

Choreographic Infrastructuring for Design Things

A New Method for Participatory Design in Teacher Education

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ABSTRACT

The aim of this study is to contribute knowledge on the implementation of a new multimodal choreography-informed method, Choreopattern, which was developed for participatory educational design. This paper presents an in-depth analysis of Choreopattern applied in a teacher education workshop on curriculum design with participants from the dance education and teacher education sectors. We shed light on the interactions that arise when Choreopattern is implemented in a workshop and how the method provides infrastructure for the configuration of genuine participation in a Thing, a sociomaterial assembly in which participants align around a shared object of concern—that is, the course content and form of a teacher education program. Drawing on choreography, we provide an extended understanding of alignment in a Thing that involves spatial, mental and emotional alignment, presenting Choreopattern as a design method that equally values emotions and rationality.

CCS CONCEPTS

• **Human-centered computing** → Interaction design; Interaction design process and methods; Participatory design.

KEYWORDS

Choreopattern, teacher education, arts education, alignment, sociomaterialism

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1 INTRODUCTION

In this paper, we present and discuss a new choreography-based and multimodal method for participatory design (PD) in teacher education (TE), called *Choreopattern*. Choreopattern has its theoretical foundation in choreography, which, in this study, is understood as a generic set of capacities [28] that can provide an infrastructure for configuring genuine participation [4, 24, 50]. This method was

applied in a PD workshop to align stakeholders from the dance education and teacher education sectors to participate in the design of a TE course. In recent years, educational science has shown increased interest in PD, recognising the potential to improve the relevance and contemporaneity of complex educational practice [11, 23]. The main concern has been to elaborate on how and to what extent the principles of PD are transferable to educational design to increase the influence of stakeholders in the development of educational content, educational practice, and learning environment [5, 6, 11, 15, 29, 35]. In our study, PD was specifically used in the phase where the participants were to explore new angles and generate ideas for the content of the TE course that focuses on cross-sector collaborations (CSC).

Internationally, CSC has become common in the educational sector, intending to provide schools with co-curricular activities that complement the regular curriculum and extend the formal learning experience [17, 44]. In Norway, The Cultural Schoolbag (TCS) is the most prominent example of CSC. It guarantees all pupils in primary and secondary schools access to a wide range of professional arts and cultures [51]. Meanwhile, teachers report having little influence on the TCS activities [10, 13]; thus, TCS activities are often perceived as happenings and interruptions of teaching [25]. We aimed to use Choreopattern as a PD method for infrastructuring the genuine participation of stakeholders to design a TE course that educates student teachers who, to a greater extent, will make TCS work as an arena for teaching and learning in schools as part of their future professional practice. Partnering TCS and TE is unique in Norway [25–27].

Many tools and techniques have been developed to support participants in telling, making and enacting in PD to ensure, amongst others, genuine participation [7], and a central concern of PD is the continuous development of suitable tools and methods for the specific design projects and tasks at hand [7, 40]. Movement-based design methods and kinaesthetic-based methods have become established research fields [18–20, 22, 34, 47], and they are regarded as “techniques, procedures or tools that contain bodily movement to stimulate the designer’s experience, understanding, or creativity with a design output within the design process” [2]. Choreopattern was developed to leverage embodied engagement in PD. The method consists of criss-cross-arranged paths in which stations are knotted together with different tasks in a flat structure (Section 2). Choreopattern uses multimodal ways of developing and expressing ideas and is based on the assumption that divergent thinking in the design process can be enhanced through kinaesthetic experiences [36]. It conditions the alignment of bodies, thoughts, feelings, materials and resources across diverse epistemic groups. Although such



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refined alignment of the participants in PD is perceived as a foundation for genuine participation, “in the area of participatory educational design, [. . .] tool development to engage non-professional designers is still in its early stages” [23:269], and the educational PD research, according to Cumbo and Selwyn, appears to lack a description of how this is done, “leaving a ‘black box’ around essential infrastructuring activities that are core to participation” [11:11]. We suggest that the concept of *Thing* is a valuable framework for understanding the infrastructuring activities of Choreopattern. The concept of *Thing* refers to a sociomaterial assembly that aligns participants around a matter of concern [3, 16, 31, 32].

This paper provides in-depth details of how Choreopattern aligns participants in a design *Thing*. The following research question informs the analysis: What interactions arise in Choreopattern when used in a PD workshop with the aim of designing a TE course that involves cross-disciplinary participants from the dance and school sectors? Overall, this study aims to contribute to the theme Expanding Worlds of PDC2022 by considering the epistemic value of genuine participation and identifying entanglements between the embodied actions (doing), materiality and verbal expressions (sayings). Specifically, the study relates to the subtopic *Sentipensar*, as Choreopattern assigns equal values to emotions and rationality in design.

2 CHOREOPATTERN

In this section, we present the theoretical foundation of Choreopattern, followed by a description of its structure and activities.

2.1 Choreography-informed participatory design

Choreography is a practice in which motions and participation in these motions are organized relative to other participants, similar to how PD practice configures participation in design, with reference to Østern [39:30]:

“To engage choreographically, to be attentive and listening in movements towards other peoples’ movements and movements of and in the world, can be understood as a way of thinking, acting and engaging with the world. A choreographic approach, where movement and orientation towards understanding through movement is the pivoting point, activates listening, engagement and attention towards other (human and non-human) bodies, situations, contexts, materials, structures and society.”

Choreography is concerned with the sensation of motion. Motion, in this context, is: i) bodily locomotion through time and space, ii) the mental activity of moving the direction of thoughts around “points in mental space and across the interconnected imaginary spectrum” [12:245] and iii) emotional motion—a sensation emerging from the motion of the outward movement of the soul as the extension of the body, that is, an *e-motion* [37]. Choreography involves the body, mind and feelings in equal ways. Similar to the goal of developing specific methods to facilitate forms of genuine human and non-human interactions in design, choreography has an organising capacity that mediates, enables and structures human-to-human and human-to-non-human interactions [21]. According to Østern,

choreographic motion “can create rifts in existing structures, push forward new patterns, encourage new qualities, exploration, new relations, maybe new meaning making and new ways of languaging” [39:26].

The participants’ alignment in the design *Thing* is crucial for the success of the PD process. If participants are aligned in a sociomaterial assembly around the matter of concern in design *Things*, that is, if design *Things* consists of interactions, relationships, constellations and proportionalities, then choreography can be the creative practice that provides the setting for these relations to emerge. As an aesthetics of change and sensitive knowing [28], choreography can provide a creative pattern for that alignment. It can contribute to the development of the tools and methods of educational PD because of its potential to enact design practices that integrate rationality, emotions and embodiment through multimodality and aesthetic expression that aim to deeply engage and involve the participants in the design process.

