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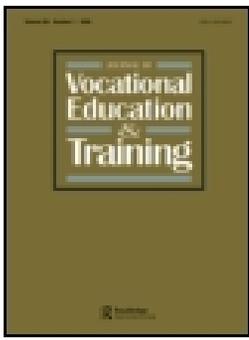
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# Knowing everything from soup to dessert: an exploratory study to describe what characterises students' vocational knowledge

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## ABSTRACT

Students' vocational knowledge can be defined as all knowledge students require performing within occupational practice. In the context of vocational education and training, students' vocational knowledge is often discussed from a perspective of either what should be taught and learned in schools or different kinds of knowledge students should gain in occupational practice. Much less focus is on students' vocational knowledge itself. This exploratory in-depth study aims to describe what characterises students' vocational knowledge. To explore students' vocational knowledge, an analytic framework is used to describe vocational knowledge characteristics specifying: (1) occupation-specific knowledge components, and (2) qualities. Results show the framework provides a structure to gain insight into the nature and meaning of vocational knowledge, and is valuable to describe characteristics in terms of knowledge components such as technical procedures or the social and occupational environment, and qualities such as richness, complexity and specificity. Additionally, to use an existing framework – originally developed in the contexts of ICT and Social Work – its usefulness is explored in a new context, namely, the hospitality industry. Recommendations about the framework serving as a potential tool to support students' learning processes are provided.

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## Introduction

The concept of vocational knowledge is a focus of growing interest to educators, policy makers and scholars in the context of vocational education and training (VET) (Bakker and Akkerman 2014; de Bruijn and Bakker 2017; Schaap et al. 2011; Wheelahan 2015; Winch 2013). Discussions about vocational knowledge in VET are often concerned with what educators intend for students to learn as laid down

in curricula (Wheelahan 2015), or with the differences between school-based learning and workplace-learning (Aprea and Sappa 2015; Bakker and Akkerman 2014; Tynjälä 2013). To date, there has been less focus on students' vocational knowledge itself, specifically on what characterises the vocational knowledge of students, which they require performing within occupational practice (de Jong and Ferguson-Hessler 1996; Eraut 1994; Schaap et al. 2009).

In this article, students' vocational knowledge is perceived with a wide-ranging knowledge definition; it involves conglomerations of all kinds of knowledge required for practising an occupation (Eraut 1994; Heusdens et al. 2016). Vocational knowledge enables students to think and act. It involves different kinds of knowledge which are based on understandings and meanings personal to them. The following episode illustrates the vocational knowledge of a culinary student named Jerry<sup>1</sup>.

The chef de cuisine has just demonstrated the day's menu to his staff and he has assigned the preparation of the sauce for the main course to Jerry: A Huntsman sauce. Jerry prepared this classic homemade currant jelly sauce last week and he remembered it was also called Grand Veneur. Preparing this sauce involves a complicated process, which includes letting the sauce thicken and reduce in the oven.

While Jerry was plating up, the orders were piling up, and Jerry noticed he did not prepare enough sauce. In all the hustle, Jerry decided to add a ready-made Grand Veneur sauce to the home-made one, because his chef expects both exemplary service and customers' orders to be served in time. Jerry was satisfied with his decision because he could serve all orders on time.

Meanwhile, during a routine check of tasting, the chef immediately noticed the home-made sauce had a slightly different taste than usual. The chef called Jerry to account for his actions, and they jointly discussed the consequences of Jerry's decision to add ready-made sauce to the home-made one.

To make meaning of the situation involving the preparation of the sauce, the culinary student Jerry is required to make all kinds of judgements. For instance, Jerry judges he should get started quickly because of the complicated task assigned to him. Since the orders are piling up and the sauce is running low, he decides to add ready-made sauce to the homemade one. Jerry's judgements illustrate what he knows and his vocational knowledge becomes visible. The episode further illustrates how Jerry did not consider every aspect of the situation. Perhaps, he did not know about the new allergy labelling legislation, and therefore, Jerry did not understand the practical application of the food rules and regulations around allergens. Namely, the ingredients of a ready-made sauce might conflict with the ingredients of the homemade sauce mentioned on the menu, and might provoke an allergic reaction to one of the customers with a food allergy.

