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How to cite this publication:

Dalsgaard, C. (2017). Theory into practice: situated reflection in product-oriented courses. Education Inquiry, 1-17. DOI: 10.1080/20004508.2017.1390379

Publication metadata

Title: Theory into practice: situated reflection in product-oriented courses
Author(s): Christian Dalsgaard
Journal: Education Inquiry
DOI/Link: https://doi.org/10.1080/20004508.2017.1390379
Document version: Publisher's PDF (Version of Record)
Document license: CC BY 4.0
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Christian Dalsgaard

To cite this article: Christian Dalsgaard (2017): Theory into practice: situated reflection in product-oriented courses, Education Inquiry, DOI: 10.1080/20004508.2017.1390379

To link to this article: https://doi.org/10.1080/20004508.2017.1390379

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Published online: 24 Oct 2017.

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Theory into practice: situated reflection in product-oriented courses

Christian Dalsgaard
Centre for Teaching Development and Digital Media, Aarhus University, Aarhus, Denmark

ABSTRACT
The objective of the paper is to explore how theory is integrated into practice in students’ academic work within upper secondary education. In order to study this, the paper develops an analytical framework for situated reflection that conceptualises reflective processes in direct relation to practical activities of students. The framework develops a distinction between empirical and theoretical reflection, which is used as a basis for an empirical study of nine product-oriented courses in four Danish upper secondary schools. The main finding of the study is the identification of four different phases of student activities. Each of these phases involves different kinds of situated reflection that result in different learning outcomes within the same subject area. From the utilisation of the analytical framework, the study further identifies a number of sub-processes within student work in product-oriented courses. Based on the study, the paper argues that these identified sub-processes are educationally valuable because they contain processes of reflection. The developed analytical framework can help increase awareness of these processes of situated learning and reflection that are often invisible to both teachers and students, and thus not recognised as valuable.

KEYWORDS
situated reflection; situated learning; learning processes; activity theory; pragmatism

Introduction
The paper explores the question of how to integrate theory and practice in student work within upper secondary education. More specifically, the paper studies processes of situated reflection, where students use theoretical concepts for reflection in processes of practical work. To study students’ possible coupling of theory and practice, a total of nine product-oriented courses in upper secondary education (in Denmark) were chosen for empirical studies. All courses were product-oriented in the sense that the outcome of student work was a concrete product.

As a theoretical basis for the empirical study, the paper develops an analytical framework for situated reflection. The conceptualisation of reflection develops a connection between theory and practice through a distinction between empirical and theoretical reflection. The developed framework is used as the basis of the study of the student’s reflection.
The situated nature of learning and knowledge

The fields of situated learning (Billet, 2001; Lave and Wenger, 1991; Lave, 1996; Wenger, 1998) and situated cognition (Brown, Collins and Duguid, 1989; Compton, 2013; Roth and Jornet, 2013) have explored the situated nature of learning. In this paper, the concept of situated reflection is developed from a combination of concepts from sociocultural theory, pragmatism and theories of situated learning and cognition. Within these research areas, it is possible to make a distinction between at least three dimensions of the situatedness of learning. First, a body of literature situates learning within a sociocultural context, which emphasises that learning is rooted in practices that have a cultural and historical origin (Clark, 2008; Engeström, 1987; Leontev, 1978; Semin and Smith, 2013; Wertsch, 1994; 1998). Second, learning is conceived as situated within a local setting or practice, which includes tools, ways of working and social relations (Billet, 2001; Brown, Collins and Duguid, 1989; Dewey, 1916; Hutchins, 1995; 1996; Lave and Wenger, 1991; Wenger, 1998). Finally, learning is also conceived as situated within immediate activities meaning that knowledge exists within the very processes of acting (Fors, Bäckström and Pink, 2013; Schön, 1987; Suchman, 1987). These understandings do not contradict each other, but they emphasise different dimensions of the situated nature of learning, which is unfolded below.