2.2 Infrastructuring design Things

Two kinds of things can be designed in PD: i) things as objects or ii) Things as sociomaterial assemblies [3]. Latour and Weibel described a *Thing* as an assembly, a gathering in a specific setting to negotiate matters of concern [32]. Things are sociomaterial; they are collectives of humans and non-humans. Based on the etymological roots of a *ting*, Things facilitate discourses and the articulation of underlying structures, arguments and assumptions about a matter of concern [14, 38]. Design Things aim to evoke discourses within dynamic, sociomaterial environments that “enable a shared object of concern to be engaged with as an object of design” [38:71]. According to Björgvinsson et al., design Things “are modifying the space of interactions and performance and that may be explored as sociomaterial frames for controversies, opening up new ways of thinking and behaving, being ready for unexpected use” [3:102].

Meanwhile, the modifications of the interactions between human and non-human agents, that is, the sociomaterial environment, need to be configured or ‘staged’ [16]. The concept of infrastructuring [45, 46] is often used to indicate strategies, processes and practices that provide a sustained relation between human and non-human agents in a *Thing* [16]. An infrastructure is the basic framework for interactions between participants with diverse backgrounds. Providing such an infrastructure, the infrastructuring, depends on the alignment of the human and non-human agents to move the object of design forward [1]. Infrastructuring involves the relationship between participants, which can best be described using the notion of knotwork. In Bødker et al.’s words, “the concept of knotworks indicates the fluid, yet momentarily stable, constellations that emerge among participants with different backgrounds, perspectives and agendas as they come together in matters of common concern” [4:251]. As outlined below, the infrastructuring emerging through Choreopattern intends to offer a flat knotwork structure for enlarged ideation.

2.3 Choreopattern – a method

Choreopattern knots together stations in a flat structure [Figure 1]. Choreopattern consists of two main elements: station work



Figure 1: Structure and activities of Choreopattern

and movement sections. In the station work, the participants engage with specific questions related to the contents, structures and methods of the course (Table 1). The participants were asked to externalise their thoughts and ideas through an aesthetic expression. These expressions are an extension of verbal language in a materialised artefact and are referred to as outputs. The work at each station lasted for 15 minutes. All the participants started at Station 1 and sequentially visited the stations according to an individual order, finishing together at Station 5. The movement sections are 2-minute non-verbal transitions between the stations where the participants interacted through movement tasks. The participants were instructed to walk along the paths and perform two tasks: If they meet other participants coming towards them, they would stop briefly, take some postures, mirror each other's postures briefly, and continue walking. Conversely, if they meet participants walking in the same direction with them, they would try to travel along the path synchronously, side by side. The total timeframe for Choreopattern was two hours. After completing Choreopattern, all the participants visited the stations together. The aesthetic outputs functioned as the starting point for a new and convergent phase of the design (not part of this paper). A follow-up workshop with the TE educators and professional dance educators was organised to concretise the outcomes and plan the course content for day 1 in detail. According to Bratteteig and Wagner, participants "do not have to participate in all aspects of a design project for it to have a participatory result. However, a participatory design result

is not possible without users having contributed to creating choices" [8:427].

3 METHODOLOGY

3.1 The context and participants in the study

In 2021, six PD workshops were held to tell, make and enact the content and form of a compulsory CSC course in TE. In this study, we focus on workshop 4 that aims to design the first course day. To contextualise and provide a background for workshop 4, we present a short description of workshops 1–3. The first workshop was a future workshop [7:152], enabling participants to engage in telling activities, including discussions of the challenges and opportunities for TCS in schools. The second and third workshops positioned, explored and anchored the professional point of view regarding teaching and learning in higher education. Dance educators elaborated their pedagogical and epistemological perspectives relating to dance, movement and choreography as part of their professional dance education (workshop 2), whereas teacher educators, together with school teachers, involved the participants in particular didactic models for TE, highlighting some concepts in the new national curriculum in Norway [48] (workshop 3). The aim of workshops 1–3 was to ensure that the dance and teacher educators gain a mutual understanding of each other's field of practice. Workshops 1–4 were conducted in May–August 2021, while the TE course was carried out from September 2021 to March 2022. The course consisted of 29 student teachers preparing to teach grades 1–7. The

Table 1: Stations within Choreopattern

Station	Topic of the station	Questions	Output
1	Assignment	What is the overall assignment that the students need to solve? How should the task be defined? What are the criteria for the assignment?	Word cloud on a large piece of paper
2	Start of the day	How should we begin the day? What impulses could be most inspiring for the students in their first meeting?	Comic drawings
3	Getting to know each other	How should the first encountering be formed? How should students get to know each other? What motivates the students to actively participate in the course? Is there something that must not happen?	Paintings
4	Co-creation	How can the students profit from each other's fields of expertise (didactical, artistic) in the planning of a co-curricular dance project? How can we provide the frames so that they can see each other's touchpoints in terms of skills and competences?	Modelling clay figures
5	Feed-in	What do the students need in terms of knowledge, skills, input and tools to be able to solve the task? How can we make it easy for the students to see points of contact in each other's skills and competencies?	A living statue created with the bodies of the participants

student teachers worked with nine professional dance students to create a TCS dance project. With help from the regional TCS administration, the students implemented these TCS dance projects in schools in South-Eastern Norway in February 2022 as part of the student teachers' school placement practice.

To ensure that relevant stakeholders have a voice in the development of the TE programme with CSC as a component, the consortium not only included teacher educators and dance educators, but also school teachers and students from dance and TE education. This study encompasses the eight participants who joined workshop 4 physically: Alfild, Birte and Gina, representatives from TE with varied competences in pedagogy, dance, choreography and drama. Celine and Dora from a professional dance college, with high expertise in dance education (DE), dance and choreography. Ellen and Frida, teachers at the primary school of a university college; both taught music, a school subject in the Norwegian LK20 curriculum that includes dance as an aesthetic form of expression [49]. Ellen is also a placement teacher and an administrative representative for TCS at their school. Hilde is a fourth-year student teacher, professional musician, and representative of the students for whom the TE course was designed.

3.2 Data collection and analysis

The data comprised video recordings of the entire workshop 4, additional audio recordings of the work at the five stations, a field note and eight reflection notes from all participants in the full workshop. These notes were collected using a self-administered online web questionnaire [9:224]. The questions were designed to capture all the participants' experiences with Choreopattern, including the movement sections and station work. First, the videotapes and audio recordings of the five movement sections and Station 4 were transcribed by the first author to provide a fully recorded account of 'naturally occurring interactions' [43:48]. Afterwards, the most relevant parts of Stations 1–3 and 5 regarding the research question

were transcribed. Every important component, including pauses and laughter, was indicated in the transcription with brackets and length of the pause (for example, 4 refers to 4 seconds [43:354]). All the transcribed recordings were anonymised, and the participants were assigned fictitious female names, although there were male participants as well.