This article presents a study that is part of a larger research project on students' vocational knowledge. In a previous study, the nature of vocational knowledge and the processes by which students develop vocational knowledge were theorised and explored in the context of Dutch VET in hospitality and culinary education (see Heusdens et al. 2016). The aim of the present study is to capture students'

vocational knowledge and characterise what students know. To gain insight into students' vocational knowledge itself helps to clarify students' use of vocational knowledge during performance in occupational practice. For instance, in the above-mentioned episode, insights into Jerry's use of vocational knowledge during occupational practices helps to understand how Jerry applies knowledge, and whether Jerry connects underlying knowledge or ideas to practice. Hence, insights into students' use of vocational knowledge provides information for teachers and educators about students' learning processes and how these processes can be best supported.

To characterise students' vocational knowledge, an analytic framework developed by Schaap et al. (2011) is used. This framework involves a structure of both occupation-specific knowledge components, to give meaning to students' vocational knowledge, and qualities, to explore features of students' vocational knowledge. The framework was developed to characterise the vocational knowledge of students in the context of contemporary VET, in the occupation-specific fields of ICT and Social Work.

In this article, we aim to characterise students' vocational knowledge in a different context, namely, for the hospitality industry. To use an existing framework in an additional occupation-specific field of practice, more meaning can be given to vocational knowledge and a body of evidence can be build up on what characterises students' vocational knowledge. Furthermore, the transferability of the framework to other occupation-specific fields of practice is explored (Guba 1981; Cohen, Manion, and Morrison 2011).

In the next section, the conceptual framework is presented, followed by the methodology and the results of this study. In the result section, examples from the data to illustrate the occupation-specific knowledge components and qualities are presented to give meaning to students' vocational knowledge relevant to the hospitality industry. This article ends with a discussion of the main findings and directions for future research.

## **Students' vocational knowledge**

In every occupation, students are challenged to deal with a range of different situations, and therefore, they are required to understand both the general context and the specific situation (Eraut 2000). For instance, students should learn to do the right thing at the right time, and they are required to know how to decide what things they should do themselves and what could possibly be left to others. Therefore, they should know about technical processes and procedures, and general rules and regulations of the industry etc. To perform in occupational practice, students require a broad range of relevant vocational knowledge related to different aspects of an occupation. However, before we can describe what characterises students' broad range of vocational knowledge, we should first understand its nature and the processes by which students develop vocational knowledge.

### ***The nature of students' vocational knowledge***

In most sociocultural perspectives on learning, students' vocational knowledge is perceived as the result of a reciprocal process in which students both integrate different kinds of knowledge and participate within communities of social practice (Billett 2014; Bijlsma, Schaap, and de Bruijn 2016; Eraut 2003; Lave and Wenger 1991; Schaap et al. 2009; Tynjälä 2013). However, a rather under theorised aspect in these perspectives is the extent to which knowledge and action are related (Billett 2014; Gamble 2001; Guile 2014). In a previous study, the idea to perceive the nature of vocational knowledge as a process, namely, an ongoing cognitive activity of meaning making was introduced to address the intimate knowledge-action relationships in vocational knowledge (Heusdens et al. 2016). A cognitive activity of meaning making involves a process of making judgements and taking action. Meaning derives from seeing the relationships of parts to the whole, rather than being composed of only the parts (Bakker and Derry 2011; Van Oers 1998).

To perceive the nature of students' vocational knowledge as a cognitive activity of meaning making explains what it means to make judgements (i.e. inferences) and take action (i.e. the appropriate use of concepts in a situation) in close relation to each other (Bakker and Derry 2011; Beckett 2008; Brandom 1994, 2000; Chan 2015; Gherardi 2009; Hager 2000; McDowell 1996, 2013). In this perspective, students' vocational knowledge illustrates a process in which students develop a growing understanding of how complex and interdisciplinary bodies of knowledge fit together, and how they learn to decide what knowledge is relevant for a purpose or a specific situation (Beckett 2004). This means, the process is dialectically related since students' vocational knowledge develops by making judgements and taking action, while simultaneously, students' vocational knowledge enables them to make appropriate judgements or take the appropriate action.

