# Creating theory-practice linkages in teacher education: Tracing the use of practice-based artefacts

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A B S T R A C T

Relatively little attention has been paid to how educators actively construct linkages between different forms of knowledge at the micro-level of educational activities in campus-based teacher education. The current article addresses this gap in existing literature by empirically examining how educators construct theory-practice linkages through the use of practice-based artefacts when teaching at campus. By employing analytical tools associated with a sociomaterial perspective, the article demonstrates the value of applying this perspective to examine the role specific artefacts can play in forging linkages between different forms of knowledge, and highlights the creative and constructive work required by educators for such linkages to be made transparent in a higher education context.

## 1. Introduction

In the field of teacher education, a key challenge over several decades has been to establish relations between different forms of knowledge in ways that support student learning and reduce the "practice shock" of novice teachers. Traditionally, many have characterised the challenge as one of bridging the "theory-practice gap", applying a distinction between so-called theoretical and practical knowledge to denote the knowledge cultures associated with higher education-based and school-based components of teacher education programs (e.g., Carr, 1995; Korthagen, Loughran, & Russel, 2006). Researchers have documented several efforts to strengthen such linkages; for instance, by making professional practice represented and relevant in the higher education context by establishing stronger university-school partnerships (e.g., Zeichner, 2010) or grounding campus-based activities in core tasks of the teaching profession (e.g., Grossman, Hammerness, & McDonald, 2009). However, relatively little attention has been paid to how educators actively construct linkages between different forms of knowledge at the micro-level of educational activities in campus-based teacher education.

The current article addresses this gap in existing literature by examining how educators construct theory-practice linkages through the use of artefacts associated with professional practice in schools when teaching at campus. Typical practice-based artefacts include teaching materials, local curricula, teaching methods and pupil texts. By employing a sociomaterial perspective with analytical emphasis on how these artefacts are mobilised in specific educational activities, this article demonstrates the analytical potential of sociomaterial perspectives for examining the generative role that practice-based artefacts can play in the pursuit of theory-practice linkages. The analysis also highlights the considerable creative and constructive work that is required from educators to successfully re-contextualise such artefacts to learning situations in a higher education context.

Empirically, the article foregrounds the campus-based teaching of a specific group of educators in Norwegian teacher education,

referred to in this article as *hybrid educators*[1] . Working both as teachers in schools and educators in campus-based teacher education, hybrid educators are particularly associated with an expectation of "building bridges" between the two knowledge cultures they work in (e.g., NTNU, 2019), and unlike campus-based educators, they have a unique opportunity to bring practice-based artefacts from the school-context to the higher-education context.

Norwegian teacher education provides an interesting empirical case, as national strategies require teacher education institutions to provide programs that are both "profession-oriented" and "research-based", for instance as an MA is increasingly demanded to teach at all school levels (Ministry of Education & Research, 2016). Yet; researchers have identified a weak link between campus-based and school-based components (Fosse, 2016; Jahreie & Ottesen, 2010), and student teachers continue to view Norwegian teacher education programs as fragmented (Lillejord & Børte, 2017; NOKUT, 2016). Attempts to address this challenge have led policymakers to introduce strategies aimed at strengthening "integration" between forms of knowledge and the professional relevance of teacher education (Ministry of Education & Research, 2017). One element of this strategy has been to expand the employment of hybrid educators; in this context, hybrid educators represent an effort to bring practitioner knowledge into higher education in order to construct stronger relations between professional practice in schools and campus-based teacher education.

Based on observational data and in-depth interviews, the current article provides an empirical and conceptual contribution to research on constructing linkages in teacher education by studying how different forms of knowledge are mobilised and linked to each other through the use of practice-based artefacts. In this study, the practice-theory distinction is applied to represent forms of knowledge, as this is an established way to talk about these different epistemologies, both in research (e.g., Carr, 1995; Kennedy, 1999; Korthagen et al., 2006; Kvernbekk, 2001) and among educators in this study. The following research questions are addressed: How are linkages between theoretical and practical knowledge created when hybrid educators use artefacts from professional practice in their campus-based teaching? What are the implications for how we understand and conceptualise efforts to strengthen theory-practice linkages in campus-based teacher education?

## 2. Bridging the theory-practice gap in teacher education

A vast line of literature addresses the challenge of creating meaningful connections between the different sites of learning and forms of knowledge that make up teacher education programs. These strands of literature focus on the construction of knowledge connections at different levels of the education program, for instance by foregrounding curriculum content or program structure. In the following, the body of literature related to how educators work to create theory-practice linkages in the campus-based context will be emphasised.