In the data coding process, we relistened to and/or rewatched the video and audio recordings in cases of doubts. In the analysis of the data, we relied on Saldaña's inductive and cyclic approaches for qualitative analysis. In the first cycle, we applied explorative "hypotheses coding" [42:165]. We used NVivo to code the data in a holistic sense with "broad brush-strokes", so-called lumping [43:23], using seven provisional codes: ownership, acceptance, influence, given a voice, engagement, actions and power relations. These codes were generated based on the initial reading of the data and consisted of a combination of data-driven in vivo codes [41:20;77] and more theory-generated codes. The codes encompassed the authors' beliefs about what might be found [41:165;171]. The data were coded 'simultaneously' [42:6], meaning that more than one code could be applied to one extract to capture the essence of the excerpt [42:23]. A "codebook" [42:27] of codes, their definitions, and on some occasions, examples from the data, was prepared to keep track of the content in the process of coding, recoding and reorganising. During this process, the seven codes were expanded to 34 categories.

In the second cycle of coding, we used "pattern coding" [42:236], and the codes evolved into three major themes: i) enactment of engagement—how participants participate and interact in Choreopattern due to their embodied being-in-the-world, ii) enactment of agency—how participants influence the creation of choices (having a voice) and iii) enactment of knowledge—how participants share ideas and knowledge in interactions. The themes captured interactions that arose in Choreopattern used in a PD workshop with

the aim to design a TE course. Notably, the main issue with categorisation is that such classification systems neither exist [41:27] nor “have clear-cut boundaries” [41:35]. Thus, categories are not mutually exclusive, and data extracts could have more or less membership in one theme. Classifications simply emerge through interpretations and inter-coding by the researchers at that given point in place and time. However, analytically, each theme is distinguished “in terms of its clear cases rather than its boundaries” [41:36]. The third cycle utilises the development of theory [42:277]. The goal of this process is to gain insight and expand our knowledge of how Choreopattern aligns human and non-human participants in a design Thing. Various queries of code passages were searched to group, link and interpret the intensities of interactions, embodied interactions and attunement, consistent with the research question [42:35].

4 RESULTS

Using the three themes as departure points, the following sections shed light on the interactions at play when Choreopattern provides the infrastructure for participation in curriculum design. It became evident that the themes apply to both elements of Choreopattern (station work and movement sections), but in unequal ways. Discrepancies are further elaborated upon when discussing the limitations of the study (Chapter 5.2).

4.1 Enactment of engagement

This theme concerns the ways in which participants interact and cooperate in Choreopattern due to their embodied being-in-the-world. It involves both the bodily and emotional engagement of participants in a process in which they explore new ideas concerning the TE course. Although the participants’ reflection notes mirror the findings to a large degree, not all participants indicated that Choreopattern supported their bodily and emotional enactments of engagement but rather the contrary.

4.1.1 Station Work. Regarding the station work, the empirical analysis showed that the material at hand enabled embodied engagement. The clearest case, which provides a significant pattern of actions, is an example involving Dora from DE and Gina from TE at Station 4, illustrating how a material, clay, comes to function for expressing ideas and thoughts regarding the TE course without the need to complement with oral communication (for example, words). In the example in Table 2, we find Dora arranging a brown spot (representing the expertise of dance students) on a white clay, suggesting that “the pupils” (the white clay) could serve as the common ground for the dance students and student teachers in their co-creating process. Gina immediately and wordlessly follows up on that idea, interfering with the clay by adding a lilac strand. The embodied actions, doings, are captured on the left side below, while the verbal expressions, sayings, are captured on the right side.

In the example, Dora expressed the statement content “if you know what I mean” by rolling the clay into a ball inside her hand, merging the brown and lilac colour. Gina exclaims “YES!”, indicating that she understood what Dora means, but did not “translate” the proposition into words. Through a ball made of clay with merged colours, Dora revealed how the varied fields of knowledge of the

Table 2: Example of enactment of engagement in the station work

Doings	Sayings
(2.20). Dora puts a little brown spot on a white clay on the floor and continues kneading. Gina carefully places a lilac tie around the brown strand.	Gina: If we think these are the artists and the teachers. . . Dora: can. . .
Gina and Dora both bend even more over the clay.	Gina: But then, this is not together, kind of, they are still different. . .
Gina points at the clay figure, Dora is kneading clay	Dora: Mm, but can, should they always be two different, if you know what I mean? Could they become like. . . this?
(2.37). Dora takes away some lilac and brown clay roles and kneads them together in one hand.	Gina: YES!
Dora rolls the clay with both hands, making a little ball, puts it on the white clay, flattens it a little bit. Gina nods.	Dora: I don’t know what they can do in the course of two days. (see result in Picture A in Figure 1)

interdisciplinary student group could be merged and unified in a co-creation of the TCS dance project. We interpret this as an elevated interaction between Dora and Gina, occurring on a prelinguistic and kinaesthetic level, set in motion by the material. The merge of the clay colours by the movement of Dora’s hands conveyed Dora’s thoughts in an intelligible way to Gina. This finding mirrors most of the reflection notes from the participants. Gina, for instance, claimed that “*the paintings and the clay worked really well, as the colours came to function as an invitation for modelling figures, and because it helped to have something in my hands*”. However, two of the eight participants did not share this view. One of them is Dora, who stated that: “. . . *it felt artificial and unnecessary to me that we should make a product at the stations. The conversations could be good, but then we had to move away from them to create something that I often did not feel represented what we had talked about.*” Based on these perspectives, it is evident that the output made at the stations did not work for all the participants, as the material became an obstacle to their relational efforts.

4.1.2 Movement Section. The analysis of the movement sections revealed an increase in dynamics, immediacy and interactions during the progress of the workshop (see Figure 1 , pictures E and B which show this). The clearest case was the encounter between the participants tasked with mirroring each other’s bodies. In the following, excerpts from movement transitions 1 and 3 are used

to capture the progression of the dynamics from low to high. In movement transition 1, the movements are rather fragmented, as in the excerpt below, in which Frida (a school teacher) takes a position and waits for the other participant, Hilde (a student), to mirror that position. Hilde then takes her turn. Mostly, their arms are involved in taking a position on the frontal plane.

Movement Section 1
(0001/0.39.20)

Frida (teacher) and Hilde (student) slowly approach each other, stopping in front of each other. Frida raises one arm to a diagonal line and stops. Hilde mirrors the position a short moment later in a slightly more extended version than Frida's. Hilde releases her arms. Frida releases her arms. They continue walking

(Picture E in Figure 1).

More dynamic and playful interactions occurred in the subsequent movement sections. The participants played with dynamics, speed, rhythms and the use of floor levels, as well as the number of participants in the encounters. They no longer mirrored positions but movements, and sometimes it was not possible to indicate who started the movement. Subsequently, new and more creative movement patterns arose. The constellations remained for a longer time as several participants became involved and as the constellations fluidly transformed into others. Finally, as is evident in the excerpt below, the movement sections were no longer sequenced. Instead, it became one fluid culmination of transitions in speed, direction and dynamics and involved six of the eight participants, representing all group stakeholders.

Movement Section 3
(0003/1.32.05)

Alfild (from TE) makes a wide position with the legs and stretches both arms to the side. Hilde (student) mirrors from behind. Ellen (school teacher) joins from the side. Dora (from DE) ducks under Alfild's arms and simultaneously mirrors Gina (from TE) in low position with arms pointing to the floor. Frida (school teacher) mirrors Gina's arm in opposite, lifting them up in the air.