Learning as situated within a sociocultural context

Within this aspect of the situated nature of learning, Wertsch (1998; 109) writes that “[...] virtually all human action, be it on the individual or social interactional plane, is socioculturally situated [...]”. Leontev’s (1978) and Engeström (1987; 1999) position the activities of the individual within a collective activity driven by a communal motive. Thus, according to Leontev (1978) and Engeström (1987), human activity is situated within and should be understood in relation to an overarching collective activity. Engeström (1999) also argues that human activity is culturally and historically situated, meaning that learning is a local instance that inherits from practices situated in a culture and with a historical development. Semin and Smith (2013) use the term “socially situated cognition” to describe cognition as an interplay between behaviour, bodily structure and environmental resources rather than focus on cognitive functions such as attention, memory or learning.

Learning as situated in local practices

A similar view is found in the field of “situated cognition” (Brown, Collins and Duguid, 1989; Compton, 2013; Roth and Jornet, 2013), in Lave and Wenger (1991), Wenger (1998) and Chaiklin and Lave (1996) who connect learning to practice. However, in comparison with Engeström (1987) and Leontev (1978), Lave and Wenger (1991) especially situate learning within local and immediate practices. They argue that knowledge is bound up in the context of practice. Through the concept of community of practice Wenger (1998) situates learning and knowledge within local practices that involve social relations, working procedures, tools, norms, etc. Wenger (1998) argues that knowledge is developed within these practices and cannot be extracted from the
setting or processes of the practices. In his development of the concept of expertise, Billet (2001) similarly focuses on the situational level, where the practice is enacted. Billet (2001) states that “[e]xpertise needs to be considered situationally, being related to the circumstances of the enactment of the vocational practice” (441) and goes on to argue that expertise should be studied in the situated context. Finally, Hutchins’ (1995; 1996) concept of distributed cognition relates to this perspective on situated learning. Hutchins (1995) as well as Salomon (1993) argue that learning and cognition relate to the on-going interactions of human beings and the tools of the immediate physical environment.

**Learning as situated in immediate processes of acting**

Dewey’s (1916; 1938; 1958) concept of experience situates learning within active processes of the individual. Dewey (1916) argues that we learn through experience and that “[e]xperience itself primarily consist of the active relations subsisting between a human being and his natural and social surroundings” (p. 274). Thus, Dewey (1916; 1958) conceives of experience as an active and on-going relation between the individual and the world. This approach of Dewey entails that knowledge exists within the very processes of the experience. Schön (1983; 1987) draws on the approach of Dewey in developing the concepts of knowing-in-action and reflection-in-action. These concepts directly situate knowledge and reflection in practice and connect them to on-going activities. Schön (1987) uses the term knowing to stress that knowing is a process, not static knowledge. Especially Suchman’s (1987; 1996) concept of situated actions connects knowledge to the very processes of performing activities. Suchman (1987) argues that humans do not act in a pre-planned fashion, but rather that human activity unfolds in the processes of action. As a consequence, there is knowledge that only exists within the action. Similar to this, Salomon and Perkins (1998) describe learning as a “highly situated activity of participation”. Fors, Bäckström and Pink (2013) have stretched the situated learning even further than Suchman (1987) in their development of the concept of “sensory-emplaced learning”, which focuses on immediate sensory-motor interaction of the individual with the present environment.

First, the paper will develop an analytical framework for conceptualising reflection within situated actions. Second, based on the analytical framework, an empirical study will examine processes of situated reflection.

**An analytical framework for situated reflection**

The paper will develop a framework by combining pragmatism of Dewey’s (1916; 1958) concept of reflective experience and Schön’s (1987) conception of reflection-in-action with an activity theoretical approach to learning activities (Engeström, 1987; Engeström and Sannino, 2010; 2012; Leontev, 1978).

The concept of goal-directed and mediated actions provides the foundation of the developed understanding of reflection. This concept is central within activity theory and it has been treated thoroughly in previous research (Billet, 1996; Engeström, 1987; Leontev, 1978; Vygotsky, 1978). Leontev (1978) argues that human activity is directed at a goal (or an “object”) which can take the form of a motive, a goal or conditions of the
situation at hand. Further, human activities are performed in order to reach the goal. These activities are always mediated: performing actions implies the utilisation of mediating tools. In continuation of Leontev’s (1978) three levels of objects, Engeström (1987; 2001) develops three levels of mediation; tool, model and methodology. Knowing and learning are directly connected with the goal of human activity, in the sense that the goals form the basis of the individual’s understanding of the actions that are performed to reach the goal.