An extensive body of literature investigates how different forms of knowledge come together in teacher education by applying the concept of a *third space* to denote the merging point between schools and universities (e.g., Bullock, 2012; Williams, 2013; Zeichner, 2010). Zeichner (2010) argues that the third, or hybrid, space is an essential dimension of teacher education where forms of knowledge come together in less hierarchical ways and involves "a rejection of binaries such as practitioner and academic knowledge and theory and practice, and involve[s] the integration of what are often seen as competing discourses in new ways—an either/or perspective is transformed into a both/also point of view" (p. 92). Korthagen et al. (2006) suggest that educators working in the third space must hold three different perspectives simultaneously; the perspective of the individual learning to teach, the perspective of the teacher in a school, and the perspective of the teacher educator in the university setting (p. 1034). Thus, the notion of the third space provides a fruitful conceptual backdrop to study efforts of breaking down dichotomies in teacher education by bringing different epistemologies and practices closer together; for instance, with hybrid educator roles.

A considerable body of literature foregrounds the notion of *coherence* as a means of creating connections between different forms of knowledge. This body of literature has produced several concepts for describing aspects of coherent teacher education programs—such as structural and conceptual coherence—foregrounding meaningful interrelationships between program components and different actor's perceptions and experiences of coherence between these components (Darling-Hammond, 2008; Hammerness, 2006). Even though this literature primarily emphasises connections at the program level of teacher education programs, a few studies have examined coherence by foregrounding the work of educators specifically. Hammerness (2013) conducted a study foregrounding conceptual and structural coherence by examining characteristics of coherence in Norwegian teacher education, and based on documents and interviews with program leaders and educators the study found that many educators and program leaders draw a clear distinction between campus courses and the practical work taking place at schools. The study further points to a lack of opportunities for student teachers to learn in the context of practice, as educators contended that in campus courses, relatively little time was used to analyse pupils' work or other artefacts used in classrooms. A study presenting findings from observations of methods courses in Finnish, Norwegian and American teacher education programs supports findings from Hammerness' study (Jenset, Hammerness & Klette, 2018). Together, these findings confirm the notion of a persisting "gap" between professional practice in schools and higher education courses in the Norwegian teacher education context.

Within literature foregrounding opportunities for student teachers to learn from practice in the higher education setting, a line of researchers has focused on strategies, routines or activities that campus-based teaching should focus on in order to make the connection between campus courses and professional practice in schools more evident. In this literature, the activities of the teaching profession that educators should foreground at campus are referred to as *core practices* (Grossman et al., 2009; Jenset, 2017), *generative*

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[1] In Norwegian policy documents (e.g., Ministry of Education & Research, 2017), teachers working both as teachers in schools and as educators at campus are mainly referred to as *kombinasjonsstillinger* (combined positions) or *delte stillinger* (divided positions).

*practices* (Franke & Kazemi, 2001), or *high-leverage practices* (Hatch & Grossman, 2009). Presented as a characterisation of quality in teaching preparation, core practices are explained as practices that occur often in the teaching profession, and it is suggested that a focus on these in both teacher education and work placement will make the connection between theoretical aspects of higher education and aspects of professional practice more evident for student teachers (Grossman et al., 2009). In sum, these notions provide valuable foundations for structuring the content of teacher education programs in order to create stronger linkages between different forms of knowledge. However, there has been less empirical attention to how educators work to construct such linkages through their everyday teaching activities in campus-based education. This analytical level is important because structural and conceptual coherence are ultimately supported and sustained by the micro-practices that educators enact in their daily work. Consequently, efforts aimed at closer integration of different forms of knowledge need to be reflected in educators' approaches to specific tasks and teaching materials. More specifically, analytical emphasis needs to be paid to how educators link representations of different forms of knowledge to each other.

