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## 1 Introduction

In this chapter, we analyse selected video data from a long-term, collaborative problem-based project work conducted by a group of Architecture and Design (A&D) students within the frame of the Aalborg PBL model. We initially discuss this pedagogical model in relation to the analytic framework for transfer developed in Chapters 2 and 3. Following that, we zoom in on selected extracts of video data of students' actual group work. From the perspective of embodied interaction analysis, we analyse the various knowledge forms that are in play in the interaction. We focus on activities occurring during the students' preparation for a formal review session and, more specifically, we focus on a group of six students. The formal review sessions are pedagogical activities that take place every semester in the Architecture and Design programme, within the wider frame of problem-based learning (PBL), and they are a means to prepare students for their future work practice where such "critical review sessions" are part and parcel of being a professional architect. In this way, we view these as specific "epistemic games" (Chapter 3) intended to involve students with professional "designerly" practices and to build bridges between "education" and "work". In the extract we analyse, the students are preparing for a formal review session. As part of this preparation, they engage in a self-initiated or informal peer-review session in their group room where they present ideas which they have developed in dyads to the other group members and critically discuss these.

Apart from "talking together", the students use multiple representations and bodily-material resources as part of their work. By employing the analytic perspective from embodied interaction analysis, we draw out two themes in the analysis: "*Embodiment – the intimacy of talk, gestures and artefacts*" and "*The material, collective history of the group and the production of shared artefacts and practices*". In the first theme, we discuss how e.g. the bodily-material handling of a styrofoam model can be viewed as an example of "practical knowledge" that transgresses a merely "communicative" or "illustrative" purpose. Rather, we suggest, it can be seen as a way of "building an argument" within a design process and as participating in an "epistemic design game". In the second theme, we extend this argument to include the physical surroundings the students work in and we argue that the students develop "experiential knowledge" as patterns of practice for organising their work, organising the studio and working with models. In the concluding discussion, we situate this analysis within the wider frame of problem-based learning (the Aalborg PBL model) and the formal and informal review sessions, as we view these as "learning designs" that frame the concrete activities, and also as "learning designs for transfer".

The analysis and discussions in this chapter thus serve three purposes. It seeks: (1) To understand and make the intimate connections between talk, gestures and artefacts in students' interactions visible, as well as emphasising the importance of the material surroundings; (2) To analyse and understand the different knowledge forms embedded and emerging in these interactions; and (3) To analyse and discuss the connections between the overarching pedagogy (Aalborg PBL model), the "epistemic design game" of the formal/informal review sessions and the embodied interaction. More specifically, as we shall return to later, we ask: what are the forms of knowledge that emerge as part of their embodied interaction and the material

surroundings? How are these forms of knowledge related to the underlying design for learning (the PBL pedagogy and the formal review sessions). These questions are tied together in our concluding discussion where we discuss the knowledge forms, the embodied interaction and the material surroundings in relation to the overarching pedagogical framework and the review sessions as particularly interesting examples of "learning designs for transfer" between education and work.

# 2 PBL and the Aalborg PBL model

In this section, we briefly outline the history of problem-based learning (PBL) relating the foundational ideas to the frameworks and concepts developed in this book, where after we turn to discuss the way PBL has been adopted in Aalborg University as the so-called Aalborg PBL model.

PBL was initially conceived within medical education and led to the formulation of the McMaster program and later the Maastricht model (Servant, 2016): PBL was (a bit crudely put) developed to address the problem of transfer. Namely to address the perceived problem that medical students were able to acquire a vast amount of knowledge on anatomy, neurology etc., but were not sufficiently able to apply this knowledge in practice. To put it in the terms adopted in Chapter 2, the medical students had propositional knowledge, but lacked the practical knowledge, and there was an urge to switch from more "memory-based" medical education, to a model emphasising practice and reasoning.

