Blue Studio. Participants indicated that they felt that the 'normal rules' did not apply in the Blue Studio, as the (darkness of the) space, the (non-descriptive) materials and the (unexpected, ambient) effects created an alien environment in which every person had to re-establish their role in the group in the space.

Scaffolds

In all iterations the EIT objects were scaffolds for ideation. The magnets in these and other objects, such as the puzzle pieces, provided anchors for building a narrative. Participants were able to switch quickly between verbally expressing their ideas and thoughts, and constructing their ideas using the EIT objects and puzzle pieces provided to them. The studies did show that it is beneficial to have scaffolds of different sizes and orientation to enable making connections in and with the entire space. Therefore, the floor, walls and ceiling of the Blue Studio should also function as scaffolds.

Traces

Building with the EIT objects and puzzle pieces, the landscape cloth or the LED strips allowed participants to physically create traces in the space. We observed that longitudinal objects were helpful for participants to create a narrative, literally moving in space from one subject to another. Finally, offering the tablet enabled to participants to create a video as a trace of the outcome of the ideation session, which was appreciated by participants.

Interactive Imagery

The Blue Studio offered various ways for participants to express themselves creatively and because the objects were not familiar and had an open script of use, they triggered imagination. Connecting the objects into new combinations was a popular way to not only generate ideas, but moreover to elaborate on each other's ideas. Unexpected connections of physical objects and unexpected effects of these connections often directly impacted the ideation, e.g. in taking a second look at things, opting for another train of thought, or uttering new ideas, e.g., "What if our product would be modular?"

Dialogical System

Participants did not necessarily 'solve' their challenge during sessions, but always mentioned an increase in shared understanding as a result of the session. The unfamiliarity of the space, and the absence of direct guidance or fixed steps to be followed in the space, makes the participants depend on one another to 'figure it out'. We observed that in some sessions, participants started to examine the room individually, but in all sessions they soon set out on a common mission to explore the capabilities of the space. In exploring, they did not only share their findings with each other, but also spent most of their time in gathering around interactive points (e.g., lights or audio strings) and experimenting with those together. While doing this, they were establishing a common understanding of the Blue Studio and exploring the possible functions of a certain interactive point. It was in this manner that the participants in user study 3 convinced themselves of their impact on the color of the lamp, which was actually displaying colors in a continuous loop. During the evaluations, the objects helped to strengthen communication and dialogue. Or, previously described, the objects supported participants to talk while exploring the topic hands-on and figuring out that they oftentimes meant the same things, but expressed them differently.

1st Person Perspective

The Blue Studio can hardly be understood or used without engaging with it physically: trying out and exploring what happens. This was a threshold for some participants, but once over that threshold (stimulated, e.g., by the Voice Commander or other participants in the session), they became engaged with their whole embodied selves. Managers could not maintain their 'managing role' as that role provides no benefit in the Blue Studio; no managerial expertise is needed to connect objects together, or build puzzle structures. To illustrate, one participant with a managerial background, initially refused to kneel down to fiddle or build with objects. However, within minutes, he started pointing at objects or specific parts of the structure, and soon thereafter, he was on his knees building the additions to the structure that he was thinking of. The element of triggering engagement could be further refined in the final design, especially in the interior design of the space itself and in the script that guides the participants, e.g. when entering the Blue Studio.

Catalyzing Engagement

When participants discovered the ability to connect objects to one another and combine them with the puzzle pieces, the landscape cloth, the wires or LED strips, they commenced an exploration of the characteristics of the space, and even of the other participants in the space. They connected objects they were holding to objects others were holding or built structures together. Furthermore, as the room is quite small and the structures (e.g. puzzle pieces, wires) were quite prominent, there were often unintended or even funny moments of participants bumping into one another, which contributed to a more relaxed relation between participants.

FINAL DESIGN OF THE BLUE STUDIO

Following the explorations in the Blue Studio, a final design (figure 5) was drawn up and realized. To amplify the alien atmosphere of the room, the walls, floor and ceiling were covered by (vaulted) wooden or steel triangular panels, integrating interactive elements, such as capacitive sensors, LED strips, a sound installation, and magnetic switches. The extended EIT objects, granting exploration of these interactive elements, were visibly spread throughout the space. The extended toolkit included larger objects than the original toolkit (figure 6), which invites people to build spacious structures and to physically connect to each other in the Blue Studio.

Phases of Ideation in the Blue Studio

To help users of the Blue Studio orient themselves, a session in the Blue Studio always consists of three pre-programmed phases, integrating two of the phases of the creative process as defined by Kneller [15]: idea generation and idea selection. The remaining two phases (problem definition and idea verification) take place before and after the session, respectively. One Blue Studio session amounts to just under 30 minutes. During the session, an ambient soundscape supports the phases of the Blue Studio. Moreover, an Instruction Board was developed and placed on the wall, indicating the time participants have spent in the Blue Studio, and the phase of their ideation session.

Orientation phase (duration: 2 to 5 minutes): during the first phase, the Blue Studio 'introduces' itself to its participants. The LED strips in the floor light up in a specific pattern, leading the participants past all of the interaction possibilities in the Blue Studio, prompting them to experience the interactions they can trigger by connecting objects to specific spots on the walls, or simply by touching the walls. Participants learn how their actions change the lighting scheme and the ambient soundscape of the room.