Thinking about the nature of students' vocational knowledge as a reasoning process helps us to focus on any reason a student might give that is relevant in a situation (e.g. an upscale restaurant), whether an action (e.g. cooking), or a judgement (e.g. tasty), or even an emotion (e.g. joy). Students' vocational knowledge is reflected in the judgements they make and the reasons they might give. Therefore, to reveal students' vocational knowledge is, in a figure of speech, to take a 'snapshot' of their reasoning process. To capture students' reasoning process at a moment in time reveals what students know, and thereby, enables us to describe what characterises their vocational knowledge.

### ***A two-dimensional framework to characterise students' vocational knowledge***

Students who are trained to become managers in up-scale restaurants make different meanings to knowledge of, for instance, a target group than culinary students who are trained for the kitchen of a hospital. To give meaning to the

vocational knowledge of individual students, Schaap and colleagues (2011) developed an analytic framework to characterise vocational knowledge of individual students for any domain specific occupational field of practice. The framework involves two general dimensions to distinguish between what students' vocational knowledge is about and the quality of their vocational knowledge (see Table 1).

The first dimension of the framework involves occupation-specific knowledge components. This dimension covers a broad range of relevant knowledge related to different aspects of an occupation (Schaap et al. 2011). It involves six knowledge components: (1) technical processes and procedures (TPP), (2) target group (TG), (3) social environment (SE), (4) organisational structure (OS), (5) occupational environment (OE) and (6) personal development (PD) (see Table 1). The TPP and TG components involve relevant knowledge of operational processes and primary activities (Young and Guile 2003; Schaap et al. 2011). The SE, OS and OE components involve knowledge about more general aspects of the occupation-specific environment (Boreham 2004; Schaap et al. 2011; van den Bogaart et al. 2016), and the PD component involves knowledge necessary for the personal development of a practitioner (Billett 2011).

The second dimension involves qualities to explore students' cognitive elaborateness and the relevance of their vocational knowledge (de Jong and Ferguson-Hessler 1996). The dimension involves four qualities, namely, concreteness, complexity, richness and specificity. Concreteness, richness and complexity reflect the detailed nature of students' vocational knowledge, and contribute to insights into students' cognitive elaborateness. The quality specificity reveals the relevance of students' vocational knowledge to their occupation-specific field of practice (Schaap et al. 2011). All qualities together indicate the extent to which students can see the relationship of parts to the whole rather than being left with a focus on isolated parts (de Jong and Ferguson-Hessler 1996). Quality is used here as a synonym to feature in a philosophical sense and not as a value judgement (van den Bogaart et al. 2016). For instance, the vocational knowledge of one student might be more complex than that of another student. However, this does not necessarily mean the first student knows more or has 'better' knowledge.

The framework developed by Schaap et al. (2011) has been validated in the occupation-specific fields of ICT (Huijts, de Bruijn, and Schaap 2011), Social Work (Schaap et al. 2011), and more recently, in the context of higher education in teacher education (van den Bogaart et al. 2016). In these studies, the vocational knowledge of individual students was characterised. In this article, vocational knowledge of a group of students is characterised in terms of individual articulations of vocational knowledge. Students' articulations are taken together to indicate what characterises the vocational knowledge of the entire selected group of students.