In PBL models, the problem as the "driver" for the learning process is an important principle, as this principle has many implications. For one thing, it means that theories, methods, procedures, practices and curriculum cease to be meaningful in isolation. Instead, they are seen as a means to solve or address a particular problem and thus they are always assumed to appear or unfold in the context of a particular meaningful, real problem (a problem can also be theoretical or methodological). In this way a pedagogy as PBL can be understood at the level of activity-framing (see Chapter 4) in that it structures, shapes and gives direction to the activity-internal and domain-internal levels. The domain might be linear algebra, but shaped and given direction by the overarching problem of e.g. designing an energy-optimised office building, and as such is always contextualised or given meaning, rather than being an isolated skill to be acquired. In this sense, PBL is assumed at its roots to address the problem of transfer in that "skills" are learned in a meaningful context, rather than as de-contextualised.

## 2.1 The Aalborg PBL model: problem-oriented learning and project work

The Aalborg PBL model (Aalborg University, 2015) is a variant of PBL that emerged in two Danish universities (Aalborg and Roskilde) at the beginning of the 1970s and is also known as Problem-Oriented Learning and Project Work (Andersen & Heilesen, 2015) or Problem Oriented Project Pedagogy (Dirckinck-Holmfeld, 2002). The models were developed in the repercussions of the students' revolts in the 1960s and (initially) with a Marxist, social and political undercurrent. A central idea was that students were to gain ownership of their learning to address complex, interdisciplinary problems, rather than reproducing an existing (elitist, bourgeois, capitalist) order of knowledge and practice. The ideas were particularly developed by the Danish learning theorist Illeris (1974, 1981) with inspiration from critical theory and pedagogy of e.g. Freire (1970) and Negt (1968). The political backdrop and the Marxist heritage are less prominent today, but some of the central principles still underpin the learning model, including problem orientation, project organisation, engagement

with real-world practices, interdisciplinarity and participant control. We mention this political backdrop because the pedagogical models were shaped by the "societal-activity-enabling structure" and equally the "level of cultural practices" (see Chapter 4), but they also seek to challenge and affect these levels. They seek their rationale not only within the bounds of an "educational logic" but seek to transcend these. For one thing, in encouraging students to reach out and think beyond the curriculum, but also because the model fundamentally challenges the idea of a "curriculum" or "existing body of knowledge".

In Aalborg University, this means each semester students work in groups over a period of approximately three months. In the process, they are facilitated by a project supervisor, who acts as a critical dialogue partner. The students define a real-world societally relevant problem to address which often involves external stakeholders. The problem evolves as the students go through different processes of enquiry: initial problem identification, problem analysis, problem formulation, theoretical and methodological inquiry, data collection, problem solving, analysis and discussion. The "solution" to the problem is discussed in a final project report (approximately 50–100 pages – and 15 ECTS [corresponding to one-quarter of a year's work]) and assessed through a group-based oral exam. The remaining credits (15 ECTS) are assessed through courses that run throughout the semester with the intention to support the students' project work.

The model is university-wide and implemented at a systemic level where it pervades the organisation of the entire curriculum of educational programmes (however, there are local variations within the university). It affects the design of relations between courses and project work within a semester, as well as the physical architecture of the universities (for example, students should – ideally – have their own group rooms). The combination of courses and project work is organised under the umbrella of a "semester theme" defined in the curriculum for the semester. In the example we analyse in the following, the "semester theme" for instance is "energy-optimised buildings".

# **3** Context of the selected examples and data collection

The material we analyse in this chapter is selected from a wider corpus of video data we have collected in an effort to study and better understand students' problem-oriented project work. To contextualise, we initially explain the wider data collection, and then we present the parts of this wider corpus we have selected for analysis.

The overarching context of this study is within science and engineering education with a particular focus on Architecture and Design (A&D) students at Aalborg University. More specifically, we have focused our wider data collection on the fifth semester A&D in 2015. In this semester, students were to design an office building for an external partner within the overall theme of "Energy Optimized Buildings" (15 ECTS). Unlike traditional project modules lasting approximately two or three months, this particular module lasted only six weeks, making data collection of the full process more manageable. In the A&D programme, the student groups are allocated a workspace or studio in an open learning environment sitting next to other groups (see Figure 8.1).