In line with this analytical approach, an emerging body of research has explored representations of professional practice at campus by foregrounding how tools or artefacts from professional practice are used in the campus-based setting. A majority of these studies focus on tools as representations of teaching and student learning in mathematical teacher education specifically (e.g. Ghousseini & Sleep, 2010; Herbst & Chazan, 2011; Lampert & Ball, 1998), where the aim is "making practice studyable" on campus by grounding learning in the "real material of teaching" (Ghousseini & Sleep, 2010, p.159). In a study on the use of practice-based learning for students teachers of mathematics, Ghousseini and Sleep (2010) argue that practice should be made studyable in a way that enables learners to become deliberate users of practice beyond that particular artefact, and the study further points out that practice is made studyable when educators explicitly model good teaching by adapting the activities to the background knowledge of student teachers, and by explicitly articulating goals and intentions that allow a study of practice where the educators do not "do the work for the learners" (Ghousseini & Sleep, 2010, p. 159). Even though these studies point at the potential of applying activities at campus that visualises the practical tasks of teaching, a report on partnership teacher education in England and Scotland identified missed learning potential as student teachers tended to interpret artefacts that educators applied from the professional field as "a rule" or "something that you do", rather than engaging in a learning process of discovering the conceptual underpinnings of such artefacts (Ellis, Blake, McNicholl, & McNally, 2011, p. 20). In this report, educators were found to primarily apply artefacts from the professional context, and researchers identified a tension in how these artefacts could function as a "tool" that mediated learning of student teachers or perceived with more instrumental motives as a "rule" (Ellis et al., 2011, p. 19-22). Combined, these findings both emphasise the opportunities of learning that may arise when artefacts from professional practice are applied, but also the challenges involved in applying these artefacts in a way that they are not merely interpreted as instrumental recipes for completing particular tasks of teaching.

In sum, these strands of research provide valuable perspectives on how to research and conceptualise theory-practice connections in campus-based teacher education by emphasising efforts made to make professional practice represented and relevant in the higher education context. The current article further expands on existing literature by analytically foregrounding the micro-practices involved when educators attempt to re-contextualise practice-related artefacts to campus-based teaching, demonstrating the different roles specific artefacts can play in forging linkages between forms of knowledge, and highlighting the creative and constructive work required by educators for such linkages to be made transparent.

## 3. Theoretical perspectives

A sociomaterial perspective offers a fruitful framework to investigate linkages between forms of knowledge in campus-based teacher education by highlighting knowledge as embedded in the routines and materials of professional practice (e.g., Carlile, 2004; Fenwick & Nerland, 2014; Knorr Cetina, 1999). From this view, professional practices are considered to be processes that take place within social systems that have evolved culturally and historically, and the *artefacts* (e.g., Cole, 1996; Fenwick, 2010) professionals make use of in these processes are historically laden and carry specific constraints and affordances that shape and guide interaction with them. Thus, the task of forging stronger relations between higher education and professional practice is not simply a matter of "bridging theory and practice", but rather involves the bridging of two sets of institutional practices and artefacts that have historically had two different purposes; whereas higher education institutions have been oriented towards the production and dissemination of research-based knowledge, work in schools is oriented towards educating children and youth. Within these two domains, what is considered legitimate and valid knowledge will differ, as they are characterised by two distinct knowledge cultures that serve different purposes (Knorr Cetina, 1999). In brief, universities and schools are characterised by different forms of knowledge that are materialised through the use of artefacts.

In this study, the practice-theory distinction is applied to represent these two forms of knowledge. The "theoretical" knowledge associated with the higher education context is often characterised as formal knowledge consisting of research-based, methodological, theoretical, and codified aspects (e.g., Cochran-Smith & Lytle, 1999; Eraut, 2004; Grossman, 1990; Nerland, 2012; Schulman, 1987). Some typical examples of artefacts associated with this domain include concepts, theories, research articles, general principles or abstract models. Theoretical and research-based knowledge can be viewed as an important aspect of professional practice; however, many researchers have emphasised the challenge involved in demonstrating the relevance of theoretical knowledge for practitioners, and the challenge involved in "translating" abstract knowledge from the higher education context to the specific tasks and requirements of professional practice (e.g., Eraut, 2004; Kvernbekk, 2001).

"Practical knowledge" is primarily associated with the tasks and demands of professional practice and can be characterised as situated and contextual, bounded by time, space and task (Fenstermacher, 1994). Practical teacher knowledge has been described as founded on a less accumulated and structured knowledge base than that associated with higher education (Lohman & Woolf, 2001;

Pedder & Opfer, 2013). In schools, typical artefacts associated with professional practice include teaching materials, pupil texts, local curricula or specific teaching methods. In order to perform school tasks, teachers are found to apply knowledge that can be characterised as primarily tacit and personal, shaped by experience and reflexivity (Cochran-Smith & Lytle, 1999; Nerland, 2012; Schön, 1987). Furthermore, teaching practice has been described as being based on a highly individualised work culture (Klette & Carlsten, 2012; Little, 1990) and a weak theoretical orientation (Ball & Cohen, 1999; Hargreaves, 2000; Grossman, Hammerness, McDonald, & Ronfeldt, 2008).