**Table 1.** A two-dimensional framework to characterise students' vocational knowledge.

| Dimension 1: occupation-specific knowledge components |  |
|---|--|
| Knowledge component                                   | Description  |
| Technical processes and procedures (TPP)              | <i>What and how?</i><br>Knowledge about specific procedures, standardised actions, and/or the use of specific tools or instruments. For instance, knowledge of procedures, standardised actions and tools/instruments.                                       |
| Target group (TG)                                     | <i>Who or what for?</i><br>Knowledge of the target group. For instance, identifying and understanding the group of customers the organisation wants to sell its products and services.   |
| Social environment (SE)                               | <i>With whom?</i><br>Knowledge about the social structures of the organisation such as social relations and positions. For instance, social relations and positions and roles of colleagues.   |
| Organisational structure (OS)                         | <i>Practitioner's position in the organisation.</i><br>Knowledge about the structural and cultural aspects of a business organisation. For instance, duties and responsibilities or knowing where to find relevant information about the organisation.       |
| Occupational environment (OE)                         | <i>The position of the organisation in the industry.</i><br>Knowledge about the environment of the occupation-specific field of practice. For instance, new developments in the occupational environment, rules and regulations of the hospitality industry. |
| Personal development (PD)                             | <i>Practitioner's development</i><br>Knowledge required for the development and learning of the individual practitioner.   |
| Dimension 2: qualities of vocational knowledge        |  |
| Quality   | Description  |
| Richness  | The degree to which students' vocational knowledge is distributed over the six knowledge components.   |
| Concreteness  | The degree to which students' vocational knowledge refer to action which are primarily based on personal experiences in practical situations.  |
| Complexity  | The degree to which students' vocational knowledge involves interconnections between concepts, concepts and action, et cetera.   |
| Specificity   | The degree to which students' vocational knowledge involves occupation-specific terminology (i.e. terms) or jargon.  |

## Method

### *Setting and participants*

This exploratory in-depth study was carried out in a practice-based setting at an institute for hospitality and culinary education (i.e. culinary entrepreneurship) in senior secondary vocational education and training in the Netherlands. The practice-based setting involved a sandwich bar at the on-campus school restaurant which was managed by a group of hospitality and restaurant management students and culinary students. In this setting, students were introduced to future work situations and to a wide variety of aspects of their future vocation with the aim to learn specific vocational knowledge. Therefore, this real-life mini enterprise provided us a great opportunity to interview students and take a snapshot of their vocational knowledge during performance in occupational practice.

The students who participated in this study were aged between 17 and 22. The hospitality and restaurant management students ( $n = 56$ ) were enrolled in a four-year school-based learning route with full-time education in their second and third year at the senior secondary vocational education level (ISCED<sup>2</sup> level IV). They were trained for management roles or entrepreneurship in the hospitality industry. The culinary students ( $n = 72$ ) were in their first and second year of training to become culinary chefs, a three-year programme with full-time education at the senior secondary vocational education level (ISCED<sup>3</sup> level III; de Bruijn and Bakker 2017). They were in training to become kitchen professionals in a wide variety of work settings in the hospitality industry.

For one semester, students managed and promoted the sandwich bar. The hospitality management students rotated in different roles which ranged from general manager of the enterprise, service-manager in the sandwich bar to executive chef in the kitchen. The culinary students were supervised by the management students and were responsible for preparing, cooking and presenting the food. The composition of the group of students varied every week because each student followed a personal educational track.

### *Procedure*

In the second semester of their school year, students were interviewed in the sandwich bar over the course of four months. The interviews were conducted every other week, during one day a week. In this way, a total of eight days of around nine hours of video-recorded interviews were collected. As many articulations as possible were collected from all students present in the sandwich bar at the time of recording and who were willing to participate (i.e. convenience sampling) (see Miles and Huberman 1994; Patton 2002). Students were invited to reflect on their actions at the time of an event or interaction. They were invited to articulate their thinking aloud during performance in occupational practice. This method of 'reflection-in-real-time-action' involves a mixture of knowing and doing described by Schön (1983) as 'theory-in-use'.