Idea generation phase (duration: 20 minutes): after the participants have explored all of the interaction opportunities of the room, the lighting scheme and soundscape of the Blue Studio change to indicate the beginning of a new phase. During the second phase in the Blue Studio, participants will tackle the creative challenge they have set before they entered the Blue Studio. Now familiar with the behavior of the room, participants can use the interaction possibilities and the Embodied Ideation Toolkit and the environment to support their ideation.

Idea selection phase (duration: up to 2 minutes): when the time for the ideation has run out, the participants are guided to one of the wooden panels in the wall, which will open up. In this panel, participants find a tablet that runs an app that invites them to film a 'future narrative': the conclusion of their creative session visualized in a scenario using the objects from the toolkit and interaction opportunities of the Blue Studio. Upon completion, the resulting video is sent to all participants of the creative session.

Evaluation of the final Blue Studio design

The final design of the Blue Studio was evaluated through three ideation sessions with two different participant groups. These three sessions were organized to evaluate both the technical and conceptual functionality of the Blue Studio, in order to prepare it for real-life, multi-stakeholder ideation sessions. The Instruction Board was still under development in the first two sessions, and only used in the third evaluation session.

Figure 6: Original Embodied Ideation Toolkit (left) and several objects (right) that extend it in the Blue Studio

Final Evaluation Setup

The final design of the Blue Studio was put to the test in several conclusive evaluations aimed at exploring the functionality of the technological and conceptual interventions in the space. The first evaluation was performed by 4 employees of Sliperiet. The goal of this session was to familiarize the employees of Sliperiet with the Blue Studio, next to assessing the technical functioning of the Blue Studio. The second was performed by five employees of Sliperiet. They were asked to focus on the functionality of the room during the session. During the third evaluation, employees of Sliperiet (two of whom had participated in study 2, and two of whom had not yet experienced the final design of the Blue Studio) used the Blue Studio in a session that focused more on the conceptual functionality of the room, rather than the technical functionality.

Findings

The final design of the Blue Studio was informed and supported by three explorative design iterations. It was inspired by and evaluated through the seven principles to design for embodied sensemaking [11]. The cavernous atmosphere, created by the (vaulted) triangular floor, wall and ceiling elements, and the ambient soundscape were designed to invoke a feeling of being removed from the 'real world', which allowed participants to relinquish existing social constructions and instead re-establish their role in a creative context (*social situatedness, dialogical systems*). The objects in the (extended) EIT turned out to be well-suited as *scaffolds* for ideation during creative sessions. The large objects that were added in the final design support the connection of participants to each other and to the interactive possibilities of the room (*interactive imagery*). The EIT, in combination with the interactive lighting plan of the Blue Studio, can be used as traces that participants can refer back to throughout the session, and that can be recorded in the future narrative at the end of the session - which, in itself, also serves as a *trace* of the session. The relatively small space and the lack of familiar setting limits the possibility for participants to lean on others and 'free ride' [5] during a session. Instead, participants seemed to be compelled to physically interact with the room (*catalyzing engagement*) and take an embodied *first person perspective* throughout the session, as we had hoped for by grounding the design of the Blue Studio in the principles for embodied sensemaking.

During the three final evaluations in the Blue Studio, several issues came to the fore. Most of these issues were of a technical nature, e.g.: some of the magnets in the objects were not strong enough to trigger the sensors that allow participants to interact with light and sound in the room. The panel that should have opened up at the end of the session to reveal the tablet for recording the future narrative, opened too early or not at all. A few LED strips in the floor did not respond to triggers from the participants. Throughout our user studies in the different iterations, we found that participants felt supported by the interaction possibilities that were *ready at hand* in the Blue Studio, but any malfunctions would pull participants back into the 'real world' [32], making the interaction possibilities *present at hand*: no longer acting as an extension of the body or as a scaffold [27] but rather as an obtrusive artifact. The three evaluations of the final design, also revealed some issues of a conceptual nature. The orientation phase and idea selection phase of the Blue Studio were experienced as being too short and the transition to filming as too abrupt. The Blue Studio should already guide participants towards a future narrative at the end of the idea generation phase. The Instruction Board, developed after the first two evaluations of the final design, helped participants to gain overview of the structure of the session and to prepare for recording their future narrative in a timely manner.

Related to this, it was noted that, although the element of surprise when entering the Blue Studio was perceived as a positive influence on the creativity of the participants, too little information about the nature of the session and the intended use of the Blue Studio had an adverse effect on the engagement of the participants. Participants enjoyed exploring the interactive possibilities of the room, but if the process or goal of the creative session were unclear, participants became anxious or agitated, which vitiated the creative atmosphere during the session. We believe that further design interventions may help preventing this situation, e.g., clearer instructions and expectation management before the session, the introduction of the Instruction Board, and a longer and more directive introductory phase in the Blue Studio.

CONCLUSION

With the design of the Blue Studio, we aimed at creating an unfamiliar environment that counterbalances rational decision making processes by inviting participants to use all of their embodied senses to ideate and explore a challenge, and therewith we strived to engage people in embodied sensemaking to generate unexpected ideas.

The seven principles to design for embodied sensemaking [11] supported the reflection on the design interventions in the three iterations that led to the final design of the Blue Studio. By grounding the interventions in theory, the principles provided the researchers with an analytic viewpoint to discover missing elements in the design.

With the description of the design process and its relation to the seven principles to design for embodied sensemaking, we have provided insights into the process of designing physical, interactive spaces for embodied, multi-stakeholder ideation processes.

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