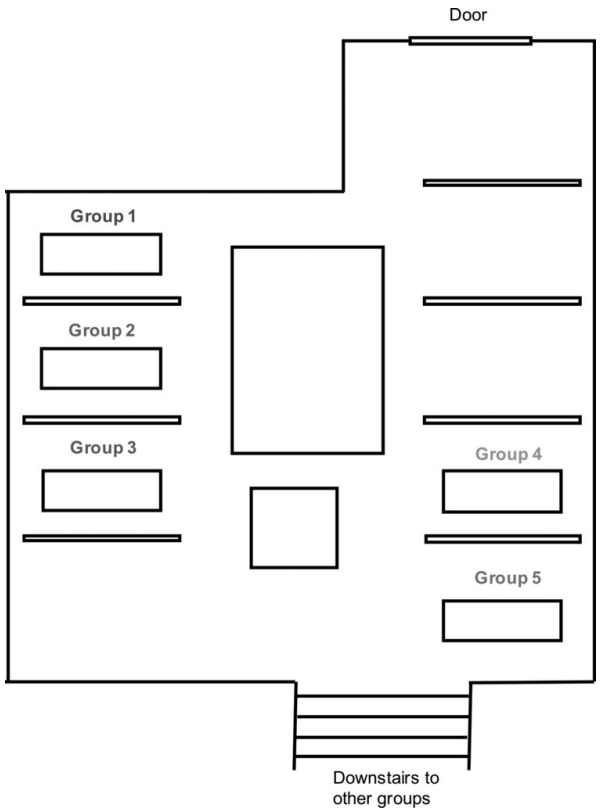


**Figure 8.1** Overview of work spaces.

Initially, we recorded five groups (see Figure 8.1), but after 14 days only three groups (1, 2 and 3) were interested in continued participation in the research project. We collected data from these groups for four weeks until they handed in their projects. Recordings of the groups were made every day between 8.00 and 16.00. In each studio, four cameras were placed in different positions. These were supplemented with a GoPro mounted on one of the students. The recordings from each of the cameras in the studios have subsequently been stitched together into one view per group to facilitate the analysis (see Figure 8.2 for a version of stitched-together cameras). From this wider corpus of data, we have selected only certain parts for more detailed analysis in this chapter, as we shall explain in what follows.

**Figure 8.2** Camera views stitched together – Overview of group space.

For the purpose of this chapter, we focus on only one group (group 3). We have chosen only a few minutes of video for more detailed analysis to illustrate the analytic points we wish to make. In the following, we outline the reasons for this selection and the wider context of the extracts. Within the six-week module, a mandatory formal review session takes place after two weeks. In these formal review sessions, lecturers, students and external stakeholders review and critique each group's design proposals. Such review sessions are common within both architecture education and professional practice, and they are an important part of the overall pedagogy of the module. As previously mentioned, they are a pedagogical means to prepare students for their future work where such "critical review sessions" are an important part of being a professional architect. Therefore, as previously mentioned, we view these as particular "epistemic games" (Chapter 3) that are consciously designed to involve students with professional "designerly" practices and to build bridges between "education" and "work". They are further important points of passage that the students prepare intensively for, as their preliminary design ideas are scrutinised and critiqued by lecturers and professional practitioners. Thus, the review sessions provide them with essential feedback on the quality of their current designs and the progress of their work and is therefore a particularly important activity within the overall six weeks of project work.

