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Contextualising Vocational Knowledge: A Theoretical Framework and Illustrations From Culinary Education

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Abstract The nature of knowledge in vocational education is often described in dichotomies such as theory versus practice or general versus specific. Although different scholars now acknowledge that vocational knowledge is more than putting bits of theoretical and practical knowledge together, it is still unclear how vocational knowledge should be theorised instead. In this article we theorise the idea of contextualising vocational knowledge to understand the nature of vocational knowledge and illustrate this process of contextualising with empirical examples from culinary education. We adopt an activity-theoretical focus on contextualising that involves both particularising and providing coherence. We posit a cognitive process of meaning making where meaning derives from seeing the relationships of parts to the whole. The aspects of the nature of coherence and the relation between concepts and actions seem rather underdeveloped in vocational education theory. To characterise this process at a micro-level, we enhance the activity-theory approach with an inferentialist one. Inferentialism offers a way to focus on reasons and inferential relations between concepts and actions that provides coherence in vocational knowledge. To characterise the broad spectrum of processes relevant for vocational knowledge, we propose the terms "conceptualising" and "concretising". Conceptualising involves inferring what follows from understanding a

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concept in a particular situation in relation to the meaning of other concepts. Concretising involves inferring what follows from understanding an aspect of the occupational practice in which students are participating. We argue that this way of framing vocational knowledge helps to better understand its nature and development.

Keywords Vocational education · The nature of vocational knowledge · Contextualising vocational knowledge · Inferentialism

Understanding The General Effect Of Sugar In Jam-Making

For the purpose of understanding the nature and development of knowledge in vocational education, it is not very helpful to think in terms of dichotomies such as theory versus practice, general versus specific, formal versus informal, or knowing how versus knowing that (Endedijk and Bronkhorst 2014; Tynjälä 2008, 2012). Many scholars acknowledge that the image of knowledge as something general acquired in education and applied in concrete situations is too simplistic to describe students' vocational knowledge development (Billett 2014; Boersma 2004; Eraut 2003; Lave 1988; Smeby and Vågan 2008). To illustrate why common dichotomies have limited power to help us understand the multifaceted nature and development of vocational knowledge, we present an episode from a cooking class in which culinary knowledge is at stake.

Teacher: Food preservation is to make a product last longer. And why do we do that, Sam? Why did we do this in the earlier days, for example? People used to preserve a lot of food because…?

Sam: Oh yes, to be able to make a lot and eat it whenever we want to, and to increase the shelf life?

Teacher: Yes, OK. In sum, why do we preserve food: to increase the shelf life, and, later in the year, to continue eating. Today, you are going to make and bottle your own strawberry jam. Is this an example of a preservation technique?

Vince: Yes, jam-making is one of the seven food preservation techniques.

Teacher: Go on Vince?

Vince: Well, jam contains high concentrations of sugar, and that draws water out of the food and dehydrates them so sugar acts as a means of preservation.

Teacher: Very good! Vince has paid attention. Thus, sugar acts as a means of preservation, and, furthermore, it helps to develop flavour and texture. Sugar is essential for successful jam-making.

This episode derives from a study on students' vocational knowledge development that is part of our overall research project. Students, in their second and third year in

culinary education of the four-year program at the third qualification level (level 3 of the European Qualification Framework, European Commission, 2008), are enrolled in a 'carousel'-project that consists of theoretical classes, skills lab and occupation-related learning practices (e.g. an on-campus restaurant). This episode during skills lab, which provides students with different kinds of knowledge related to the latest kitchen technology and equipment, is an example of articulating vocational knowledge relevant for cooks. We are not concerned with the nature of the interaction between teachers and future cooks but our focus is on the nature of vocational knowledge. In the episode, the general concept of preservation techniques is linked to its purpose – to increase the shelf life – and concretised in the example of jam-making. The general effect of sugar – dehydration, that can be explained as a concept with roots in the discipline of chemistry – is linked to practical consequences in terms of flavour and texture. Hence, vocational knowledge is more subtle than thinking in common dichotomies; it is not just declarative, explicit, or abstract, but also procedural, implicit, and concrete (de Jong and Ferguson-Hessler 1996; Winch 2013).

Although different scholars now generally acknowledge that vocational knowledge is more than something general or abstract, or something specific or contextual, and knowledge development cannot solely be described as putting together kinds of knowledge acquired at different sites, it is still unclear how vocational knowledge and knowledge development should be theorised instead. Therefore, the purpose of this article is to focus on the nature of vocational knowledge and the process of contextualising in order to have an appropriate theoretical framework. We use this framework in further studies in our overall research project to empirically study contextualising by students, and hence, how students develop vocational knowledge. The theoretical framework of contextualising vocational knowledge that we will present here is informed by our attempts to understand empirical examples of contextualising, in particular by teacher-driven examples because the process of contextualising is most succinctly seen in these explicit examples. Future research needs to spell out these processes in students' vocational knowledge development.