What is less explored within activity theory are the very processes involved in goal-directed mediated activities. In order to conceptualise processes of learning and reflection, the paper draws on Dewey’s (1916; 1958) concept of experience and Engeström and Sannino’s (2012) description of actions of expansive learning. Dewey (1916) divides what he terms reflective experience into a number of processes: (i) perplexity, confusion or doubt, (ii) a conjectural anticipation, (iii) careful survey or examination, (iv) elaboration of the tentative hypothesis and (v) a plan of action and doing something. Engeström and Sannino (2012) describe seven actions of expansive learning: questioning, analysing, modelling, examining the developed model, implementing the model, reflecting and consolidating (a new form of practice).

From the concept of goal-directed mediated activity, Dewey’s reflective experience and Engeström and Sannino’s (2012) learning actions, it is possible to describe the following four basic elements and processes of learning: goal, examination, construction and actions/mediation. Together these four elements constitute situated learning. The final action of Engeström and Sannino (2012) will not be applied in the current paper because the conception of reflection used in this paper does not include an expansive aspect (however, it does not exclude it). What is missing in Dewey’s description is the process of reflection. To develop the concept of situated reflection entails a connection of reflection with processes of situated learning.

To define situated reflection, the paper extends the processes of goal-directed mediated activities with two kinds of reflection processes. The first kind will be termed empirical reflection and the second theoretical reflection. This distinction is a continuation of Vygotsky’s (1986) distinction between spontaneous, everyday concepts and scientific concepts, Davydov’s (1999) distinction between empirical and theoretical thinking and Dewey’s (1997) distinction between empirical and scientific thinking. According to both Davydov (1999) and Dewey (1997) empirical thinking relates to observations of a given situation. This corresponds to the individual’s awareness of goals that also relate to the practical situation of the individual. A student’s awareness of an aim or goal of an activity is a precondition for empirical reflection. The paper will explore a definition of empirical reflection as evaluation of the consequences of actions in relation to the goal of an activity. An example of this kind of reflection is a student writing a speech for a politician, while evaluating whether the contents of the speech deliver the intended message.

Theoretical thinking, according to Dewey (1997), involves an analysis of the situation. In support of this, Wartofsky (1968; 1979) argues that the individual’s conception of an artefact is what makes reflection possible. A conceptual representation of action corresponds to an awareness of concepts or theories, which are not directly related to the empirical situation. However, the concepts and theories should support the goal or aim of the activity. Thus, students’ awareness of concepts or theories forms the
prerequisite for theoretical reflection. Based on this understanding, the paper will explore a definition of theoretical reflection as evaluation of the consequences of actions in relation to a concept or theory not inherent in the empirical situation. As an example of this kind of reflection, the student, writing a speech, would evaluate the form, structure and content of the speech in relation to concepts from rhetoric (such as pathos, logos and ethos).

Based on the working definitions of empirical and theoretical reflection an analytical framework for situated reflection is developed by adding processes of reflection to the four elements of situated learning. The developed model is illustrated in Figure 1. The empirical study presented below has utilised the model to examine and analyse processes of reflection.

The processes of both kinds of reflection are situated because they only occur in direct relation to on-going goal-directed activities. In order to identify processes of reflection, the study must also examine the other elements of situated learning.

**Study objective and research questions**

From the theoretical understanding of reflection and the developed analytical framework are formed specific research questions for the empirical study. The objective of the study is to examine whether it is possible to identify occurrences of empirical and theoretical reflection in practice. The following research questions form the basis of the study:

- How do processes of situated empirical and theoretical reflection manifest themselves in practice?
- How do processes of situated reflection support student learning?

**Methods**

**Context and participants**

The study involved students from nine classes from four upper secondary schools in Denmark. A total of 143 students and nine teachers from the four schools participated.
in observational studies. Thirty students and eight teachers participated in interviews. The students are in the age group between 16-19 years.