Group 3, which we focus on in this chapter, began their focused and intense preparation for the review session two days before the formal review session. This was an allocation of time the group agreed on early in the process and added to their shared calendar and overview of tasks. We therefore view this two-day period as a recognisable activity or segment within the overall activity; or what Jordan and Henderson (1995) refer to as a "natural unit of analysis", as it is limited in time and with a particular purpose. Consequently, we have devoted our analytic focus to this two-day period. Following what Jordan and Henderson (1995) refer to as an "unmotivated looking" through the video data, we started to identify segments or observable chunks of activities (e.g. students working in smaller dyads, lunching, modelling etc.). From this, we have further chosen to zoom in on a self-organised peer-review session that took place over a couple of hours on the day before the formal review session. Leading up to this self-organised peer-review session the students split into smaller groups of two, in which they worked on developing, altering or refining their shared design proposal into three subproposals. Each dyad's subproposal was then presented in the group, and the students discussed and further developed the proposals. The entirety of the self-organised peer-review session is characterised by vivid dialogues, where all six students are mutually engaged in debating, sketching, redesigning and

working intensively with models, paper and various technologies. The extracts we have chosen for analysis are from a part of the peer-review session where Sine and Heidi (pseudonyms) are presenting their proposal. Then the group starts to build upon, elaborate and further develop the suggestion into a common idea or proposal. We found this part of the self-initiated peer-review session particularly interesting as the students themselves evaluated it very positively by expressing “it is great when everything comes together” and “it was a nice ping-pong we got going today”. In other work, we have used data from the peer-review sessions to explore how students develop a professional dialogical space (Davidsen, Ryberg & Bernhard, forthcoming) and intercorporeality (Davidsen & Ryberg, 2019). However, for the purpose of this chapter, we are interested in: what are the forms of knowledge that emerge as part of their embodied interaction and the material surroundings? How are these forms of knowledge related to the underlying design for learning (the PBL pedagogy and the formal review sessions)?

Analytically, we have approached the extracts from the perspective of interaction analysis (Jordan & Henderson, 1995) and embodied interaction (Streeck, Goodwin & LeBaron, 2011), meaning that we view interaction, thinking and meaning-making as a complex accomplishment comprising language, gestures, bodily-material resources and artefacts that occur in socio-culturally shaped practices and activities (Davidsen & Ryberg, 2017). Initially, we explain and discuss further the setting and activities in the analysed clip and then we draw out two themes from this: “Embodiment – the intimacy of talk, gesture and artefacts” and “The material, collective history of the group and the production of shared artefacts and practices”. Within these themes, we discuss the different forms of knowledge emerging in their embodied interaction.

# 4 Setting the scene for the analysis

We shall initially discuss the setting or the “studio” where the analysed activities take place. Then we give a brief, narrative account of the work they are performing in the segment, as the activities and the wider context can often be hard for the reader to establish.

As previously mentioned, each student group in the fifth semester programme is provided with a working space. In Figure 8.2, one can see an overview of the “open studio” in which group 3 are working.

The group is encircled by a fixed wall with windows, and two “walls” consisting of whiteboards, pinboards and blackboards (Figure 8.2). Each semester, the student groups spend time organising these studios to meet their needs for a good space to learn, work and design. This includes labelling different boards and areas of the studio for specific activities. For example, one of the “board walls” (the upper right corner of Figure 8.2) is used for various design ideas and sketches with each board having a particular type or category (e.g. printed computer designs or drawings). The other board wall is used as a calendar and overview of tasks (with different colour-coding). During the project work, the studio is often rearranged to reflect different phases or main activities in the project, which is what we, in other work, have termed the “orchestration of work phases, spaces and activities” (Ryberg, Davidsen & Hodgson, 2018). In the midst of the group space is the “working table”, which is littered with paper, sketches, laptops, models, iPads, bottles etc. (Figure 8.3).


**Figure 8.3** Group members (pseudonyms).

The student groups design their spaces in different ways, although there are some “patterns of use” e.g. having a calendar or overview of tasks. These “patterns” can also be viewed as socio-cultural artefacts or practices that can “travel” among the students. Due to the open space with many different groups, they often find inspiration in each other’s designs and practices (such as particular ways of structuring a calendar or design ideas). Likewise, the individual group members have developed certain practices for group work e.g. particular orchestrations of technology or structuring and managing the work process (Ryberg et al., 2018; Sørensen, 2018). In the extract to discuss further, it is also clear that the students have replicated or adopted the pattern of the formal review session – or what we could call a particular epistemic game – into their own group work practice, as a peer-review session.