(Picture B in Figure 1).

Furthermore, advanced movements, such as turning (Alfild, Birte, Gina, Hilde at 0004/0.45.47), balancing and transforming positions while standing on one leg (Birte and Hilde at 0004/0.45.00) using the floor actively by crawling (Celine and Dora at 0004/45.37), evolved. This corpus of data is evidence of a development in movement complexity, and we interpret this as the result of an increase in the confidence of the individual participants and the trust between them.

This analysis exemplifies a general pattern in the data—an increase in engagement, dynamics and immediacy throughout the movement sections. We posit that the movement sections brought the participants closer together and provided them with opportunities to feel acknowledged, respected and resourceful. It is a progression that is enabled through heartfelt and passionate participation and engagement; therefore, we suggest that the movement sections contribute to establishing the preconditions that need to be met for successful collaboration in the station work.

The written reflection notes indicated that most of the participants were positive towards the movement transitions because they provided a break from the work at the stations, which helped their minds to be cleared in readiness for the next station. Hilde (a TE

student) said, “*I could move on to the next stations with a ‘fresh start’*”, and Gina from TE noted, “*I think there was an inspiring dynamic between participants in the movement part, and a positive attitude towards each other*”. However, there were variations in the degree of acceptance of the movement transitions. The two school teachers stated that the movement section was slightly outside their comfort zone but that they loosened up during the workshop. Frida wrote, “*I became a little taut, but eventually, I managed to loosen up, a little bit more*”, while Ellen noted, “*The movement part was challenging [. . .] It is unusual for me to work like this, but interesting to have experienced*”. However, Celine from DE was critical, stating that this part of Choreopattern did not take into account the varied preconditions that participants may have regarding competence in dance. She claimed that “*Inviting people, without any dance experience to improvise or move freely, I am critical to*”. She also indicated that two minutes may be too short and that she did not experience any connection between the movement sections and the station work.

4.2 Enactment of Agency

Agency relates to the participants’ impact and influence in creating choices regarding the course design, indicating ways in which the participants’ voices played out in their interaction with each other and the material at hand. The main finding is that the enactment of agency can be manifested in (a productive) turn-taking as having a voice, which influences the transformation of the situation. In Choreopattern, this turn-taking occurs on a bodily level as well as on a verbal level.

4.2.1 Station Work. Concerning the station work, the enactment of agency was manifested in a linear turn-taking, where the participants built on each other’s proposals and transformed the situations when new directions of thoughts relating to the course content and form arose. In the following example from Station 2 with Alfild and Birte (both from TE) and Dora (from DE), agency is enacted by influencing the direction of the discussion. The talk concerns the first meeting between the student teachers and dance students, and they are discussing impulses that might be most inspirational. They refer to a suggestion expressed in a comic made by a previous trio that the space should be adapted in a specific way.

Birte: I like that! Because it makes something with the space, you get curious. . .

Alfild: Yes, and that’s just how we started the other course, or like. . .

Dora: Can we do something with the space?

Alfild: Yes. . . can we do something. . . [2].

Birte: To come in here and now, it is a trustfulness in itself, kind of, there happens something new, there happens something different.

Dora: Or can that be scary?

Alfild: No. . . Yes. . .

Dora: It is about finding a balance there, that it does not get like hhhh [inhales, rises the shoulders] . . . Now I should enter and there happens something and it has not become a usual classroom.

Alfild: No, you know what, the way I know them, after working in teacher education since 2013 – they like it. And these are fourth-year students. We can change the space.

Birte: mm. . .

Alfild: I imagine a spotlight [continues describing and sketching options for how to adapt the space]

(Station 2, 1.03.03)
(Picture F in Figure 1).

Here, Birte had an impact on the topic of the discussion by expressing her support of the idea of space transformation. Alfiled supported the idea based on her experience with another course. Birte explained why she supported the idea, but Dora countered it by expressing uncertainty regarding transforming the space because too much transformation could be scary for the students. Alfiled intervened by stating strongly that the students would like the idea. Hence, Alfiled transformed the situation from discussing the constraints to discussing the possibilities of manipulating the space. We interpret this as a situation in which the participants' voices were not only used to express an opinion but to influence and intervene in the conversation. Thus, the participants had an impact on the kinds of choices that were actually produced. In contrast to an open-end brainstorming where all ideas are collected, some decisions about the kinds of ideas worth presenting were made in the collaboration at the station.

From the analysis of the participants' written reflection notes, it is evident that the participants were most aware of their agency in the station works. Hilde's reflection note serves as one example: *"The threshold for participation was low, this allowed to be quickly able to contribute". "We had to contribute, in a way", as Birte (TE teacher) claims, "that complement each other. If one came with an idea, the other would start to draw or shape clay, and in this way contributing with the development of the idea".* Furthermore, as in the example above, the fact that Choreopattern allows for small trios to collaborate on the tasks leads to enhanced contribution. Celine and Dora from DE were both sceptical of the station work, stating that the task at the station hindered them from developing ideas and that they did not come up with thoughts not already known beforehand. For them, this work felt senseless, in Celine's own words, *"The art only becomes a means, a happening or a decoration, and I didn't understand the reasons behind these efforts. The expressions I 'produce', means nothing".*

4.2.2 Movement Section. In the movement section, turn-taking can be described as giving and taking/refusing of movements, which opens up a new space for reacting to the other participant. In the station work, the turn-taking (enactment of agency) leads to enhancement and deepening of thoughts concerning the questions at hand, thereby leading to an expanded creation of choices. Concerning the movement section, turn-taking can be described as turning moves, as captured in one of the field notes from the second transition: *"One movement is giving the impulse for the next movement. Turning moves".* Two TE teachers illustrate a significant pattern of turning moves as an enactment of agency. Here, Alfiled and Birte encounter each other and start mirroring each other. Alfiled first offers a possibility. Birte picks it up and takes a turn by offering a new possibility, which is again picked up by Alfiled.

Movement Section 1
(0001/ 0.39.33)

Alfiled and Birte approach each other. Alfiled bends her knees sideways and arms to a runner position. Birte mirrors immediately. Birte rises to a standing position and raises her arm above her head. Alfiled

mirrors immediately. Alfiled changes her arm. Birte mirrors. Both walk away from each other while lowering their arms.

(Picture E in Figure 1)

Here, it is evident that both participants had an impact on the development of the encounter, as they offered a starting point that influenced the range of possibilities that the other participant could choose from. Thus, as we interpret it, they transformed the situation in the movement-based dialogue with each other. We consider the movement turnings to be an iterative, helical structure of turn-taking where an increase in dynamics occurs within the interaction, but without a significant change in the way of interacting. The participants' reflection notes mirrored this fact. Most participants expressed that they were active in the collaboration, could contribute and felt that they were able to complement each other. Dora, one of the school teachers, for example, wrote, *"I really enjoyed being grouped with different partners; the change of compound [on each station]. The short time frame made us focused and it did not get bored".* Most of the other stakeholders shared that they appreciated working in small groups with changing constellations and that the given time limit at each station increased the flow, concentration and determination in the collaboration. We interpret this as an affordance of Choreopattern—the provision of a low-threshold infrastructure for having a voice. Nevertheless, Celine from DE said that the movement section did not contribute to the process. In her view, there was a lack of coherence between the different tasks, as for example *"the warm up exercise did not provide any tools [needed for the next assignment]".* Thus, she felt that the tasks did not consider the varied dance backgrounds of the participants. Hence, in her opinion, the movement sections did not prepare the ground for common work.