A sociomaterial perspective assumes that the physical and conceptual artefacts associated with specific knowledge domains carry beliefs, knowledges and logics from the culture they originate from, and offer constraints and affordances for use (Cho & Wayman, 2014; Nerland & Jensen., 2012). This assumption makes the work of hybrid educators an interesting empirical case for examining knowledge relations in teacher education: The hybrid educators literally bridge two institutional cultures by virtue of working both in schools and higher education, and they are specifically tasked with "bridging" this cultural and epistemic gap. They are therefore well positioned to bring practice-related artefacts into higher education to support student learning and forge relations between different forms of knowledge. However, the specific role that artefacts play in teacher education will depend on how they are taken up and mobilised by educators in classroom settings, including how they are related to other conceptual and material artefacts. Furthermore, artefacts that travel from one culture to another typically need to be translated and re-contextualised as they enter a new setting; when practice-related artefacts are introduced in a higher education setting, it is not necessarily clear how linkages are to be made between the artefact and the knowledge that is valued in higher education, or how the artefact can be mobilised to support student learning. Further, artefacts are often complex, can have diverse potentials, and require analysis and creative work to serve specific purposes.

In summary, the perspective adopted here implies an analytical focus on how theoretical and practical knowledge are mobilised and placed in relation to each other when artefacts from professional practice are used in campus-based teaching.

## 4. Methodology and analytical approach

The data used in this paper is derived from observations and in-depth interviews of three hybrid educators at three teacher education institutions. This group of educators are particularly associated with an expectation of "building bridges" between the two knowledge cultures they work in and have a unique opportunity to bring practice-related artefacts from the school-context to the higher-education context. Even though several teacher education institutions have long traditions of including teachers in campus-based tasks, for instance as part of university-school partnerships, there is not an established tradition in Norway of employing hybrid educators; thus, the tasks they are asked to perform as part of teacher education programs vary from institution to institution, and it was therefore of interest to recruit hybrid educators from more than one institution. The selection criteria for choosing informants to this study were that they worked at different teacher education institutions and that each of them had a workload of at least 20 % related to teacher education.

To recruit informants, leaders at eight teacher education institutions were contacted, and four of these confirmed that they had employed hybrid educators for the 2018–2019 academic school year. These institutions provided contact information and three of the educators confirmed that they were willing and interested in participating in the study. The informants were notified that participation was voluntary and that they could withdraw at any time. The project was approved by the Norwegian Centre for Research Data (NSD).

The informants (see Table 1) were observed in the different campus-based settings they participated in throughout the academic school year of 2018–2019. The observation material consists of field notes, including near-verbatim reconstructions of spoken interaction, and make up approximately 100 h of observations. Due to the geographical distance, it was challenging to observe all of Nina's campus-based activities, and therefore, observations of Emma and Ingrid comprise a majority of the observation material. The observations provided information about how the informants used artefacts in their work as educators, and after observing the informants over time, in-depth interviews were conducted in order to get a better understanding of their intentions and considerations when applying different artefacts. The three interviews were semi-structured and lasted one hour each; they were audiotaped and subsequently transcribed.

The analysis was guided by the following research question: How are linkages between theoretical and practical knowledge created when hybrid educators use artefacts from professional practice in their campus-based teaching? To examine this, the analytical process

**Table 1**
Overview informants.

| Name of informant (fictious) | Ingrid | Emma | Nina |
|---|---|---|---|
| Workload | 20 % as teacher educator<br>80 % as secondary school teacher | 30 % as teacher educator<br>70 % as upper secondary school teacher | 50 % as teacher educator<br>50 % as upper secondary school teacher |
| Main campus-based tasks | Teaching seminars focusing on aspects of the teaching profession | Teaching religion and ethics didactics | Teaching social science didactics |
| Other teacher educator tasks | Mentoring students in their practicum | Mentoring students in their practicum<br>Participating in research group<br>Evaluating student papers and exams | Mentoring students in their practicum<br>Participating in research group<br>Evaluating student papers and exams |

was initiated by a preliminary open reading of both sets of data, identifying all instances where artefacts were used in the observation material and talked about in the interviews, focusing on the educators' campus-based teaching. The analyses were then conducted through the following steps: First, I identified all episodes in the observational material where the informants used artefacts that could be said to originate from professional practice, focusing on physical artefacts. The analysis revealed that the informants mainly applied a variety of artefacts from professional practice, but also, they were found to use research articles, curriculum extracts and artefacts that could be said to represent other forms of knowledge.