In the segment we analyse, we come in at a point in time where the members of the group (see Figure 8.3) are discussing the design proposal by Heidi and Sine.

Heidi and Sine have proposed the modification of the original shape of the office building that the group developed the day before (see Figure 8.4). In their design proposal (Figure 8.5) Heidi and Sine decided to cut off the triangular shape at the “ends” of the building as a way to allow for more “regular rooms inside the building”.

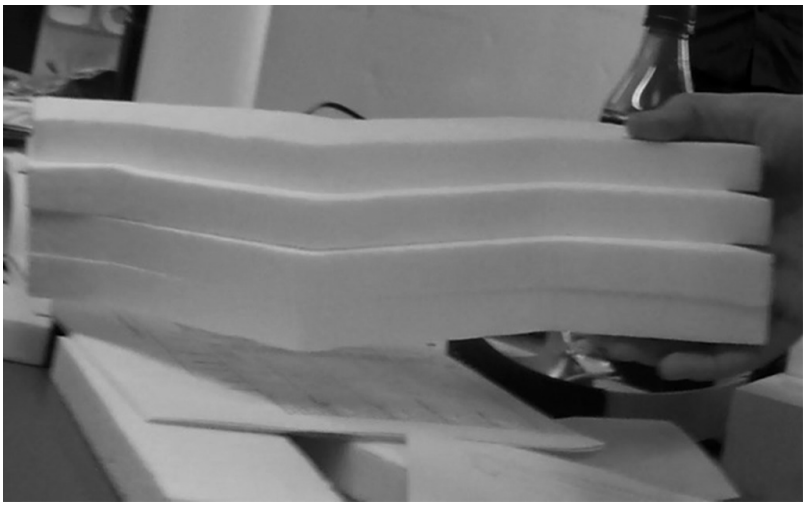

**Figure 8.4** Styrofoam model.

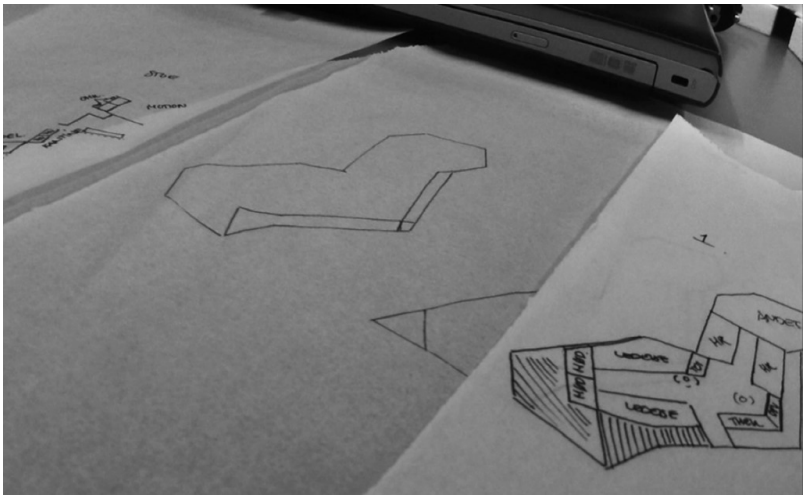

**Figure 8.5** Sine and Heidi's design sketch.

Initially, Mette has some queries to the design and notes they have not incorporated split-levels in their design. To this, Heidi responds (pointing to a sketch on the iPad) that they did think about a split-level, which Sine, Heidi and Mette discuss. Ina interjects with an "Ay, that would be cool; if the second level was a split-level"; she borrows the styrofoam model from Mette and explains a concept for how the stairs could be on the outside. An idea to which others agree, whereas Mette ask for an elaboration. This leads to Ina borrowing the model again, manipulating the levels to illustrate how the idea of outside stairs could work.