4.3 Enactment of knowledge

Enactment of knowledge concerns the expression and sharing of knowledge, for example, explanation, mutual learning and meaning making in the process of sharing ideas using movements, words and/or material in the making of the outputs related to the given task. The analysis showed that the enactment of knowledge in the stations differed significantly from that in the movement transitions. At the stations, knowledge was enacted in a discursive manner with the use of verbal language and aesthetic expression as an extension of verbal language (that is, thoughts accomplished by language). In the movement section, enactment of knowledge cannot be described as expressing knowledge on something (propositional knowledge), nor can it be translated into words.

4.3.1 Station Work. A significant pattern of action regarding the enactment of knowledge was recognisable when the material at the station served as a visualisation tool for shared knowledge and opened up new thoughts. In the following example (Table 3) from station 3, where painting was used, Ellen, one of the teachers, summarised the preliminary result not in full sentences but in single words, while pointing at the painting with her hand. Before the extract below, Ellen, together with the TE educators Birte and Alfiled, express how the knowledge fields of the students merge in the painting and that this merge creates a centre of energy, with energy that sprouts out of this centre. Birte looks at the task and realises that the question of what motivates the students to actively

Table 3: Example of enactment of knowledge in station work

Doings	Sayings
(6.11) Ellen points at the drawing and makes a round shape with her hand above the painting.	Birte: What do we think makes the students motivated to participate? We haven't talked about that yet. Ellen: I think it's exactly this here. If we manage to get this. . . Alfild: Mm. Ellen: Like just. . .
(6.20) Ellen moves her hands above the painting. Ellen makes outward movements with her hands. Alfild makes a figure with her hand above the painting and follows along the green line.	Alfild & Birte: hehehe. Ellen: If we manage to achieve this, that it is fun to meet each other, that it is fun to use each other's side. That it is that we always want, we work. . . Alfild: And that they understand that we want that they go here, or that they should spin. Alfild: And then they should understand that we have spun and from this spinning. . .hehe. . .
(6.28) Alfild takes a brush.	Ellen: And we spin together. . . Alfild: So we spin together with them, and then we spin together with those. Ellen: Yes, right spin further.
Alfild paints lilac lines around the green dots.	Alfild: And then we are back here. . . and here. . .
Birte points at the drawing.	Birte: And this way... (See final result in Picture H in Figure 1, lower middle)

participate has not yet been answered. In the example below, the embodied actions (doings) are captured on the left side, while the verbal expressions (sayings) are captured on the right.

Here, Birte returned to the task by rereading the question. Ellen responded by referring to the created painting, indicating that what they expressed in the painting was exactly what motivates the students (a merge of fields of knowledge that creates a centre of energy that sprouts energy, expressed with green dots). We consider the painting to be a materialisation of the thinking process and an externalisation of knowledge. Alfild pointed to the effects of the meeting between the students, which was illustrated with a green spiral line on the bottom of the paper (“we want that they

go here, that they should spin”), and then transferred this idea of spinning to the role of the course designers, expressing it with lilac lines that spin back and forth and around the green dots. We interpret the act of transforming the proposed solution into a painting as meaning-making. Based on mutual meaning making, the discussion between Birte, Ellen and Alfild was transferred to a new, yet related topic, namely how the process of co-designing the course with stakeholders in TE is similar to the process of co-designing the TCS dance project by student teachers and dance students.

In this example, knowledge was enacted in a sociomaterial relation between Birte, Ellen, Alfild and the painting. The data from the participants’ reflection notes mirrored this finding. All the stakeholders, except two from DE, stated that the manner in which the stations were prepared helped them to express, share and make meaning of their own and others’ thoughts. Birte from TE said, “*I experienced that the expression we created became an extension of the idea and at the same time developed the idea. Through the expression, it also became clearer what the others thought, and how my ideas could coincide with theirs*”. By contrast, the two DE participants expressed a feeling of being unable to work constructively on the tasks and that the extension of the thoughts and ideas was disturbed rather than supported. They considered the enactment in the outputs to be quite the opposite. Celine, for example, wrote, “*The outputs and the work on the station, was experienced as detached from the aim of the workshop; to develop a TE course for our students [. . .] The work became superficial, and I did not experience to progress in my own reflections*”.

4.3.2 Movement Sections. Regarding the movement sections, knowledge was enacted pre-linguistic but still consisted of the sharing and development of ideas. The following extract, including two of the TE participants, illustrates a significant pattern of how the process of expression—meaning making—and thinking (developing a thought) is manifested in the movement transitions.

*Movement Section 3
(0003/1.33.30)*

*Alfild meets Gina. Gina goes impulsively to a position, and Alfild mirrors the movement with the same intensity. Alfild takes up a new position with arms up front and one leg stretched out. Gina mirrors the opposite
(Picture D in Figure 1).*

In this example, after Alfild and Gina encountered each other, Gina expressed how to change the position (impulsively), and Alfild made meaning of that quality by repeating the movement with the same intensity. Alfild took turns proposing a new position to Gina, a position that Gina briefly examined and mirrored in an opposite movement (for example, arm upwards vs. arm downwards). We interpret that Gina made meaning of the proposal offered by Alfild but developed that proposal into a new but related position as embodied thinking and enacted knowledge. This pattern of enacting knowledge is similar to that in the station work but on a pre-linguistic, kinaesthetic level. Nevertheless, the participations from DE felt that the movement transition did not add anything significant to the process of meaning making, with Celine stating, “*I became uncomfortable and provoked*”.

5 DISCUSSION

Based on the theoretical foundations of choreography and design Things, will discuss how Choreopattern aligns human and non-human participants around a shared matter of concern. First, we offer an extended understanding of alignment and discuss its implications for infrastructuring for participation in a design Thing. Second, we illuminate the discrepancies between the participants' experience in Choreopattern. Third, we discuss some limitations regarding Choreopattern.

5.1 Alignment

As stated in Section 2, choreography, as an organising capacity, is concerned with threefold motions: bodily locomotion in time and space, motion of thoughts and motion of feelings. In Choreopattern, the alignment around a matter of concern is likewise threefold: it concerns arrangement as spatial alignment, attention as alignment of thoughts and attunement as alignment of feelings. It is worth pointing out that the alignment of feelings (attunement) and the alignment of thoughts (attention) are coequal in Choreopattern.