In order to study processes of situated reflection, it was important to find courses that displayed the active work of students. For the study, nine product-oriented courses were selected. The rationale for choosing product-oriented courses was first that they are goal-directed, which is relevant for the employed conception of situated reflection. Further, such courses are suitable for observation. Product-oriented courses – as opposed to writing an essay or doing a math assignment – make activities visible to observation. The chosen courses were three within design, two within visual arts and four within media studies. In all media studies courses, students work on producing a TV commercial; in visual arts, the product is a work of art in the form of a sculpture in clay; and in the design courses, students are producing either a carafe, a lamp or a chair.

**Study design and procedure**

The study was initiated by a workshop involving the nine teachers and the researcher. The intention and outcome of the workshop was for the teachers to design courses that were product-oriented and that were developed with the intention of combining theory and practice. Each teacher would run a course within their own discipline based on the design. Some teachers used the design for several of their courses, but only one course per teacher was included in the study. The courses spanned a period of time of 4 to 10 weeks.

A qualitative study of nine courses was performed by the researcher. The study was primarily based on observations of student work in each of the courses. Follow-up group interviews were conducted with selected students from each class (for practical reasons it was only possible to interview students from eight of the classes). Teacher interviews were also completed, but these are not included as part of this paper. The empirical studies consist of:

- Observations in nine lessons, one for each class. Each lesson was observed for a period between 45 and 90 minutes (depending on the length of the current lesson). A total of 143 students were involved in the observations.
- Interviews with 30 students in groups of 3-4 in a total of 8 interviews, one from each of the eight classes. Each interview lasted approx. 30 minutes.

Since the aim of the study is to examine processes of situated reflection, the observational studies provide the key empirical material. The studies employ a participant observation method (Kawulich, 2005). Student work was observed at different stages in their course: three in the initial phases of developing ideas, three around halfway through the course, and three towards the end of the course, where students were finalising their products. In all observations, students were actively working on their products either in groups or individually. The role of the researcher was as an “observer as participant” (Kawulich, 2005) aiming to establish a “peripheral membership role” (Adler and Adler, 1987). Thus, the researcher walked among students, observed student work and conversations and also interacted with students.

To gather data from the observational studies, brief notes were written down, and pictures were taken to capture the setting and products (DeWalt and DeWalt, 2002). Subsequently, the notes were written out in detail. Also, student productions were collected to capture productions in the different stages of student work. To support and focus the
observational studies, an observation guide was created. The guide is based on the analytical framework for learning and reflection and was divided into three focus areas: (1) products, which aimed at examining the goal-directed nature of student work, (2) work processes aimed at identifying examination, construction and reflection, and (3) reflection as a specific focal area. Table 1 shows the focus areas and questions for the observational studies.

Interviews with students were done immediately after the observational studies, making it possible to discuss the observed activities with the students. Students were selected in collaboration with the teacher. The rationale for selecting students was to choose students from active groups and students that the teacher thought were able to express themselves. Also, it was important to have a mix of gender. The interviews were semi-structured and based on an interview guide developed from the same focus areas as the observation guide (Kvale, 1997). The role of the interviews in the study was to supplement the observational studies by primarily gathering students’ experiences. Table 2 shows the focus areas and the background questions for the student interviews.

The questions in both guides were not asked directly to the students, but the questions directed the observations and formed the background for developing specific questions for the interviews.

**Ethical considerations**

The focus area of the observations and interviews does not involve personal or sensitive topics for students. The studies have focused on processes of school work and have not been considered of a sensitive nature. However, all interviews and observational notes have been handled anonymously without any references to the students involved.