Shortly after, Ina picks up the styrofoam model again (Figures 8.4 and 8.6). She explains why she is unhappy with cutting off the triangular ends of the building, and why she feels the form "completes the idea". Using the model, she shows how the triangular end-point could be made of glass and maybe contain a stairwell or elevator, and the others start to build on this idea, adding that it could be something green, a tree, etc. Heidi, who is sitting down, starts to draw the triangular glass-tip – one in each end of the building – and Mette refers to an earlier idea from Sine pointing to one of the whiteboards. Heidi makes the sketch while the others comment, and she finishes by adding a "little tree"; an idea Ina then (again) relates to the previous design proposal by

Sine. She not only points to it, but walks up to the whiteboard and calls attention to it (making Mette comment that she just referred to the very same earlier). They work a bit more with the idea, adding ideas or starting subtasks (e.g. Anders has sketched a more detailed idea for the tree, while the others were talking). Now they also evaluate their work, with Ina commenting that it is nice when “everything comes together” and Mette adds that they have had a nice ping-pong.

**Figure 8.6** Extract from video.

# **5** Analysis: embodiment – the intimacy of talk, gesture and artefact

The first thing to notice is the intimate relation between talk, gesture and artefacts are in the students’ transformation of knowledge and collaboration. In fact, filtering out gestures and artefacts focusing only on talk would render much of the interaction difficult to understand for us (and also the participants). However, more interestingly we would point to the complexity of the knowledge forms available here, and as is discussed in Chapter 2 these are rarely “pure” and more often intertwined. What we would initially like to raise here is a question of how we could understand, for example, Ina’s gestures, talk and use of artefacts as she picks up the styrofoam model (Figure 8.6). For one thing, we could highlight how these gestures can be viewed as “procedurally realised routines” i.e. much as writing with a pen or on a computer keyboard they are examples of “clearly definable action sequences leading to specifiable events” such as pointing or twisting the model. We could look at such a sequence as an example of “illustrating a point”, where the bodily movements combined with the handling of the artefact and the simultaneous talk constitute such an action sequence. However, we

would argue, this is an example of “practical knowledge” that transgresses the merely “illustrative” nature and can be seen as a way of “building an argument” within a design process. This would associate the actions more closely with the idea of “practical knowledge” i.e. as “skilful mastering of action within a domain or a skill exercised as multifaceted response to specific circumstances”. This resembles what Goodwin (1994, 2000) has explored as “professional vision” or “professional action” when looking at e.g. archaeologists discussing and handling samples of soil comparing them to a Munsell chart detailing specific layers of soils. Goodwin is pointing out that knowledge and knowing is a practical achievement among the participants in a particular context using various media and artefacts. Noting Ina’s gestures and movements, it is interesting to see how she initially seems to “place” or “ground” the model. This could be interpreted as a way of making a common point of reference (this is how the building is placed) before she picks it up, explains with fingers and hands the placement of the stairs and where the building is cut off. She then shows how the tip could be made of glass by “dragging” her fingers along the model’s triangular tip – making Sven replicate the triangular tip with his hands, while stating his understanding of what Ina was suggesting.

This might seem a moot point overstating, or analytically exaggerating, what could be viewed as “mundane or trivial” acts of gesturing as part of “human communication”. However, Atman, Adams, Cardella, Turns, Mosborg, and Saleem (2007) conducted studies of design processes comparing students vs professional designers in artificial/experimental settings. They found that students, to a lesser extent than the professional designers, integrate objects and materials into their design activities (and that the process of designing featured less iterative processes compared to those of professionals), and they suggest that such activities are an important part of professional design practice and knowledge. Thus, we would argue, what could be seen as mere gestures and communication are instead particular forms of “practical knowledge” that are important patterns of “designerly” practices, or what we could say are particular elements of the epistemic game of “design practice”.