Choreopattern aligns the collective of humans and non-humans [30] through *infrastructuring for spatial arrangement*. The encounters in the movement sections were facilitated and structured by the pattern on the floor by organising the locomotion and spatial orientation of the participants towards each other. Engagement in the station work was facilitated and structured through the spatial arrangement of the participants and the material at hand. There, the participants' bodies were oriented towards the material, and the material was spatially arranged through the engagement of the participants with it. Hence, Choreopattern makes use of the organising capacity of a choreographic approach regarding locomotion and transfers this capacity to align participants and material in time and space.

Regarding mental activity and motions of thoughts, Choreopattern aligned the participants through *infrastructuring for attention*. Attention is the directedness of thoughts towards the matter of concern. In the walking session, attention was guided by the other participants' body positions and movement dynamics. The progression of the interaction, as presented in 4.1.2, was the result of an increased level of attention. At the stations, the material guided the thoughts of the participants through the task of answering the questions. We found that several topics were discussed repeatedly at multiple stations and that participants cross-referenced between the stations. Some topics informed further design decisions. One example is related to what student teachers and dance students have in common or share. "Dramaturgy" was one such concept that could easily be applied to both professions (outputs of Stations 2, 3, 4). Although dramaturgy in teaching is not related to theatre and performance, a teaching unit is composed of well-founded sequences of actions to establish an arc of suspense. There seemed to be a feedback loop between the embodied actions (doing), the material, and the verbal expressions (sayings): through a specific doing that is an embodied engagement with the materiality, the sayings were extended through the materiality and uttered in the materiality. These materialisations, in turn, guided the thoughts and thereby facilitated and fed back to an extended, thereupon-based saying. Through the hands, the saying was shaped into materiality,

and the materiality became a score of the thoughts (the mental motions), recorded in one unit of expression. This unit of expression of mental motions into material eluded a description but was still intelligible to others. The outputs at the station were the visualisation tools in which controversies, underlying structures, arguments and assumptions of the matter of concern were represented [16, 33, 38].

Concerning feelings, Choreopattern aligned the participants around a matter of concern through *infrastructuring for attunement*. This clearly occurred in the movement sessions based on an increased attunement and progress in the dynamics of the interaction that arose. An internally motivated drive to develop the kinds and quality of interaction was recognisable, indicating genuine participation in the movement sections. The progress happened in the framework of the setting, and the progressions were negotiated on a bodily level. From the work on the stations, we found that concerning the design of day 1 of the course, the participants uttered repeatedly at several stations that the implementation of this day should provide an art experience that evokes feelings (outputs of Stations 1, 4 and 5). Varied options for transforming the space were discussed (outputs of Stations 2 and 3). One concrete example was the idea of an art installation in the middle of an empty space and the transformation of light using coloured spotlights (which was actually realised in the course). Another example was a gift. During the talk, several participants realised the value of a welcoming gift, or as a "get to know each other" gift (not realised in the course). Humour, playfulness, openness and flexibility were mentioned as conditions for both the educators and students when participating in the project (outputs of Stations 2, 4 and 5). Apparently, the student teacher had some prejudices regarding the course, explaining that some of their fellows were as afraid of the course as the exams. A remedy to that attitude could be found by highlighting the fun, interactive and creative parts of the project.

With these three alignments in mind, design Things can be specifically designed to enhance these alignments. We argue that i) Choreopattern, based on the threefold alignment, can provide the relational and structural conditions for the Thing to emerge and ii) Choreopattern can provide the infrastructure for the configuration of participation in a Thing through the threefold alignment. Choreopattern aims to facilitate fluid, distributed, symbiotic relationships between the participants, and it is an infrastructure that provides a knotwork [4] for genuinely participating in different design phases. The floor pattern, the movement tasks, and the station work in Choreopattern can be described as knotworks enabling a flat structure in the collaboration, as there are no centres of control or authorship.

5.2 Limitations of Choreopattern

The empirical analysis clearly shows that Choreopattern implies particular forms of participation, which, for some, may be found challenging, frustrating and/or alienating (see 4.2.2, 4.3.2.). In our study, the two DE participants felt that both the station work and the movement transitions were hindrances or disturbances to the enactment. Regarding the station work, these participants expressed serious reservations about using aesthetic expressions for ideation, claiming that artwork would not be taken seriously. A more thorough explanation of the purpose of the activities in Choreopattern

could have helped to clarify the function of the aesthetic expressions that were not supposed to be “art” of any kind but extensions of verbal language. Our intention was to use the outputs as a medium for communication. Regarding the movement section, asymmetries (varied competence) and short timeframes were particularly mentioned in the reflective notes of the two DE participants. The participants found it unethical to ask non-dancers to improvise with movements without instructing them in improvisation beforehand. An extended warm-up or improvisation workshop could have helped bridge the gap between varied competences. This option was not considered beforehand because of the emphasis on movement improvisation and choreography in the previous workshops 2 and 3, and the quality of movement was not considered essential for being able to participate in Choreopattern (see Section 2). Nevertheless, the stakeholders from the school, who teach dance, and the student teacher, who is a musician, did not consider the movement section as an issue but rather a challenge and a new experience. Thus, a key to facilitating ownership and participation is to set aside sufficient time and effort to explain and discuss how and why Choreopattern is implemented in a specific way, as participants could have valuable inputs for adapting Choreopattern.

Choreopattern was created and implemented to design a TE course where student teachers and dance students meet. Since teaching units (that is, courses and lessons) can be considered as sociomaterial assemblies of teachers, pupils, classrooms, curricula, legislations and budgets (among others) dealing with matters of concern, such as learning, education and Bildung, the focus on infrastructuring of Things makes PD applicable in educational contexts. We are certain that Choreopattern can be applied to many other design contexts and situations, as it is very adaptable for projects that aim to provide infrastructure for Things. Despite the significant potential of Choreopattern, there are also some restrictions that need to be considered if one wishes to implement the method. First, the method is based on movement. Even if the quality of movement in terms of artistry is irrelevant in Choreopattern, the method uses an expressive dimension of movement that could cause discomfort to some participants. In our case, all the participants were familiar with aesthetic expressions, either through their professional or semi-professional practice; however, we found heterogeneous conditions in the openness and skills needed to move together. In our case, it seems contradictory that these constraints appear to have no influence on the degree of participation. Second, although a strength of Choreopattern lies in the possibility to externalise and manifest ideas in the material at hand, the challenge is how to transition from the materialising of a saying as part of the early stages of the design phase (where multiple ideas are generated) to the continuing process where choices become concrete and decisions are made. To achieve this step, the outputs from the stations must be made explicit in words, which can only cover part of what is expressed through the material. The creation of choices is the heart of the design process and is the foundation for decision-making; however, it is important to further examine how the shift from creating choices to decision-making can be facilitated and if and how a development of Choreopattern could enhance the other phases in PD. Third, the method is extremely time- and energy-consuming, both in its preparation and implementation. It

is not possible to rush through it. Hence, Choreopattern would not be a suitable method in an economically pressed situation.