**Data analysis**

The analysis of both observation notes and interviews was performed as a thematic analysis (Braun & Clarke, 2006; Guest, MacQueen, & Namey, 2011). Braun & Clarke (2006) outline six
basic steps for thematic analysis: (1) familiarisation with the data, (2) generating initial codes, (3) searching for themes, (4) reviewing themes, (5) defining and naming and (6) producing a report. These steps were followed in the data analysis. In the first step, the interviews were listened to and an initial deductive analysis was performed using the concepts of goal, examination, construction and reflection from the analytical framework. Citations related to these concepts were transcribed. The observational notes written down after the observations were also divided into the four analytical concepts. In the second step, an inductive coding of both interview transcripts and observation notes was performed. This analysis searched for specific codes within the four analytical categories. Codes in this analysis are words and terms that describe what characterises the four analytical concepts. Examples of the coding is shown below:

“We found [Examination] some images on Google as inspiration [Goal] and we have tried to put some of them together [Construction] to see, whether we could make it into a carafe.” (Student interview)

“We have also mixed [Construction] different ideas [Goal] together to one.” (Student interview)

“If you find [Examination] something, which you believe is good, you have to vary [Construction] it and mix [Construction] it, so it will not be the same [as the original].” (Student interview)

“They consider [Reflection] whether their product relates to the theme [Reflection] of gender roles.” (Observational notes)

All identified codes were put into a table with keywords for Goal, Examination, Construction and Reflection (see Table 3). In the third step, the collected codes were analysed to gather them into themes. Codes in the goal category provided a means of dividing them into themes describing phases. From the coding within the goal category emerged the themes of inspiration, ideas, models and (end) products. In the fourth and fifth step, the codes within each of the four themes (inspiration, idea, model and product) were reviewed and provided with names that encapsulate the meaning of the codes. Table 3 shows examples of codes that were named for the inspiration phase, to illustrate the process of analysis. The final step of reporting is this paper.

Results: Phases and processes of student work

The results of the thematic analysis are presented in Table 4. The analysis showed first of all that it was possible to identify processes of examination, construction and

| Table 3. Examples of codes that developed the theme “Inspirational phase”. |
|-----------------------------|-----------------------------|---------------------------------|
| Excerpts from transcripts and observation notes | Naming of codes |
| Goal | “Inspiration” | Inspiration |
| | “Gathering related materials” | |
| Examination | “found images on Google” | Related products and materials |
| | “searching online” | |
| | “image search on Google for ‘film noir’” | |
| Construction | “cutting out pictures from a magazine” | Pick and choose |
| | “gathering and sorting materials” | |
| Reflection | “browsing through and discussing whether they like the images or not” | Evaluation of related products |
| | “Is this film noir?” | |
reflection as described in the analytical framework. However, although students in each of the courses worked on one overall objective of creating a product (a lamp, a chair, a commercial, etc.), the analysis showed that the specific goals of student work differed in different phases. From the analysis emerged four different phases of students’ product-oriented work: inspiration, idea development, modelling and production. Table 4 shows the findings from the thematic analysis in the form of four identified phases and their characteristics. The phases are not exhaustive, but they provide different examples and aspects of processes of student work.

For example, the studies showed that processes of examination in an inspiration phase were an investigation of existing products and materials that related to students’ own product, whereas the production phase contained an examination of specific materials and tools utilised to construct the end product. When processes of examination are seen as a dimension of a learning process, it can be argued that students learn different aspects of the overall course within each of the phases, and, more specifically, within each of the sub-processes of the phases. Looking specifically at reflection, the study shows that the nature of situated reflection also varies in the different phases and reflection involves different preconditions and abilities in each of the phases. Below, each of the phases will be unfolded to highlight their differences and characteristics with a special focus on the distinction between empirical and theoretical reflection.

**Inspiration phase**

Students in this phase did not focus their attention on the product they were to create, but rather on input for inspiration. The goal of their activities was to gather materials of inspiration. In some courses, the result of the phase was a collection of inspirational input to their own product.

Processes of examination dominate this phase. Observations show that this is an open and rather unclear process for students. Most students use Google image search to find pictures from motion pictures or of specific design products such as lamps. In this phase, student examination has a focus on related products and materials. Although the searches are rather basic, students examine countless images that can potentially inspire their own product. As a student states “It gives you an understanding of what you are going to create”.

The construction processes of this phase are closely related to the examination of images. Students construct by picking and choosing specific items that they wish to be inspired by in their own product. As seen in the pictures below, some teachers
specifically asked students to create mood boards to collect and present their input. A mood board is intended to capture the mood or a certain expression (see Figure 2).