Adding to this observation, we see how the students seem to shift seamlessly between different types of artefacts, models and representations in their work. For example, in the extract, where Mette is standing with the styrofoam model, Heidi pulls up a sketch on the iPad, and Sine points to three different locations on the paper sketch they have in front of them. Ina also points to the drawings and gestures in the “air” before borrowing the styrofoam model from Mette. The wider material, and the shorter excerpt in this chapter, hold many such examples of shifts between different design representations and artefacts. This is relatively complex interactional work of meaning-making where six people are trying simultaneously to build and elaborate a common understanding of an idea. An idea which is discussed with references to a digital sketch, sketches on paper, through gestures as well as the model and yet they seem to be able to understand and follow what the others are suggesting. While obviously, we cannot inspect their individual mental states, ideas or representations we can glean from the interactions that they seem to share a sufficient common understanding of the ideas and proposals. This is suggested by the absence of asking for clarifications (one thing Mette actually does when she asks Ina to elaborate an idea), but also by the pace of the ongoing interactions where the students contribute with various additions to the idea, as they go along. The stream of ideas is rarely interrupted by questions for elaboration, and perhaps more importantly there are no or few objections or counter-arguments in this segment. Thus, they seem able to quickly build upon and co-produce new ideas in a fast-paced, complex interaction involving multiple design representations, talk, gestures and artefacts.

# 6 The material, collective history of the group and the production of shared artefacts and practices

While we have initially focused on the interaction around the work-table, the surroundings are equally important. This becomes clear, as Ina (and previously Mette) refers to a concrete design sketch hanging on one of the pinboards. These various externalisations function for one thing as a collective memory, where the studio by its design becomes an intimate part of the students' knowledge, but also instrumental in developing knowledge and new ideas. As previously explained, the design and organisation of the studio is not coincidental. There are areas for calendars and tasks, areas for computerised sketches, for shapes and forms, for various design ideas and for models. Thus, the spatial arrangement and the categorisations are part of the group's "knowledge" or rather a resource for their active "knowing". In addition, these are also socio-cultural practices or material artefacts that are easily replicable and remixable. For example, we found in an earlier study (Ryberg et al., 2018) that it was common and accepted practice amongst students to be inspired by others' ideas. A particular design (such as the tree in this example) could be adopted into other students' design proposals. In this way, the notion of transfer – or rather transformation – becomes quite concrete and entails both the more concrete design ideas, but equally particular practices of structuring, planning and modelling can quite materially "travel" amongst the groups of students.

There is a very strong (bodily-)material underpinning to the students' practice that includes modelling, drawing, sketching and that they, as part of their design process, produce material artefacts, which serve both as a shared memory, but also as important resources for acting, knowing and producing knowledge and ideas together. These patterns of practice incorporate the different forms of knowledge as explored in Chapter 2. To exemplify: the use of the styrofoam model includes propositional knowledge (e.g. knowledge of materials used for modelling or of scale); procedurally realised routines (such as producing the models, cutting, carving etc.); practical knowledge of how to make models useful in the design process in building an argument and designing with others i.e. how models are used within a design practice and become part of the "epistemic game of designing". Thus, a simple styrofoam model is enacted and functions across all of these forms of knowledge.

Over time, the students develop "practical knowledge" as patterns of practice for organising their work, organising the studio, working with models and engaging with epistemic games, such as carrying into their own work the pedagogical structure of the formal review session as informal or internal peer-review sessions. Further, these patterns of practice are important in actualising and situating, for example "models" within a particular practice. One could imagine that students were taught to create models, make drawings etc., but never were given the opportunity to experience how to incorporate these into a professional practice or an epistemic game. This, we pick up in the discussion and conclusion to follow.

# 7 Discussion and conclusion

In the final conclusion, we now return to discuss the questions we outlined previously: what are the forms of knowledge that emerge as part of their embodied interaction and the material surroundings? How are these forms of knowledge related to the underlying design for learning (the PBL pedagogy and the formal review sessions)?