We adopt the idea of contextualising as put forward by Van Oers (1998a, b) from an activity-theoretical perspective. One advantage of contextualising, as we will argue, is that the focus on activities helps avoid the aforementioned dichotomies and the unhelpful view of vocational knowledge and knowledge development as putting bits of theoretical and practical knowledge together. Van Oers distinguishes two processes that are part of contextualising that he calls particularising and providing coherence. These processes involve the cognitive activity of meaning making, where meaning derives from seeing the relationships of parts to the whole rather than being composed of only the parts. What is under-theorised in Van Oers's account is the nature of providing coherence. To this end, we turn to inferentialism, a philosophical semantic theory that Guile (2014) has argued is fruitful in understanding the contextualisation of vocational knowledge.

In the following sections, we first address the nature of knowledge in the vocational domain. Secondly, we use Van Oers's (1998a) activity-theoretical account of contextualisation to ground our choice to examine the contextualisation of vocational knowledge in an attempt to better understand the nature of vocational knowledge and the processes by which it develops. Thirdly, we elaborate on the nature of providing coherence by summarising several inferentialist ideas. Fourthly, we present our

theoretical framework for contextualising vocational knowledge. In the final section, we discuss the implications of the developed framework for vocational education.

The Nature of Knowledge in the Vocational Domain

There is a growing concern about knowledge and knowledge development in vocational education (Young 2008; Guile 2010; Wheelahan 2010; Bathmaker 2013). In several countries, the emphasis has long been on skill rather than knowledge (Bathmaker 2013; Hordern 2014). Scholars in various countries, such as Guile (2010) and Young (2008) in the UK, Muller (2009) in South Africa, Wheelahan (2010) in Australia, and De Bruijn and Bakker (2015) in The Netherlands, have argued for the importance of knowledge, including theoretical knowledge, in vocational education. Although theoretical knowledge is often considered to be inaccessible and disengaging, and hence often avoided in vocational education, these scholars consider theoretical knowledge, both from academic disciplines and "occupationally contextualised disciplinary knowledge" (Wheelahan 2009, p. 23) to be necessary and powerful.

With regard to the nature of knowledge in the vocational domain, Guile (2014) argues vocational knowledge develops during actions in practice. Concrete actions like actually putting sugar in jam gains meaning through the interpretations and uses by people; this example exemplifies a process in which kinds of knowledge and actions can be interrelated. Although kinds of knowledge can be analytically distinguished, we suggest that different kinds of knowledge and actions, (i.e. the appropriate use of concepts in a particular situation) have an inextricable relationship with one another (cf. Billett 2014; Guile 2014). In the opening episode, this inextricable relationship between knowledge and actions is illustrated. For example, in the act of making strawberry jam, the concept of sugar is at stake. Students may experience that, for example, cutting down on the sugar in a jam recipe is asking for failure because the jam could deteriorate. Therefore, descriptions of knowledge in isolated "chunks" are not sufficient for understanding what characterises knowledge in the vocational domain where knowledge and actions are interrelated (cf. de Jong and Ferguson-Hessler 1996; Young and Guile 2003; Smeby and Vågan 2008).

Following from the view that knowledge and actions have an inextricable relationship, students in vocational education need to be introduced to situation-specific conglomerates of different kinds of knowledge because they need to get access to the knowledge that underpins actions in practice. Knowledge is embedded in occupational practices (Wheelahan 2009) and practitioners use disciplinary knowledge (e.g. chemistry, mathematics, biology, et cetera) and transform it into applied disciplinary knowledge or occupationally contextualised disciplinary knowledge as part of their practice (Young 2006). In the opening episode, the student's judgment, that one of the effects of sugar in jam-making is dehydration, and therefore sugar acts as a means of preservation, can be explained by means of concepts from the disciplines of chemistry and biology. An understanding of the chemical processes like an understanding how foods and flavours develop under different conditions and temperatures, is essential for routine cooking. Although students need not to know everything about chemistry and biology, they do need to know aspects of these disciplines relevant for cooking. Hence, students need to have access both to contextually specific knowledge in occupational practices and to wider systems of meaning in which this knowledge is embedded.

In sum, vocational knowledge is the knowledge required for practising a vocation (knowledge displayed in action), or embodied in a vocation (knowledge used and transformed by people, tools, and specific occupational practices). We characterise vocational knowledge as a configuration of all kinds of knowledge required to adequately function as a practitioner in a vocation in which knowledge is embodied in the practises, people, and tools that belong to that vocation (Billett 2006; Schaap et al. 2009; Young and Guile 2003; Eraut 1994, 2004). Having defined our object of study, in the next section we describe what characterises the development of vocational knowledge. We first briefly describe the shift in theories on vocational knowledge development — from transfer to participation to contextualising — in order to introduce our framework for contextualising vocational knowledge.