Whereas some of the observed students could not see the purpose of the mood board and primarily did “what the teacher asked them”, other groups of students were more engaged in creating a collection of inspirational materials in a mood board. The latter students explained that they have acquired an insight into the forms, shapes and materials of related designs.

Reflection in the inspiration phase is an evaluation of related products. Students’ empirical reflection can be identified in the observational studies when students are evaluating images based on their immediate appearance. This kind of reflection is evident when students are unable to make explicit criteria for their evaluation. Students would often state that they chose a specific image because they “liked it” or thought it was “beautiful”. The observational studies also identified theoretical reflection, which is evident from discussions between students. Within all courses, students were working with concepts that were intended as a basis or influence to their product. In media studies students explored genres such as western, film noir and horror; the design students were given concepts such as dynamic, asymmetrical, cheeky, mysterious or classic as a framework for their lamps or chairs; in visual arts, students were told to express feelings such as anxiety, happiness or disgust through their works of art. These concepts appear in students’ evaluation of images. Theoretical reflection is particularly clear within the design courses, where students constantly articulate concepts when they discuss images to select. For instance, they try to find “mysterious” and “dynamic” in carafes they watch on screen. In the interviews, several students state that they did not have a clear understanding of these concepts prior to the course, but that they acquired an understanding of them through their practical work.

**Idea development phase**

The goal of student activities in the idea development phase is to construct one or more ideas for their product. Although this phase in practice can blend with the inspiration
phase, the goals and activities are different. Where students in the inspiration phase survey other products, they create something themselves in the idea phase.

At first glance, the observed processes of examination in this phase resemble the inspiration phase. Students also evaluate images of related products. However, due to the different goals, there is a key difference between the phases. In the idea phase, students are looking for answers and solutions that can contribute to their specific idea. This entails students evaluating elements and functions in images. Examination is a matter of identifying elements that students can draw out and use in their own idea. As an example, a group of design students were looking for “something that twists”. Thus, the idea phase aims at transforming a pool of inspiration to an idea. This is evident in the processes of construction that dominate this phase. Construction processes in this phase manifest the emerging idea. For example, students use pen and paper to draw sketches of their idea or they write down notes to describe their idea, as this student in visual arts:

I started out with some words. What do you believe relates to “anxiety”? I wrote it on post-it notes. “Distortion”, “inner”, “expression”, “the world collapses around you.” (Student, visual arts)

The observed construction processes can be described as copy, change and construct. Many students initially copy elements from existing products and then add their own changes to it to form their idea, as this student also states:

We found images on Google as inspiration, and then we have tried to put some of them together to see, if we could create a carafe from that. (Student, design)

Both observations and interviews indicate that many students are struggling to create an idea. As an example, design students constantly consider and assess their sketches; they look at inspirational images, erase, draw again, discuss with teammates, etc. The construction processes in this phase appear to be very focused and intense. In this phase, students constantly reflect on their emerging idea. This is obviously reflection-in-action, since students are reflecting within construction processes of creating and revising their idea. In this phase, students’ reflective conversation with the materials takes on the form of “conversations” with, for instance, pen and paper in order to reach a satisfactory solution. For example, design students show examples of empirical reflection by evaluating angles and curves in their sketches against materials of inspiration. The image below (Figure 3) shows an example of a student’s reflection on her own sketch (of a carafe) in relation to elements from a vase that she is using for inspiration.

Theoretical reflection can also be observed within this phase. Whereas empirical reflection in this phase is evaluation of an idea in relation to existing images, theoretical reflection occurs when students use concepts to guide construction of ideas. For example, observations of design students show that they reflect on their sketches in relation to concepts such as mysterious, asymmetrical and dynamic. Students in the interviews also explain that they have used these concepts a lot:

We have used the words a lot. Especially the form “cheeky”. We have defined it as something different, to have the courage to do something different, something special. We have talked a lot about it during our work. (Student, design)
Modelling phase

The goal of student activities in the modelling phase is to manifest the idea in a model. Thus, modelling is different from making sketches in the phase of idea development. In the modelling phase, the students are still not directed at the final product. Instead, the modelling phase aims at developing the “ideal” or “perfect” model of their end product.