In the analysis, we have initially highlighted the intimacy of gestures, talk and artefacts. We have suggested we should not view these as merely "communicative acts", but rather as complex knowledge forms

that encompass different forms of knowledge. Building on Goodwin's (1994) idea of "professional vision", we would suggest that the handling of drawings and models, e.g. the styrofoam model, is not merely an act of bodily twisting and turning the model, but rather an important "pattern of practice" in the "epistemic game" of designing. In the terminology of the book, the act requires not only the activation of "procedurally realised routines", but rather are part of "know how" in terms of how to explain and argue for a design, i.e. are part of the students' "practical knowledge". As suggested by the studies of Atman et al. (2007; 1999), this is not a given skill, but something that is developed as part of becoming a professional designer. What we are seeing in the analysis are glimpses of how such skills develop in practice, and thus how knowledge is transformed and deepened through the students' embodied interaction with each other, the artefacts and the surroundings.

We have argued that there is a strong bodily-material underpinning to the students' practices. One that extends to the design and organisation of their physical surroundings, and their organisation and planning of activities, which we equally characterise as "practical knowledge" or patterns of practice that are part of particular epistemic games. These are aspects that could easily be overlooked due to their "common-sensiness" i.e. viewing them as "common" aspects of communicating or collaborating, while they are in fact more complex knowledge forms that may be uniquely situated within a particular professional practice comparable to Goodwin's (1994) example of using a Munsell Chart.

These knowledge forms, however, do not develop in a vacuum. Rather, we would argue, these are facilitated by the pedagogical model of AAU-PBL, the more specific pedagogical adoption of "formal review sessions", as well as the students' own adoption of peer-review sessions. The PBL model allows students to work on their own projects over a lengthy period, which encourages them to develop their own ways of organising the work and their spatial and socio-material surroundings, and allow them to engage in concrete design practices, such as building and discussing models and sketches. It is a pedagogical model which encourages students to work with real-life problems, such as designing an office building or a serious game for use in primary school, and that seeks to bridge the gap between theory and practice, knowing and doing. We stated previously that it is a pedagogical model, that – at least in theory – aims to bridge between the different form of knowledge and does so through intended relations between the levels of activity-framing affecting the activity-internal and domain-internal levels. For example, as in this case, theories of energy optimisation are practiced as a part of the overarching project of designing an office building, rather than as decontextualised and purely propositional knowledge. Rather, the propositional knowledge is actualised and necessitated by the need to solve a concrete problem or making a concrete design. Adding to this, the pedagogical adoption of the formal review sessions also appears as an important vehicle for the students' learning process, and one we would characterise as a specific epistemic game. The review sessions are particularly interesting, as they are intended to bridge between school and work settings, because such sessions are part of professional architect practice, and thus can be seen as "learning designs for transfer". For one thing, the students are preparing for a formal review session, but, more importantly, the students seem to have adopted this format into their own practice as self-initiated peer-review sessions. Based on our analysis, the underlying PBL model and the formal/informal review sessions seem fertile formats for developing complex practical knowledge forms. They are examples of knowledge forms, we could argue, that Atman et al. (2007; 1999) found lacking in the students they studied, but which seem present in the examples presented here (although it should be noted that it is difficult to compare the findings as they are found under very different conditions).

As a final note of critical reflection, our examples and analysis from within architectural design practice are both a strength and a weakness. They are helpful in unearthing material and bodily practices and illustrating the complexities of these. However, they are also examples from a practice which is essentially deeply material, and where there is a high level of correspondence between in-school practice and professional

practice (e.g. the review session and working in studios with specific design projects). Such an example could seem difficult to directly relate to areas of research or practice that are (seemingly) less tangible and material in nature, such as literature studies or religious studies. However, we conjecture that such areas of research and professional practice are equally bodily-materially grounded practices that contain particular professional epistemic games that students need to engage with as part of their education. We view the Aalborg PBL as one fertile ground – amongst many others exemplified in this book – for engaging in meaningful, situated practices within higher education.

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