A Shifting View

In theories on vocational knowledge, the perspective on knowledge as an abstract representation that can be decontextualised from its context of origin and applied in another context (i.e. knowledge-transfer between situations) has been around for more than a century (for historical overviews of transfer research, see Beach 1999; Bransford and Schwartz 1999; Lobato 2006; Tuomi-Gröhn and Engeström 2003). In these theories of transfer, knowledge development is primarily being viewed as a cognitive activity; the focus is on knowledge development "in" or by individuals. Compared to previous theories on transfer, new perspectives on knowledge development shifted the view from the individual learner to the learner as a participant in a cultural community (Vygotsky 1978; Wertsch 1985, 1998). For example, Lave and Wenger (1991) argued that the idea of transfer could be replaced by the idea of participation: all forms of knowing emerge from participating in social practices. They argue that rather than to replicate in a new situation what has been taught elsewhere, people use different resources – conceptual, material, and social – as a way to engage with and evolve forms of occupational practice. Knowledge is situated within communities of practice (i.e., a community of practice is formed by people who engage in a process of collective learning in a shared domain of human endeavour) rather than being something that exists "out there" in books (Lave and Wenger 1991).

In the shift from transfer to participation, the attention paid to knowledge and knowledge development in the vocational domain has been reduced (Guile 2010). Because Lave and Wenger (1991) built their argument about apprenticeship as a model of learning through a focus on traditional rather than modern apprenticeships, the contribution of educational settings in which apprentices develop knowledge is minimised (Gamble 2006; Wheelahan 2010; Young 2000). As a helpful way to restore the attention to vocational knowledge, and to do justice to Lave's insights on knowledge in practice, Guile (2014) proposes to turn to recent Hegelian reading of Vygotsky. Although Vygotsky, like Lave, argued that all forms of knowledge are created through social practices (Derry 2013; Edwards 2010) the crucial difference is that Vygotsky draws attention to knowledge and knowledge development by recognising the ways in which social practices are responsible for generating different kinds of knowledge that are evidenced in the different types of concepts used. Concepts can involve "everyday" and "theoretical" concepts, that is, ideas of what something is or how it works, and Vygotsky emphasises their inextricable relationship (Edwards 2010; Guile 2010). Thus, Guile's interpretation of Vygotsky's

perspective of vocational knowledge is underpinned by a very contextual understanding of the development of knowledge.

In this article, we argue that vocational knowledge is the ability to appropriately use and justify the use of concepts. Vocational knowledge is evidenced by the use of different concepts, and therefore, someone has knowledge of a subject if she or he has mastery over related concepts. We propose the development of vocational knowledge consists in the growing understanding of the uses of different concepts. Van Oers (1998a) reinterpreted Vygotsky's (1987) idea about the relationship among concepts, learning, and action in his theory of contextualising knowledge that provides a helpful way to characterise students' vocational knowledge development. Van Oers described that to use a concept in a new and different context means to use that concept in a different manner. We might, for example, use a knife in the kitchen to chop onions or use it to rob a bank. By using it differently, our perspective on that concept changes, as well as the meaning of the concept, which is consequently redesigned to better fit its purpose in the new context. Hence, to focus on the nature of vocational knowledge as a process of contextualising suggests that we study the functions of context, notably particularisation and providing coherence, in terms of the dynamical features of activity systems and the embedded process of the emergence of meanings (Van Oers 1998a).

Particularisation of meaning in Van Oers's theory is the cognitive process of meaning making, and providing coherence is deriving meaning from seeing the relationships of parts to the whole rather than being left with only the parts. To illustrate this, we return to the cooking example. When a student appropriates the concept of ratio in the context of a meaningful activity of jam-making, the concept of ratio will probably be linked to other meaningful concepts, such as units of measurement, quantities, proportion, flavour, texture, consistency, et cetera. The student then needs to tie different concepts and actions together, as a result of which the concept of ratio will be more than just a formula that is used in a particular situation (particularisation or meaning making). Context making prevents the particularised meaning of ratio from being isolated as it brings about coherence with a larger whole (providing coherence).

Van Oers's (1998a) idea of contextualising promises to be useful in the vocational context, but in his argumentation the aspects of the nature of coherence and the relation between concepts and actions are rather underdeveloped. Therefore, we propose to enhance his theory to gain a deeper understanding of what characterises the process of contextualising vocational knowledge. We found a promising theoretical framework in inferentialism. To describe in more detail the micro-level process of contextualising vocational knowledge we consider the way in which the philosopher Brandom (1994) uses the ideas of "inference" and "webs of reasons" to be useful. In the next section, we introduce these philosophical ideas so we can present our framework for contextualising vocational knowledge, in particular what it means to provide coherence.

An Inferentialist Approach Towards Vocational Knowledge

Inferentialism is a philosophical theory of meaning that allows us to analyse what it means to make judgements and take action (i.e. the appropriate use of concepts in a particular situation) in close relation to each other. For Brandom, judgements and actions are the minimal units for which human beings are responsible:

One of [Kant's] cardinal innovations is the claim that the fundamental unit of awareness or cognition, the minimum graspable, is the judgment. Judgments are fundamental, since they are the minimal unit one can take *responsibility* for on the cognitive side, just as actions are the corresponding unit of responsibility on the practical side.... Applying a concept is to be understood in terms of making a claim or expressing a belief. The concept *concept* is not intelligible apart from the possibility of such application in judging. (Brandom 2000, pp. 159–160, emphases in the original).