I then completed a thick description (Geertz, 1973) of how these artefacts were used, with an emphasis on how linkages between practical and theoretical knowledge were created. From these analyses, two prominent and recurring patterns emerged (Ryan & Bernard, 2003); one characterised by episodes when theoretical and practical knowledge were explicitly linked to each other through the use of a practice-based artefact, the other when linkages were mentioned but not further pursued. To enable a more detailed exploration of the different ways theoretical and practical knowledge were linked to each other, I employed two intermediate concepts to the analyses (Hermansen & Nerland, 2014; Jahreie & Ottesen, 2010; Vennebo, 2016). The concept of *knowledge mobilisation* is used to highlight how different forms of knowledge are mobilised and made relevant when artefacts are introduced, and the concept of *knowledge linkages* is used to identify how these forms of knowledge are put in specific relations to each other through the use of artefacts. These concepts contributed to identify how theoretical and practical knowledge were made relevant for practice-based artefacts in different ways and helped pinpoint what it entails to make use of these linkages.

The examples included in the empirical analyses do not cover all linkages created; they are chosen as they represent characteristic, yet different ways, that forms of knowledge are linked through the use of practice-based artefacts and reflect the diversity of linkages created. Furthermore, the examples are chosen as they show both how linkages that are initially mobilised are explicitly made use of, and how they remain latent, reflecting the constructive and challenging work that is involved in using practice-based artefacts in ways that make linkages to the higher education context available. Extracts from the interviews are included in the analyses to shed light on how the educators reason about artefacts and different forms of knowledge.

The study has limitations in that it explored linkages by using a limited set of qualitative data sources and does not account for students' perceptions ; thus, this study's empirical and conceptual implications may be further developed through additional empirical research. In order to ensure validity and consistency in the study (Cohen, Manion, & Morrison, 2013), text segments from the analysis were discussed with other researchers, who provided feedback.

## 5. Empirical analysis

### 5.1. Example 1: the evaluation criteria

This example illustrates how linkages are created when theoretical knowledge is mobilised as an analytical tool that can be used to scrutinise conceptual underpinnings of an artefact from professional practice, and shows how these linkages are made explicitly available for student teachers when approaching the artefact.

Teaching a seminar on the topic of oral competence and oral activity, Emma initiates a task where a sheet of evaluation criteria used in a school subject is the main artefact:

> Emma: "I have used these criteria for oral assessments with my pupils. Remember that the general subject demands are a foundation. Do you remember Bloom's taxonomy?" She explains Bloom's taxonomy, saying it has to do with moving from reproducing information to being able to reflect on a topic and says that the article on this is on their learning platform. "Now, discuss advantages and disadvantages with these evaluation criteria, and suggest changes." The students discuss the evaluation criteria. Emma asks them to share their thoughts and reminds them that these criteria are concerned with oral competence; the subject-specific competence is not explicitly mentioned. A group member says that they discussed that the difference between subject-specific terms and everyday language could be emphasised. Emma agrees and gives an example of a pupil who thought he deserved the top grade, but he did not use subject-specific vocabulary. Emma says that this can be related to Bloom's taxonomy.

When the sheet of evaluation criteria is introduced, Emma makes theoretical knowledge relevant for the practice-based artefact by mobilising knowledge of a specific conceptual framework. By emphasising aspects of Bloom's taxonomy when the artefact is approached, Emma positions theoretical knowledge from campus-based courses as a relevant analytical tool that can be used to scrutinise an artefact from professional practice, and thus makes theory-practice linkages explicitly available for the student teachers through the use of the artefact.

As the concept of Bloom's taxonomy is not explicitly mentioned in the evaluation criteria, the extract provides an example of how the educator has worked creatively to identify underlying linkages that the practice-based artefact provides and how these linkages are made relevant for student teachers as the artefact is re-contextualised to the higher education context. In the interview, Emma elaborates on the challenge involved in re-contextualising practice-related artefacts to the higher education context in ways that make them meaningful for student teachers:

> It's easier to deal with the research-based part than the practice-related part because practice-related needs to—I feel—be translated… I think the most complicated thing is doing classroom activities that they can transfer and use in their own teaching, without having to do the exact activity that is made for a fourteen-year-old. Before, I used to just explain classroom activities that they could do, more than actually asking them to do it. Because that translation process is complex, and I felt it myself when I studied teaching—it feels meaningless, as a student, to do activities at the secondary school level… it's enough to

just get it explained. You know, sitting in a Spanish class at university and being told to draw a picture and explain it in Spanish, it feels strange.