Although processes of examination do not dominate the modelling phase, the observational studies show that examination also exist within this more productive phase. An example is the creation of storyboards (in media studies). Observations of media study students shows that although they focus on creating the storyboard, they search for videos, television commercials and music online during the process. The examination processes are, however, different than the apparently similar examination processes of the idea and inspiration phases. In the modelling phase, students examine materials with the objective of finding specific examples that they can use. Students are examining to find answers and solutions, specifically the media studies students are looking for music, sounds and images that they can use in their shots.

The models that students are developing in the construction processes are drawings of chairs, lamps or art products or storyboards. In the interviews, students explain how they form an “inner image” or conceptualisation of their product. Thus, the

Figure 3. Empirical reflection of a sketch in relation to a vase (design).
construction processes of this phase can be interpreted as a kind of dialogue between tangible modelling and inner conceptualisation of a product.

The observational studies show that within this phase student reflection is often empirical. For example, in media studies, students are guided by images, angles, perspectives, framing, etc. Reflection in the modelling phase is evaluation of models in relation to an idea. However, students primarily evaluate the developed model in relation to practical limitations in shooting the film. Thus, they often moved mentally into the production phase. There are also examples of theoretical reflection. Again, in media studies, students use film genres and other film concepts to discuss their storyboards. For example, a group creating a film noir inspired television commercial discusses the clothing of a female character, “Noir means dresses. Shouldn’t she wear a dress?” (student, media studies).

**Production phase**

The goal of the production phase is to make the final product. This phase apparently looks much like the modelling phase, but the key difference is that the focus now is to finalise the product.

The phase is dominated by craftsmanship, which is not in apparent in the modelling phase. This is evident from the processes of examination that take on a different character than in the previous phases. The observational studies show that students are studying and examining the specific materials and tools. For instance, students are moulding clay, touching and feeling different kinds of cardboard and holding fabric against the sunlight; they study the thickness and plasticity of wires; and they search online for specific materials, etc. Thus, the examination processes of this phase provide students with an understanding of characteristics of materials and tools.

Construction processes in this phase are characterised by experimentation and implementation. In design and visual arts, students are bending wires, cutting cardboard, taping paper together, sewing, etc. In media studies, students are editing scenes, adding music, adjusting colours in the film editing tool Final Cut Pro, etc. Observations in media studies show that students are experimenting in their film editing, where they repeatedly go over scenes, they cut the scenes at different points, replace with other recordings, add different colour filters, etc. The difference between the modelling and production phase becomes clear when students are now confronted with challenges of translating their model into a product. Students in the observed classes encounter several problems that relate to the limitations of materials and their own craftsmanship, which means that they have to alter their product. Construction processes of this phase have a focus on characteristics of materials such as colours, viscosity, sizes, materiality, surfaces, texture, etc.

Empirical reflection dominates this phase. In the observed classes, students’ reflections are often aesthetic and the criteria for judging them are most often unclear. When discussing their products, students primarily use terms such as “pretty”, “ugly”, “clumsy”, “crooked”, etc. Theoretical reflection is less evident from the observations and interviews. An example of this kind of reflection was observed in visual arts, in which students’ work was guided by concepts such as anxiety, disgust and love. Students were discussing whether their works of art (in the form of eggs) were able to express these feelings.
Discussion: How students reflect on the same in different ways

The main finding of the empirical study is the identification of different kinds of situated learning and reflection that relate to different goals of student work. The study shows that students in each phase engage in the subject matter (of film production, visual arts and design processes) in unique ways. Based on these findings, it can be argued that students learn about different dimensions of the subject matter in the different phases – even though the subject matter does not change. In this section, the potentials and learning outcomes of reflection in each of the phases will be discussed. Examples from film production will be used to illustrate the different dimensions of theoretical reflection in each of the phases.

In the inspiration phase, students reflect on existing images and film clips with the intention of finding examples that could inspire their own work. The learning potential of this kind of reflection is for students to gain an insight into the domain of film production, more specifically into the aesthetics of genres such as horror, film noir and westerns. Theoretical reflection in this phase consists of an identification of elements of film images with genre concepts. Practically speaking, reflection in this phase would see students evaluating and selecting examples of what characterises horror, film noir, etc. In the words of Schön (1987), students engage in reflective conversations with the images. These conversations are in fact very explicit. Students use the concepts in discussions to consider and evaluate the images. Through these processes, students learn how to identify and distinguish between genres.