Inferentialism provides us a language and theory of how coherence is established between different concepts, and also between concepts and actions. Thus, rather than focusing on analytic distinctions between kinds of knowledge or different concepts involved in vocational knowledge, inferentialism offers a way to focus on reasons and inferential relations between judgements and actions.

Reasons are relational: a judgement can be a reason for an action or another judgement, and an action can be the reason for a judgement or another action. For example, the judgement that sugar helps to preserve jam is one of the reasons to use sugar when making jam. Why sugar helps to preserve jam can be explained with knowledge from several disciplines such as chemistry and biology. Why we want to preserve jam is connected to practical reasons: to increase the shelf life of jam so we can eat it later in the year, but also to make it taste and look good. The vocational knowledge centred around jam-making is thus the ability to make the appropriate inferences: to use concepts appropriately and to justify the use of them. This involves responsiveness to the various reasons involved, which can post hoc be distinguished analytically as predominantly practical or theoretical, but which are in any concrete situation inextricable, or as Guile (2014, p. 6) would put it, "commingled."

One attractive feature of inferentialism is its pragmatist view of knowledge. For Brandom:

> To grasp or understand (…) a concept is to have practical mastery over the inferences it is involved in – to know, in the practical sense of being able to distinguish, what follows from the applicability of a concept, and what it follows from" (Brandom 2000, p. 48).

Hence, as Bakker and Derry (2011) conclude, concepts should be understood in their inferential role. Mastery of the concepts related to jam and jam-making includes mastery of the inferences involving related concepts as far as they are relevant to jam and jam-making (sugar, preservation, shelf life, taste, structure, et cetera.). This way of thinking is in line with Vygotsky (cf. Derry 2008; Edwards 2014) because he sought the psychological equivalent of the concept not in general representations, but in a system of judgments in which the concept is disclosed (Vygotsky 1998).

Concepts are embedded in wider systems of inferences that are part of the vocational knowledge domain. These systems are not abstract systems; they are intricately connected to practical situations. Therefore, vocational knowledge development involves gaining familiarity with these wider sets of inferences and thereby a deeper understanding of the concept in everyday practice (Derry 2008; Edwards 2014). This implies Brandom's inferentialism is holistic: "one cannot have any concepts unless one has many concepts. Thus, the content of each concept is articulated by its inferential relations to other concepts. Concepts, then, must come in packages" (Brandom 2000,

p. 15–16). Bakker and Derry (2011) concluded that when people reason with any concept, they also draw on its inferential relations to other concepts.

Systems of inferences can be thought of as "webs of reasons". Bakker and Derry define these as the conglomerates "of interconnected reasons, premises and implications, causes and effects, motives for action, and utility of tools for particular purposes that have rational impact in a particular context" (2011, p. 10). Thinking in terms of such webs helps us to focus on any reason relevant in a situation, whether an action, or a judgement (or emotion, but we focus here on action and judgement). Although people are not always consciously aware of the webs of reasons in a particular context, these reasons still impact their work. Hence, students need to be inducted into relevant applications of concepts, and thus meanings, through activities with others within a particular practice.

Brandom's inferentialism may come across as rationalistic because of his focus on making things explicit (1994) and articulating reasons (2000). It does not have to be interpreted as such. He considers responsiveness to reasons a feature of human beings. These reasons do not have to be explicitly in a linguistic form, as exhibited by McDowell's (1996, 2013) careful avoidance of an overly rationalistic or mentalistic interpretation of reasons. The ideas of inference and webs of reasons within pragmatist philosophy help us understand the aforementioned issue of coherence in more detail. What creates the coherence among judgements, actions, and emotions, and among knowledge elements of very different natures, are the inferences and webs of reasons involved in knowledge-based actions within a vocation. With these insights, we are now ready to present our framework for contextualising vocational knowledge.

Contextualising Vocational Knowledge: Conceptualising and Concretising

The term "contextualising" may have the connotation of bringing something abstract into context, but in line with Van Oers (1998a). we do not restrict its meaning to concretising alone. Rather, we see bringing any judgement or action into a more conceptual context as a form of contextualising as well. We thus use the term "contextualising" in a broader sense than some readers may be used to. For example, where some authors write about decontextualisation, we prefer to avoid this term. As Van Oers (1998b) notes, this is a non-informative term about what is not going on. Moreover, what is sometimes meant by decontextualisation is in our view a particular form of contextualisation: bringing ideas into a more conceptual disciplinary context. For us, contextualising also incorporates recontextualising. By using the more general term contextualising we aim to avoid the question of what is reconceptualised and how this initially emerged. The advantage of this view is that "contextualising vocational knowledge" thus covers a broad spectrum of commingled processes that seem relevant in using and developing vocational knowledge without falling prey to dichotomisation.

To perceive the nature of vocational knowledge as the process of contextualising vocational knowledge suggests students must learn to recognise contexts and to use concepts appropriately. Furthermore, they also need to learn to relate the general to particular situations, and to different kinds of situations. Since not all knowledge that students need to use emerges from practice, they need the means to move beyond contextually specific applications of knowledge in order to access systems of knowledge and their generative

principles (Young 2007). Students need to be inducted in the webs of reasons at stake in particular contexts to learn the relevant applications of concepts, and thus, meaning.