Here, Emma expresses a wish to provide student teachers with practice-based activities that they can "transfer" to their own teaching, but suggests that these should not be merely examples of practice as she points to the complexity of "translating" practice-based knowledge to the higher education context.

This example shows how theoretical knowledge is used as a tool to analyse conceptual underpinnings of a practice-based artefact. By positioning aspects of theoretical knowledge as relevant for approaching the practice-based artefact, the two epistemologies are promoted as interconnected forms of knowledge. The example further highlights the educators' awareness of the challenge involved in re-contextualising practice-based knowledge to the higher education context.

### 5.2. Example 2: the wheels of writing

In this example, theory-practice linkages are constructed when theoretical knowledge is mobilised to challenge existing practice and to validate the use of the practice-based artefact. Linkages are further forged as the educator uses the artefact to position theoretical knowledge as a form of knowledge that can shape and challenge professionalism and professional development.

In this extract, Ingrid teaches a seminar on written competence and initiates an activity with the "wheels of writing" as the foregrounded practice-related artefacts. The wheels of writing are artefacts developed by Norwegian researchers as a tool that can be used in all school subjects to highlight different aspects of written texts. Ingrid foregrounds paper versions of the two wheels; they are made of paper layers that are connected in the middle and can be turned in order to match categories of writing; for instance, purpose of writing and acts of writing (see Fig. 1).

Together with the paper versions of the wheels of writing, Ingrid provides the student teachers with an article that explains the research-based intentions and uses of the wheels:

> After showing the student teachers the two paper-versions of the wheels, Ingrid hands out a research article on the wheels of writing. "We're going to read a lot of theory now, guys. This is so important because teachers are committing sins out there." She says she asked teachers at her school about the wheels, but no one knew them. "And that is just embarrassing." Ingrid talks about the importance of writing in all subjects. "I have become much more aware after reading up on this; I've even become fond of the wheels." She holds up a copy of the first wheel, explains its parts to the students, and reads an extract about the wheel from the article. She says they should read the entire article in order to understand the greater context. The students are asked to cut out and put together a paper version of both wheels, and Ingrid says they should bring it for their school placements. "Remember, you are the future, we cannot continue to think that the focus on writing in all subjects will disappear. I believe that you understand the importance of this, it is really important." After the students have cut out their wheels, Ingrid asks them to discuss how they could use these wheels when teaching.

After introducing the wheels, Ingrid mobilises the research article as an artefact of "theory", and as the article explains the research-based intentions of the wheels, the theory-practice linkages between the two artefacts are easily accessible However, the example shows how theory-practice linkages are further forged as the article is not only used to validate the practical use, but also to challenge existing professional practice and the lacking use of the wheels. By emphasising the importance of the wheels for the student teachers' future practice and by characterising the lacking use of the wheels among her colleagues as "embarrassing", Ingrid creates linkages between the two forms of knowledge through the notion of research-based practice and professionalism.

Ingrid further points to the use of research as important for professional development when noting that she has become fonder of the wheels after reading the article, and thus, her own professional development trajectory is mobilised as a resource to position research-based knowledge as an important part of professional practice.
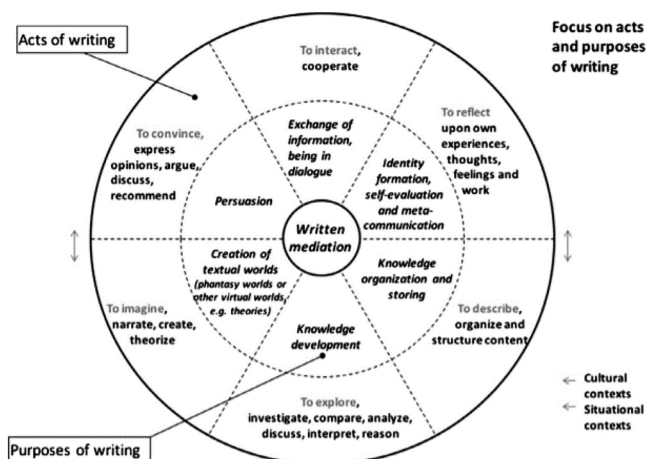


**Fig. 1.** An example of a wheel of writing (English version from Berge et al., 2019).

In the interview, Ingrid points to the use of research that is relevant for professional practice when asked what kind of research she includes in her campus-based teaching:

> Research tends to be a bit polarised, and you have professional practice in the middle somewhere. And then you constantly have to consider what personality you are—I do that with students in their practicum—but they have to find their own role as a teacher, and they have to be professional, and to be professional they have to lean on good research that works.