Student reflection in the phase of idea development relates to the construction of their own idea for a horror movie. In the words of Leontev (1978), theoretical reflection in this phase supports students’ appropriation of concepts, meaning that students make the concepts their own. During idea development, students begin to construct their own understanding of what characterises for instance a film noir. Students form an idea containing key structures and elements within the genre they are employing. Theoretical reflection in this phase is the students’ reflection on their developed storyline and character line-up in relation to concepts from film noir such as mystery, crime, detectives and femme fatale, or from horror films such as shock effects, and suspense. In this phase, reflection supports students in learning about specific elements of film genres.

The modelling phase contains yet another kind of reflection. Now the students in media studies will have to develop specific images that create for instance mystery, a shock effect or the feeling of suspense. Wenger’s (1998) concept of reification describes the core of the modelling phase. Reification describes a transformation of meaning into something concrete. Students are translating their idea into a concrete model. Students are modelling the movie in a storyboard and they will reflect on specific means and effects in the storyboard, for instance a close-up or a tracking shot, in relation to the creation of a shock effect or suspense. Reflection in this phase supports students in learning about filmic means and effects within specific genres.

The production phase asks of students to implement their model in an actual film. Focus is no longer on means and effects, but on the very materials and tools of film production.
Theoretical reflection supports student learning about the more technical aspect of film making. The point from Hutchins (1995) that learning relates to interactions between students and tools of the immediate physical environment become evident in this phase. Students learn about how very specific materials of film making, such as colours, light sources, camera movements and editing relate to theoretical concepts of genres.

Based on the findings of theoretical reflection within each of these phases, it can be argued that although students examine the very similar images or videos in different phases, they learn different aspects of the same materials. Students’ understanding of “film noir” or “horror” is constantly changing and developing through the phases by the different kinds of reflection. As a design student states, “The idea of what the vase should look like, changes constantly, every time you are working on it.”

### Conclusion

The paper has explored the question of how to integrate theory and practice in student work through empirical studies of situated reflection in upper secondary education in Denmark. As a basis for the studies, an analytical framework for situated reflection was developed. The study showed that the framework is suitable for studying and analysing processes of situated learning and reflection and to make visible and conceptualise different phases and sub-processes of learning and reflection within specific subject areas. The studies identified both empirical and theoretical reflection in the practices of the students working within product-oriented courses. Further, the studies showed that reflection supports integration of theoretical concepts in the activities of students engaged in practical work. The studies showed many examples of students using theoretical concepts from media studies, design and visual arts to reflect on their on-going activities. Further, the studies identified four different phases of student work that provided examples of different kinds of reflection. These phases are defined by the different goals of student activities. A key finding of the studies is that students learn different aspects of the subject matter within each phase.

These results of the developed analytical framework and the studies call for an increased focus on processes of situated reflection in educational practices. The question following these findings is how to facilitate theoretical reflection? What can teachers do to promote theoretical reflection? The answers are not trivial because reflection exists within phases and sub-processes of student work that can be difficult for a teacher (and students) to recognise. The current study does not contain the answers to these questions, but the study points towards areas of focus for further inquiry. The study suggests that teachers could make use of explicit phases of student work. It is necessary to establish meaningful phases and communicate to students that specific sub-processes of their work are important in their own respect – and not only as steps towards the end product. A key to establishing meaningful phases is to clarify the goals of student work within different phases, since the study has shown, that theoretical reflection is dependent upon the goal of the activity.
Notes on contributor

Christian Dalsgaard, PhD, is associate professor and research programme director at the Centre for Teaching Development and Digital Media, Aarhus University, Denmark. His area of research lies within the field of educational research and educational design, and his research is primarily concerned with the study of open-ended learning resources and learning environments which support self-governed activities of students. He has published articles within the fields of learning theory, personal learning environments, online learning, and educational technology.

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