Our inferentialist perspective on vocational knowledge development suggests contextualising vocational knowledge involves gaining familiarity with wider sets of inferences that are part of the vocational domain. These wider sets of inferences can be pictured as webs of reasons that include any reason relevant in the situation. Vocational knowledge is the ability to make the appropriate inferences relevant to the vocation, that is, to use and justify the use of concepts appropriately. Concepts are embedded in wider systems of inferences that are part of the vocational knowledge domain. Hence, what creates coherence between different concepts, and also between concepts and actions, are the inferences and webs of reasons involved in any knowledge-based action in an occupation.

By unpacking concepts through their inferential relations suggests concepts are not abstract representations but systems of inferences with norms of what counts as valid, situated in occupational practice. Students gradually master more and more appropriate inferences involved in using particular concepts in relation to other concepts, in relation to more and more possible appropriate actions. In the opening episode on dehydration for example, although students do not need to understand all the chemical and biological webs of reasons around the concept, they do need to know in this concrete example that sugar absorbs water with the effect that microbes cannot as easily grow because they need a moistures environment. We propose that it is by learning about more and more inferences that students develop vocational knowledge.

Our framework can be summarised as follows. To characterise the spectrum of processes relevant for contextualising vocational knowledge, we propose the terms "concretising" and "conceptualising". Concretising involves inferring what follows from understanding an aspect of the occupational practice in which students are participating. This involves understanding how to interpret a particular situation and how to transform and use concepts appropriately. The main reason for concretising is to make a general or key concept better understood, to do justice to local circumstances, and, typically, to act. Conceptualising means inferring what follows from understanding a concept in relation to other concepts. This involves understanding what a concept means in a particular situation in relation to the meaning of other concepts. The main reason for conceptualising is to increase the understanding of concepts by inferentially relating them to other concepts. Together the processes of concretising and conceptualising allow students not only to express understanding, ideas, and arguments in accordance with systems of meaning and generative principles, but also to use something in a new way and in a new situation. We argue that for students to make things explicit and articulate reasons is key in the process of learning how to recognise and use vocational knowledge that is required in occupational practice.

To illustrate our theoretical framework of contextualising vocational knowledge, we return to the opening episode of this article. An example of concretising is to mention jam-making as an example of the more general technique of preservation. Another example of concretising in the act of jam-making of gooseberries is understanding that gooseberries, unlike strawberries or raspberries, need to be lightly poached before adding sugar. An example of conceptualising is to explain what sugar does in the preservation technique of jam-making in terms of dehydration, and what happens in chemical and biological terms. A teacher or student may point out that creating a lower pH value and binding available water makes it is more difficult for micro-organisms to develop so that the jam will not deteriorate so fast. Another example of conceptualising is to explain that poaching is a moist-heat

cooking technique to soften the skin of gooseberries. Once the sugar is added, the skin will not soften because of dehydration by means of sugar. The relatively low temperatures used in poaching are particularly suitable for delicate foods like gooseberries because gooseberries might easily fall apart.

What makes different concepts and actions cohere are the inferential relations between them (i.e. why something is done and why this fits the purpose). To emphasise that we consider contextualisation to be a spectrum spanning both conceptualising and concretising, we note that it is not always clear whether reasons are analytically predominantly theoretical or practical. For example, there is an inferential relation between the action of using a preservation technique and the purpose of increasing jam's shelf life – one is a reason for the other. The action of adding sugar not only increases the jam's shelf life, but also has – as an additional reason – the purpose of improving the flavour and texture of the jam. One could justifiably argue that increasing shelf-life and improving flavour and texture are practical reasons. However, shelf-life, flavour, and texture are also general concepts with a much wider scope than jam-making. Thus, increasing shelf-life can be done in different ways for different foods (e.g., pickling little cucumbers or smoking salmon). When focusing on these concepts more generally, the orientation is predominantly on understanding rather than immediate action.

A second illustration of our theoretical framework can be found in the next empirical example from a cooking class derived from the previously described overall research project on students' vocational knowledge development. The focus, like in the opening example, is on the nature of contextualising, which can be found in the articulations of the teachers as an example of the kind of contextualising process we would like students to engage in. Again, we are not interested in the nature of interaction but in the process of contextualising. How students actually contextualise vocational knowledge is object of another, empirical study. In this example, the teacher presents students with knowledge tailored to concrete situations.

Teacher: Think of salmon, salmon swim in a given season. Then you have a lot of salmon, a salmon abundance. The salmon is caught and preserved. And then we are able to …? At times when there is no salmon? To eat it. Another simple example is our pickle. Because a pickle is a preserved something, right? What was a pickle before?

…Silence…

A little cucumber. And the French name of this little cucumber?

Sam: … chorni…

Teacher: Cornichon. And cornichons, those little pickles, in which season do they grow again? Ben?