Here, Ingrid emphasises the link between research and professionalism as she describes being professional as applying "good research that works" for individual personalities of teaching. In line with this notion, the research-article in the extract is applied in a way that emphasises the relevance for professional practice.

In sum, this example shows how linkages are constructed when research-based knowledge is mobilised to validate the use of the practice-based artefact. The example further demonstrates how linkages are not only created through the easily accessible link between the article and the wheels, but the example further highlights the creative work of constructing linkages between theoretical and practical knowledge as the educator uses the artefact to position research-based knowledge as a form of knowledge that can shape and challenge professionalism and professional development.

### 5.3. Example 3: pupil texts and teacher feedback

This extract provides an example of how theory-practice linkages are created when theoretical knowledge is mobilised as a form of knowledge that can be put to the test by practice-based artefacts. The example further illustrates how these linkages remain latent when the artefacts are approached in a way that provides students with an example of solving a task of professional practice without making use of the linkages that are initially mobilised.

In this extract, Nina asks student teachers to read two sets of anonymised pupil texts and her feedback for the first and the final version of the texts. The feedback has been removed from the pupil texts, and the student teachers are asked to find out where the teacher feedback belongs:

> "You are going to look at the first draft, my feedback, and the final text. I have removed the feedback from the text, so you have to find out where in the texts you think the feedback belongs. Do we think that the formative assessment, that research claims is so good, has had any effect?" The students read the text and feedback. After a while, Nina asks if they can discuss the task together. She tells them to focus on the first anonymised pupil text and asks where they think the feedback belongs. No one answers. Nina asks if it was a difficult task, some students nod. She explains where the feedback belongs. They look at the final version of the text. "Here, the pupil has listened to his teacher's advice. He has included other perspectives and moved the paragraph and the sentence that I commented on." Nina shows the feedback she gave for the final version of the text and moves on to the next text. She explains where the feedback belongs. A student says that this pupil was given very specific advice. Nina says that the feedback is adapted to the pupil, and this pupil needs clearer feedback.

As the practice-based artefacts are introduced, Nina mobilises theoretical knowledge by pointing out that research can be used to put claims of formative assessment to the test on these real artefacts of assessment. However, this theory-practice linkage is not made further use of when the students approach the artefact or in the discussion following the activity, and thus, the research-based underpinnings of the practice-based artefacts remain latent. Rather, the practice-based artefacts are used as examples of how to solve a task of practice; more specifically, the task of assessing pupil texts. As the student teachers seem to be quite unfamiliar with the task of assessing, the educator moves on to explain where her feedback belongs, and thus, provides the students with examples of professional practice.

When asked to consider if her campus-based teaching as a hybrid educator is different than that of other educators, Nina emphasises the access to practical knowledge:

> Of course, other educators have a good understanding of professional practice as well, they are often out there researching, but it is something different being out there every day, teaching and tackling the challenges that arise, seeing what works, what makes the pupils motivated when they learn something. That is something I think the students appreciate getting to know more about.

Here, Nina points to the importance of providing students with examples from professional practice, noting that her position as a hybrid educator allows her to provide students with "authentic" practice experience from her own professional practice as a teacher, and this may explain why the pupil texts are used primarily to show student teachers how to assess pupils, without further pursuing linkages that are initially mobilised.

In sum, this example shows that theoretical knowledge is mobilised and made relevant for practice-based artefacts and further demonstrate how the linkages that are initially constructed with the intention of putting theoretical knowledge to the test, remain latent when the practice-related artefact is used to provide student teachers with an instrumental example of how to solve a task of professional practice. The extract further highlights the hybrid educator's wish to provide student teachers with authentic examples from practice.

### 5.4. Summary

The empirical examples illustrate how theoretical and practical knowledge are mobilised and linked to each other when practice-based artefacts are introduced in the higher education context in ways that promote the two epistemologies as interconnected forms of

knowledge; specifically, with the purpose of scrutinising theoretical underpinnings of evaluation criteria, verifying the practical use of the wheels of writing, or putting research claims of formative assessment to the test. Two of the examples demonstrate that these linkages are explicitly made use of when the artefacts are approached, while the last example illustrates how linkages that are initially constructed, remain latent as the artefact is used to provide an instrumental example of solving a practical task. In line with this use of a practice-based artefact, the analyses identify a wish among the educators to provide student teachers with authentic, relevant examples from practice. In sum, the analyses exemplify the creative and constructive work required by educators when they do what Emma identifies as "translating" practice-based artefacts to the higher education context and illustrate what it requires to identify theory-practice linkages that are relevant for the artefact and make these linkages available when the artefacts are used.