6 CONCLUSION

Choreopattern can provide the sociomaterial infrastructure for aligning participants around shared matters of concern, thereby providing the infrastructure for design Thing. The three alignments of arrangement, attention and attunement should be considered both as thinking tools for design workshops and as units of analysis in design research. We have shown how the organising capacity of a choreographic approach regarding the three motions can be utilised in PD to induce those alignments and thereby provide the conditions for the basic principles of PD, such as interaction, having a voice and sharing of knowledge. Choreopattern is a PD method that equally values rationality, emotions and bodily and discursive interactions and is intentionally multimodal in expressing what is difficult to describe. The main finding from this study is that Choreopattern facilitates three ways of enactment: bodily and emotional engagement, having a voice (agency), and the sharing of knowledge. It is evident that the ways in which participants enacted knowledge differed between the station work and the movement transitions. The outputs at the stations were the externalisation and materialisation of ideas and a visualisation tool for the matter of concern. In general, the participants interacted in a heartfelt and passionate manner. With a few exceptions, the participants expressed a positive attitude towards the structure and activities in Choreopattern. In future studies, Choreopattern will be further developed based on these findings, taking the DE participants’ views and experiences into particular consideration.

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REFERENCES

- [1] A. Telier, Thomas Binder, Giorgio De Michelis, Pelle Ehn, Giulio Jacucci, Per Linde, and Ina Wagner. 2011. *Participation in Design Things*. The MIT Press, Cambridge, MA.
- [2] Rasmus Vestergaard Andersen, Søren Lekbo, René Engelhardt Hansen, and Lars Elbæk. *Movement-Based Design Methods: A Typology for Designers*. In *Proceedings of the 14th European Conference on Game Based Learning, ECGBL, 2020*. DOI: <https://doi.org/10.34190/GBL.20.082>
- [3] Erling Bjögvinsson, Pelle Ehn, and Per-Anders Hillgren. 2012. *Design Things and Design Thinking: Contemporary Participatory Design Challenges*. *Des. Issues* 28, 3 (2012), 101–116. DOI: https://doi.org/10.1162/DESI_a_00165
- [4] Susanne Bødker, Christian Dindler, and Ole Sejer Iversen. 2017. *Tying Knots: Participatory Infrastructuring at Work*. *Comput. Support. Coop. Work* 26, 1–2 (2017), 245–273. DOI: <https://doi.org/10.1007/s10606-017-9268-y>
- [5] Catherine Bovill, Alison Cook-Sather, and Peter Felten. 2011. *Students as co-creators of teaching approaches, course design, and curricula: implications for academic developers*. *Int. J. Acad. Dev.* 16, 2 (2011), 133–145. DOI: <https://doi.org/10.1080/1360144X.2011.568690>