Ben: August and September.

Teacher: Yes, then there are lots of small cucumbers and we pickle the little cucumbers. Pickling is a preservation technique, right? We will make a marinade,

an acidic marinade, and we pour that on the cucumbers so we have preserved pickles. And we can eat them all year round. We are doing the same here in school, right? Exactly the same. Today, you are going to make and bottle your own strawberry jam. Is this an example of a preservation technique?

One of the remarkable aspects in this example of the teacher and students' contextualisation of vocational knowledge is the continuous evolution into new types of inferential relations resulting from the continuous stream of questions that the teacher puts forward or encounters. Even though educational scholars may criticize the interaction pattern evident in the episode (i.e. initiate-response-evaluate), it illustrates how the teacher tries to provide coherence in implying inferential relations of preservation techniques, examples of preserved foods, the purpose of preservation, et cetera. The teacher constantly conceptualises and concretises when he illustrates the concept of preservation with reasons why to preserve food, both with concrete examples (e.g., salmon, pickles) and with the purpose of preservation techniques (e.g., increase the shelf-life, eat them all year round).

A Growing Understanding of Vocational Knowlegde and the Process of Contextualising

This article has set out to provide a theorisation of what characterises contextualising vocational knowledge, and to illustrate this framework with examples from culinary education. We have used Van Oers's (1998a, b) activity-theoretical account of contextualisation to examine the contextualisation of vocational knowledge and argued that contextualising for us involves both concretising and conceptualising. Concretising involves inferring what follows from understanding an aspect of the occupational practice in which students are participating. Conceptualising presupposes inferring what follows from understanding a concept in relation to another concept, and understanding what a concept means in a particular situation in relation to other, more general concepts. These two processes may, in some cases, be inextricably connected. What makes the different concepts and actions cohere are the inferential relations between them as part of webs of reasons. In this way, contextualising vocational knowledge leads to a growing understanding of how complex and interdisciplinary bodies of knowledge fit together, and how practitioners can decide what knowledge is relevant for a particular purpose or in a specific situation.

With inferentialism we have tried to offer a precise language to talk about the intrinsic connections between concepts embedded in wider systems of inferences and practical situations. By unpacking concepts through their inferential relations shows that concepts are not abstract representations but systems of inferences with norms of what counts as valid, situated in practices. So students learn to master concepts bit by bit, being able to make more and more appropriate inferences with the accompanying term in relation to other concepts, in relation to more and more actions, et cetera. Hence, this view on the nature of vocational knowledge emphasises the appropriate use of concepts and explains the inferential relations of these concepts in terms of the ability to explain and justify to others the reasons for what you say or do. Although there is potential to broaden the focus to affective issues such as emotion and identity, a

cook may take pride in knowing about the history of potatoes for example, the role of affect was not our primary concern in this article.

Inferentialism as interpreted in this article is compatible with Vygotsky's ideas (Derry 2008) while it has a precise account of the use and content of concepts. It may assist in bridging between the more cognitive approaches on knowledge and concepts on the one hand, and sociocultural approaches on the other. Our inferentialist perspective on the nature of vocational knowledge suggests that any historically developed disciplinary knowledge domain (e.g. mathematics, chemistry, cooking) can be taken seriously while keeping an eye on the practical relevance of vocational knowledge for students (Wheelahan 2010; Young 2008). That is, inferentialism takes the historically developed knowledge seriously as something that students need to appropriate in particular ways so that they are useful in vocational settings and tasks. At the same time, this perspective highlights the webs of reasons of which students need to become aware. These webs include a range of reasons, such as the purpose and relevance of particular actions, techniques, et cetera.

We have avoided the term decontextualizing because a more helpful view is that people can make inferences in which they temporarily ignore contextual information which has no or little influence on the validity of the inference. This does not mean that context is not important or neglected but that it does not influence the validity of inference as in adjusting a recipe, for example, when changing the quantities of ingredients but not the ratios between these quantities. In our case, seemingly simple examples about cooking may involve knowledge about food and food preparation but also from biology, chemistry and mathematics, though not at an abstract level. Where a chemist teacher may focus on elaborating webs of reasons around a scientific phenomenon such as dehydration, a cooking teacher may focus on the unique webs of reasons relevant to preservation techniques. These webs can be considered conglomerates of many different kinds of reasons that we can analytically distinguish as predominantly practical (e.g. to increase shelf life) or theoretical (e.g. that in acidic environments microbes cannot live), and stemming from different disciplines (e.g. biology, chemistry, mathematics).

The reader may object that students or practitioners might not be aware of the reasons they have for doing particular things (cf. Harteis and Billett 2013; Schear 2013). However, as Guile (2014) observes, doctors make conceptually-structured professional (i.e. practical) judgements in context-specific circumstances. These judgements are often implicit or tacit in nature: they occur in the flux of working in a hospital or in general practice without explicit verbalisation. This does not mean, however, that doctors are unable, if pressed, to articulate reasons for their diagnosis and subsequent course of action.