## 6. Discussion and conclusions

The article set out to examine how educators construct theory-practice linkages through the use of practice-related artefacts when teaching at campus. By employing a sociomaterial perspective with analytical emphasis on how these artefacts are used in specific educational activities, the analyses demonstrate the role artefacts can play in forging theory-practice linkages. Providing empirical examples of how educators put different forms of knowledge in relation to each other when artefacts from professional practice are used, the analyses also highlight the considerable creative and constructive work that is required from educators to successfully re-contextualise such artefacts to learning situations in a higher education context in ways that make knowledge linkages transparent.

The analyses exemplify that an analytical focus on artefacts can help identify how educators work to create linkages between theoretical and practical knowledge in campus-based teaching. Specifically, the examples demonstrate how these forms of knowledge are put in relation to each other in different ways and to different purposes; for instance, to explore the theoretical underpinnings of a practice-based artefact, to validate the practical use of an artefact with claims of research, or to put claims of theoretical knowledge to the test with practice-based artefacts. These examples show how artefacts can be used to promote theory and practice as interconnected epistemologies, and thus, the analyses contribute with specific empirical examples of what it may entail to do what Zeichner (2010) refers to as integrating "competing discourses of theory and practice" when educators work in the merging point between school-based and university-based teacher education and bring practical knowledge to the higher education context.

The empirical analyses further demonstrate that even though different forms of knowledge are mobilised and made relevant for practice-based artefacts, linkages between these are not necessarily explicitly made use of when the artefacts are approached. The analyses pinpoint the challenge involved in making theory-practice linkages available for student teachers by providing an example of how these remain latent when pupil texts are used to provide student teachers with examples of solving a practical task without making use of the linkages that were initially mobilised. This use of practice-related artefacts can be characterised by a tendency to do what Ghousseini and Sleep (2010) refer to in their study as "doing the job for the students", and the findings align with claims from Ellis et al. (2011), as they illustrate how artefacts from professional practice become instrumental "recipes" when educators use these in ways that provide students with examples of what works when completing specific professional activities. The analysis suggests that this use of practice-related artefacts may be a result of the hybrid educators' role as both teachers in schools and educators at campus, and their wish to provide student teachers with what is referred to in the interviews as "authentic" examples that they can "transfer" to their own professional practice. Thus, practice-based artefacts are not used in ways that reveal how theoretical and practical knowledge are related to each other beyond the specific artefact, but rather, to provide instrumental examples of professional practice without clear linkages to the higher education context.

By foregrounding empirical examples of the artefacts educators use and tracing the knowledge linkages that are made relevant with these, the current paper has implications for how we can understand and conceptualise efforts to strengthen theory-practice linkages in campus-based teacher education with an increased focus on materiality. Employing analytical tools associated with sociomaterial perspectives, the article demonstrates the role artefacts can play in forging linkages between different knowledge domains and highlights the work required by educators for such linkages to be made. The analyses further pinpoint an awareness among the educators of the challenges involved in re-contextualising artefacts from one epistemic culture to the other, as one of the educators points out teaching the research-based as a less complex task due to the challenge of *translating* the practice-based in ways that make this knowledge meaningful and relevant in the higher education context.

Whereas the existing lines of research on third space, coherence and core practices highlight ways of structuring the content of teacher education programs in order to promote epistemic connections, relatively little attention has been paid to how educators actively construct linkages between different forms of knowledge at the micro-level of educational activities in campus-based teacher education. This analytical level is important because structural and conceptual coherence are ultimately supported and sustained by the micro-practices that educators enact in their daily work. The sociomaterial conceptualisation of how educators' work to construct knowledge linkages that is demonstrated in this study, is especially helpful as new educator roles—such as the hybrid educator role—are created in the higher education context with the intention of "building bridges" in the third space between higher education components and practice, without a specification of what this work entails for educators when teaching at campus.

A dimension that could benefit from further research is the perspective of student learning, as this article does not account for students' perceptions of knowledge linkages created. The findings raise a more general question of the knowledge hybrid educators bring to the campus-based context, and further research is needed to explore how their knowledge as both practitioners and educators can be put in fruitful collaborations with other actors in order to strengthen connections in teacher education programs.

## Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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