- [6] Catherine Bovill and Cherie Woolmer. 2019. How conceptualisations of curriculum in higher education influence student-staff co-creation in and of the curriculum. *High. Educ.* 78, 3 (2019), 407–422. DOI: <https://doi.org/10.1007/s10734-018-0349-8>
- [7] Eva Brandt, Thomas Binder, and Elizabeth Sanders. 2012. Tools and techniques: Ways to engage telling, making and enacting. In *Routledge International Handbook of Participatory Design* (1st. ed.), 145–181. Routledge, London.
- [8] Tone Bratteteig and Ina Wagner. 2016. Unpacking the Notion of Participation in Participatory Design. *Comput. Support. Coop. Work* 25, 6 (2016), 425–475. DOI: <https://doi.org/10.1007/s10606-016-9259-4>
- [9] Alan Bryman. 2016. *Social research methods* (5th ed. ed.). Oxford University Press, Oxford.
- [10] Catharina Christophersen, Jan-Kåre Breivik, and Norsk kulturråd. 2013. *Den Kulturelle skolesekken*. Kulturrådet Fagbokforlag, Oslo, Bergen.
- [11] Bronwyn Cumbo and Neil Selwyn. 2021. Using participatory design approaches in educational research. *Int. J. Res. Method Educ.* (2021), 1–13. DOI: <https://doi.org/10.1080/1743727X.2021.1902981>
- [12] Scott DeLahunta. 2012. A conversation about choreographic thinking tools. *J. Dance Somat. Pract.* 3, 1–2 (2012), 243–259. DOI: https://doi.org/10.1386/jdsp.3.1-2.243_1
- [13] Ingvild Digranes. 2009. *Den kulturelle skolesekken: narratives and myths of educational practice in DKS projects within the subject art and crafts*. Arkitektur og designhøgskolen i Oslo, Oslo.
- [14] Carl DiSalvo. 2009. Design and the Construction of Publics. *Des. Issues* 25, 1 (2009), 48–63. DOI: <https://doi.org/10.1162/desi.2009.25.1.48>
- [15] Mollie Dollinger and Jason Lodge. 2020. Student-staff co-creation in higher education: an evidence-informed model to support future design and implementation. *J. High. Educ. Policy Manag.* 42, 5 (2020), 532–546. DOI: <https://doi.org/10.1080/1360080X.2019.1663681>
- [16] Pelle Ehn. 2008. *Participation in Design Things*. In *Participatory Design Conference (PDC)*, Bloomington, Indiana, USA, 2008. DOI: <https://doi.org/10.1145/1795234.1795248>
- [17] Ori Eyal and Marissa Yarm. 2018. Schools in Cross-Sector Alliances: What Do Schools Seek in Partnerships? *Educ. Adm. Q.* 54, 4 (2018), 648–688. DOI: <https://doi.org/10.1177/0013161X18765268>
- [18] Maiken Fogtmann, Jonas Fritsch, and Karen Kortbek. 2008. Kinesthetic interaction: revealing the bodily potential in interaction design. *OZCHI* (2008), 89–96. DOI: <https://doi.org/10.1145/1517744.1517770>
- [19] Kristina Höök. 2018. *Designing with the body: somaesthetic interaction design*. The MIT Press, Cambridge.
- [20] Kristina Höök, Baptiste Caramiaux, Cumhur Erkut, Jodi Forlizzi, Nassrin Hajinejad, Michael Haller, Caroline C.M Hummels, Katherine Isbister, Martin Jonsson, George Khut, Lian Loke, Danielle Lottridge, Patrizia Marti, Edward Melcer, Florian Floyd Müller, Marianne Graves Petersen, Thecla Schiphorst, Elena Márquez Segura, Anna Ståhl, Dag Svanæs, Jakob Tholander, and Helena Tobiasson. 2018. Embracing first-person perspectives in soma-based design. *Inform. Basel* 5, 1 (2018), 8. DOI: <https://doi.org/10.3390/informatics5010008>
- [21] Stacy Hsueh, Sarah Fdili Alaoui, and Wendy Mackay. 2019. Understanding Kinesthetic Creativity in Dance. *Conf. Hum. Factors Comput. Syst.* (2019), 1–12. DOI: <https://doi.org/10.1145/3290605.3300741>
- [22] Caroline Hummels, Kees C. J. Overbeeke, and Sietske Klooster. 2007. Move to get moved: A search for methods, tools and knowledge to design for expressive and rich movement-based interaction. *Pers. Ubiquitous Comput.* 11, 8 (2007), 677–690. DOI: <https://doi.org/10.1007/s00779-006-0135-y>
- [23] Fred J. J. M. Janssen, Karen D. Konings, and Jeroen J. G. van Merriënboer. 2017. Participatory educational design: How to improve mutual learning and the quality and usability of the design? *Eur. J. Educ.* 52, 3 (2017), 268–279. DOI: <https://doi.org/10.1111/ejed.12229>
- [24] Helena Karasti. 2014. Infrastructuring in participatory design. *Particip. Des.* 1, (2014), 141–150. DOI: <https://doi.org/10.1145/2661435.2661450>
- [25] Kristine Høeg Karlsen, and Gunhild Brønne Bjørnstad. 2020. Skaperglede, engasjement og utforskertrang: nye perspektiver på estetiske og tverrfaglige undervisningsmetoder som redskap i pedagogisk virksomhet (1. utgave. ed.). Universitetsforlaget, Oslo.
- [26] Kristine Høeg Karlsen and Joakim Karlsen. in press. What good is it anyway? Professional dance artists legitimising their work for the Cultural Schoolbag in Norwegian schools. *Res. Dance Educ.* (in press).
- [27] Kristine Karlsen, Lisbet Skregelid, and Kari Holdhus. *Styrking av praktisk og estetisk innhold i skolen: Velment, men uforpliktende strategi*. Retrieved from <https://www.utdanningsnytt.no/laereplaner-laerertutdanning-praktisk-estetiske-fag/styrking-av-praktisk-og-estetisk-innhold-i-skolenvelment-men-uforpliktende-strategi/227587>
- [28] Michael Klien. 2007. Choreography: a pattern language. *Kybernetes* 36, 7/8 (2007), 1081–1088. DOI: <https://doi.org/10.1108/03684920710777856>
- [29] Karen D. Konings, Tina Seidel, and Jeroen J. G. van Merriënboer. 2014. Participatory design of learning environments: Integrating perspectives of students, teachers, and designers. *Instr. Sci.* 42, 1 (2014), 1–9. DOI: <https://doi.org/10.1007/s11251-013-9305-2>
- [30] Bruno Latour. 1999. *Pandora's hope: essays on the reality of science studies*. Harvard University Press, Cambridge, Mass.
- [31] Bruno Latour. 2004. Why Has Critique Run out of Steam? From Matters of Fact to Matters of Concern. *Crit. Inq.* 30, 2 (2004), 225–248. DOI: <https://doi.org/10.1086/421123>
- [32] Bruno Latour and Peter Weibel. 2005. *Making Things Public: Atmospheres of Democracy*. Zentrum für Kunst und Medientechnologie (ZKM), Karlsruhe, Germany. Retrieved from <http://www.bruno-latour.fr/node/333.html>
- [33] Bruno Latour. 2012. *A Cautious Prometheus?: A Philosophy of Design with Special Attention to Peter Sloterdijk*. Retrieved from <http://www.bruno-latour.fr/node/69>
- [34] Lian Loke and Toni Robertson. 2013. Moving and making strange: An embodied approach to movement-based interaction design. *ACM Trans. Comput.-Hum. Interact.* 20, 1 (2013), 1–25. DOI: <https://doi.org/10.1145/2442106.2442113>
- [35] Samantha E. Martens, Stephanie N. E. Meeuwissen, Diana H. J. M. Dolmans, Catherine Bovill, and Karen D. Konings. 2019. Student participation in the design of learning and teaching: Disentangling the terminology and approaches. *Med Teach* 41, 10 (2019), 1203–1205. DOI: <https://doi.org/10.1080/0142159X.2019.1615610>
- [36] Cara Miller. 2014. *Movement and Divergent Production, Understanding opportunity for strategic kinesthetic movement during participatory ideation sessions*. M.F.A. Thesis. <https://hdl.handle.net/1805/4433>. Retrieved from <https://hdl.handle.net/1805/4433>
- [37] Jean-Luc Nancy. 2008. *Corpus*. Fordham University Press, New York.
- [38] Nicholas Spencer and Mark Bailey. 2020. Design for Complex Situations: Navigating 'Matters of Concern.' *Int. J. Des.* 14, 3 (2020), 69.
- [39] Tone Pernille Østern. 2018. *Choreographic-pedagogical entanglements*. In: Dansens Hus. *Choreography*. Dansens Hus Choreography (2018). Retrieved from <https://issuu.com/dansenshus/docs/choreography-en-screen>
- [40] Toni J. Robertson and Ina Wagner. 2013. Ethics: engagement, representation and politics-in-action. In *Routledge International Handbook of Participatory Design*, (1st ed.). Routledge, USA and Canada, 64–85.
- [41] Eleanor Rosch and Barbara B. Lloyd (Eds.). 1978. *Cognition and categorization*. Cogn. Categ. (1978), viii, 328–viii, 328.
- [42] Johnny Saldaña. 2016. *The coding manual for qualitative researchers* (3rd ed.). Sage, London.
- [43] David Silverman. 2020. *Interpreting qualitative data* (6th ed.). SAGE, Thousand Oaks, California.
- [44] Karl Smith. 2016. Partnerships in teacher education - going beyond the rhetoric, with reference to the Norwegian context. *CEPS J.* 6, 3 (2016), 17–36.
- [45] Susan Leigh Star and Geoffrey C. Bowker. 2002. How to infrastructure. In Leah A. Lievrouw and Sonia Livingstone. *Handbook of new media*. SAGE Publications, 151–162. DOI: <https://dx.doi.org/10.4135/9781848608245.n12>. 230–245
- [46] Susan Leigh Star and Karen Ruhleder. 1996. Steps Toward an Ecology of Infrastructure: Design and Access for Large Information Spaces. *Inf. Syst. Res.* 7, (March 1996), 111–134. DOI: <https://doi.org/10.1287/isre.7.1.111>
- [47] Dag Svanæs. 2013. Interaction design for and with the lived body: Some implications of Merleau-Ponty's phenomenology. *ACM Trans. Comput.-Hum. Interact.* 20, 1 (2013), 1–30. DOI: <https://doi.org/10.1145/2442106.2442114>
- [48] Utdanningsdirektoratet. 2020. *Fagfornyelsen*. Retrieved from <https://www.udir.no/laring-og-trivsel/laereplanverket/fagfornyelsen/>
- [49] Utdanningsdirektoratet. 2020. *Læreplan i musikk (MUS01-02)*. Retrieved from <https://www.udir.no/lk20/mus01-02>
- [50] John Vines, Rachel Clarke, Peter Wright, John McCarthy, and Patrick Olivier. 2013. Configuring participation: on how we involve people in design. *Conf. Hum. Factors Comput. Syst.* (2013), 429–438. DOI: <https://doi.org/10.1145/2470654.2470716>
- [51] Report No. 8 to the Storting (2007–2008). Retrieved from <https://www.regjeringen.no/en/dokumenter/report-no.-8-to-the-storting-2007-2008/id492761/?ch=2>