Our theoretical framework and empirical illustrations of contextualising vocational knowledge provide an elaboration of existing theories of contextualising (Van Oers 1998a, b) that we enhanced with inferentialism. We argued that contextualising vocational knowledge leads to a deeper understanding of the inextricable relationship between concepts and actions, and the relevance of vocational knowledge for a particular purpose or in a specific situation. In this article we could only speculate on students' vocational knowledge development, on what it looks like and what it requires from students and curricula. In our overall research project these processes will be

further substantiated with empirical studies on students' knowledge development in culinary education.

Compliance with Ethical Standards

Conflict of Interest   The authors declare that they have no conflict of interest.

Inform Consent   Empirical data were collected with consent of the people video or audio taped.

References

Bakker, A., & Derry, J. (2011). Lessons from inferentialism for statistics education. *Mathematical Thinking and Learning*, *13*(1–2), 5–26. doi:10.1080/10986065.2011.538293.

Bathmaker, A. M. (2013). Defining vocational 'knowledge': stakeholders, purposes and content of vocational education qualifications in England. *Journal of Vocational Education and Training*, *65*(1), 87–107. doi:10.1080/13636820.2012.755210.

Beach, K. (1999). Consequential transitions: a sociocultural expedition beyond transfer in education. *Review of Research in Education*, *24*(1), 104–139.

Billett, S. (2006). Relational interdependence between social and individual agency in working life. *Mind, Culture, and Activity*, *13*(1), 53–69. doi:10.1207/s15327884mca1301_5.

Billett, S. (2014). Integrating learning experiences across tertiary education and practice settings: a socio-personal account. *Educational Research Review*, *12*, 1–13. doi:10.1016/j.edurev.2014.01.002.

Boersma, K. T. (2004). Ontwikkeling van doorlopende leerlijnen van 4 Tot 18 [development of continuous learning from 4 to 18]. *Niche*, *35*(2), 18–21.

Brandom, R. B. (1994). *Making it explicit*. Cambridge, MA: Harvard University Press.

Brandom, R. B. (2000). *Articulating reasons: An introduction to inferentialism*. Cambridge, MA: Harvard University Press.

Bransford, J. D., & Schwartz, D. L. (1999). Rethinking transfer: a simple proposal with multiple implications. In A. Iran-Nejad, & P. D. Pearson (Eds.), *Review of research in education, Vol. 24* (pp. 61–100). Washington, DC: American Educational Research Association.

De Bruijn, E., & Bakker, A. (2015). In E. de Bruijn, S. Billett, J. Onstenk, & L. Nieuwenhuis (Eds). *Enhancing teaching and learning in the Dutch vocational education system*: *reforms enacted*. Springer, Dordrecht, The Netherlands, in press.

de Jong, T., & Ferguson-Hessler, M. (1996). Types and qualities of knowledge. *Educational Psychologist*, *31*(2), 105–113. doi:10.1207/s15326985ep3102_2.

Derry, J. (2008). Abstract rationality in education: from Vygotsky to brandom. *Studies in Philosophy and Education*, *27*(1), 49–62. doi:10.1007/s11217-007-9047-1.

Derry, J. (2013). *Vygotsky and philosophy*. London: Wiley Blackwell.

Edwards, A. (2010). How can Vygotsky and his legacy help us to understand and develop teacher education? In V. Ellis, A. Edwards, & P. Smagorinsky (Eds.), *Cultural-historical perspectives on teacher education and development* (pp. 63–77). London: Routledge.

Edwards, A. (2014). Learning from experience in teaching: a cultural historical critique. In V. Ellis, & J. Orchard (Eds.), *Learning teaching from experience: multiple perspectives, international contexts* (pp. 47–61). London: Bloomsbury.

Endedijk, M. D., & Bronkhorst, L. H. (2014). Students' learning activities within and between the contexts of education and work. *Vocations and Learning*, *7*(3), 289–311. doi:10.1007/s12186-014-9116-x.

Eraut, M. (1994). *Developing professional knowledge and competence*. London: Falmer Press.

Eraut, M. (2003). The many meanings of theory and practice. *Learning in Health and Social Care*, *2*, 61–65. doi:10.1046/j.1473-6861.2003.00045.x.

Eraut, M. (2004). Informal learning in the workplace. *Studies in Continuing Education*, *26*(2), 247–273. doi:10.1080/158037042000225245.

Gamble, J. (2006). Theory and practice in the vocational curriculum. In M. Young, & J. Gamble (Eds.), *Knowledge, curriculum and qualifications for South African further education* (pp. 87–103). Cape Town: HSRC Press.

Guile, D. (2010). The learning challenge of the knowledge economy. Rotterdam, The Netherlands: Sense.

Guile, D. (2014). Professional knowledge and professional practice as continuous recontextualisation. In M. Young, & J. Muller (Eds.), *Knowledge, expertise and the professions* (pp. 78–92). London: Routledge.

Harteis, C., & Billett, S. (2013). Intuitive expertise: theories and empirical evidence. *Educational Research Review, 9*, 145–157. doi:10.1016/j.edurev.2013.02.001.

Hordern, J. (2014). How is vocational knowledge recontextualised? *Journal of Vocational Education and Training, 66*(1), 22–38. doi:10.1080/13636820.2013.867524.

Lave, J. (1988). *Cognition in practice*. Cambridge: Cambridge University Press.

Lave, J., & Wenger, E. (1991). *Situated learning*. Cambridge: Cambridge University Press.

Lobato, J. (2006). Alternative perspectives on the transfer of learning: history, issues, and challenges for future research. *The Journal of the Learning Sciences, 15*(4), 431–449. doi:10.1207/s15327809jls1504_1.

McDowell, J. (1996). *Mind and world* (2nd ed.,). Harvard: Harvard University Press.

McDowell, J. (2013). The myth of the mind as detached. In J. Schear (Ed.), *Mind, reason and being-in-the-world: The McDowell-Dreyfus debate* (pp. 41–58). London: Routledge.

Muller, J. (2009). Forms of knowledge and curriculum coherence. *Journal of Education and Work, 22*, 205–226.

Schaap, H., de Bruijn, E., van der Schaaf, M., & Kirschner, P. A. (2009). Students' personal professional theories in competence-based vocational education: the construction of personal knowledge through internalisation and socialisation. *Journal of Vocational Education and Training, 61*(4), 481–494. doi: 10.1080/13636820903230999.

Schear, J. K. (Ed.) (2013). *Mind, reason, and being-in-the-world: The McDowell-Dreyfus debate*. London: Routledge.

Smeby, J., & Vågan, A. (2008). Recontextualising professional knowledge–newly qualified nurses and physicians. *Journal of Education and Work, 21*(2), 159–173. doi:10.1080/13639080802018014.

Tuomi-Gröhn, T., & Engeström, Y. (2003). Conceptualizing transfer: from standard notions to developmental perspectives. In T. Tuomi-Gröhn, & Y. Engeström (Eds.), *Between school and work: New perspectives on transfer and boundary-crossing* (pp. 19–38). Amsterdam: Pergamon.

Tynjälä, P. (2008). Perspectives into learning at the workplace. *Educational Research Review, 3*(2), 130–154. doi:10.1016/j.edurev.2007.12.001.

Tynjälä, P. (2012). Toward a 3-P model of workplace learning: a literature review. *Vocations and Learning, 6*(1), 11–36. doi:10.1007/s12186-012-9091-z.

Van Oers, B. (1998a). From context to contextualising. *Learning and Instruction, 8*(6), 473–488. doi:10.1016/S0959-4752(98)00031-0.

Van Oers, B. (1998b). The fallacy of decontextualization. *Mind, Culture, and Activity, 5*(2), 135–142. doi:10.1207/s15327884mca0502_7.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Vygotsky, L. S. (1987). Thinking and speech (N. Minick, trans.). In R. W. Rieber, & A. S. Carton (Eds.), *The collected works of L. S. Vygotsky: Vol. 1. Problems of general psychology* (pp. 39–285). New York: Plenum Press.

Vygotsky, L. S. (1998). The Collected Works of L.S. Vygotsky, Volume 5. In R. W. Reiber (Ed.), *Child Psychology*. New York: Plenum Press.

Wertsch, J. V. (1985). *Vygotsky and the social formation of mind*. Cambridge, MA: Harvard University Press.

Wertsch, J. V. (1998). *Mind as action*. Oxford: Oxford University Press.

Wheelahan, L. (2009). The problem with CBT (and why constructivism makes things worse). *Journal of Education and Work, 22*(3), 227–242. doi:10.1080/13639080902957913.

Wheelahan, L. (2010). *Why knowledge matters in curriculum. A social realist argument*. London and New York: Routledge Taylor & Francis Group.

Winch (2013). Education and broad concepts of agency. *Journal of Philosophy of Education, 47*(1), 128–146. doi:10.1111/1467-9752.12006.

Young, M. (2000). Bringing knowledge back in: a curriculum for lifelong learning. In A. Hodgson (Ed.), *Policies and the future of lifelong learning* (pp. 97–110). London: Kogan Page.

Young, M. (2006). Reforming the further education and training curriculum: an international perspective. In M. Young, & J. Gamble (Eds.), *Knowledge, curriculum and qualifications for South African further education* (pp. 46–65). Cape Town, South Africa: HSRC Press.

Young, M. (2007). *Bringing knowledge back in: from social constructivism to social realism in the sociology of education.* London: Routledge.

Young, M. (2008). From constructivism to realism in the sociology of the curriculum. In G. J. Kelly, L. Allen, & J. Green (Eds.), *What counts as knowledge in educational settings*: *disciplinary knowledge*, *assessment*, *and curriculum.* London: SAGE Publications Ltd, doi: 10.3102/0091732X07308969

Young, M., & Guile, D. (2003). *Between School and Work*: *New Perspectives on Transfer and Boundary Crossing.* In T. Tuomi-Gröhn, & Y. Engeström (Eds.), *Transfer and transition in vocational education: Some theoretical considerations* (pp. 63–85). Oxford: Pergamon (Elsevier Science).

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