With the aim to manage and reduce the amount of data, half of the interviews were selected for data analysis. From the 8 days of recordings, recording days 1, 3, 5 and 7 were selected preventing to solely select interviews in the beginning or at the end of the timeframe (Guba 1981; Patton 1990). A teacher and a researcher (i.e. the first author) conducted the interviews together. This method was selected because the teacher was up-to-date on the current level of students' vocational knowledge and was therefore able to ask in-depth or follow-up questions. While the researcher played the role of 'naïve-other' and asked questions about students' activities which might be all too often implicit or tacit in nature for both student and teacher (cf. knowledge encapsulation, Rikers, Schmidt, and Boshuizen 2000). In this way, the teacher was trained to become more responsive to the implicit and tacit knowledge, and the researcher was inducted into relevant applications of concepts and gained familiarity with the language of the occupation.

### **Analysis**

A coding scheme was developed based on the two-dimensional framework and coding scheme of Schaap et al. (2011). To develop a valid coding scheme, a step-wise procedure was followed (cf. Miles and Huberman 1994). In the first step, the first and second author independently labelled in three rounds, 10% of students' articulations of vocational knowledge with the two dimensions. Exclusively students' articulations were labelled since the interviewers' prompts were not the focus of this study.

After each round adjustments were made. Conjectures and conclusions were jointly discussed by the first two authors, and in cases of doubt, verified by the third author until agreement was reached (Guba 1981). For instance, one of the adjustments involved the exclusion of the quality concreteness. The operationalisation of the quality concreteness was not distinctive enough from the other three qualities. Therefore, in the coding scheme the dimension qualities involves only three qualities, namely, richness, complexity, and specificity.

To distinguish six knowledge components, each of students' articulations of vocational knowledge received one label, namely, one of the six components or the label 'not applicable' (i.e. articulations which did not relate to one of the components or involved yes/no, repetitive or conformation answers, or a feeling or hunch/intuition). The inter-rater agreement (Cohen's Kappa) was determined for the six knowledge components and showed a more than adequate level of agreement ( $K = .81$ ).

To distinguish qualities in students' vocational knowledge, each articulation of students' vocational knowledge received a label for richness, complexity or specificity. Richness was defined as the degree to which students' articulations involve elements of the six knowledge components. For complexity, each articulation received one label with either (1) factual statement or (2) explanation. And for specificity, three categories were developed reflecting the number of

occupation-specific jargon used per articulation. The inter-rater agreement for complexity showed a more than adequate level of agreement ( $K = .80$ ), and for specificity an average level of agreement ( $K = .68$ ).

Regarding complexity, factual statements involve basic descriptions or information statements. Explanations often address 'know-how' and 'know-why'. A sign of explanation is when students formulate *if-then* constructions or *cause-effect* relationships, or when students use examples or use cause, condition or result signal words such as, because, so that, so, then, therefore, etc. When students' articulations involve explanations, their vocational knowledge is perceived as complex since the ability to explain requires a more complex level of understanding than to merely provide factual statements (Bakker and Akkerman 2014; Stoddart et al. 2000). The frequency and percentage of factual statements and explanations were calculated overall, and for each component.

Regarding specificity, the number of jargon used per articulation ranged from 1 to 10+. Specificity was classified into three categories. The first category involved articulations in which 1 or 2 occupational-related terms or examples were articulated. The second category involved articulations that are more specific in which students use 3–5 occupational-related terms or examples. The third category of specificity involves articulations which are the most specific, students used > 5 occupational-related terms or examples. The frequency and percentage for each category of specificity was calculated overall, and specifically, the frequency and percentage for each category for each component was calculated.

## Results

A total of 1397 articulations were collected from four days of recordings. 453 articulations received a label 'not applicable' (e.g. yes and no or confirmative answers). Since our intention is to characterise what students know rather than to analyse interaction patterns, yes/no or confirmation words were not considered in the analysis of the data. A total of 944 students' articulations were labelled for the two dimensions of the framework. In the next section, first the results of the dimension 'knowledge components' are presented, and examples of students' articulations from the data are used to illustrate how the knowledge components can be interpreted for the hospitality industry. Following, the results of the dimension 'qualities' are presented and the qualities complexity and specificity are illustrated with examples from the data.

### ***Dimension 1: occupation-specific knowledge components***

Five of the six knowledge components defined by Schaap et al. (2011) were clearly identified. The Technical Processes and Procedures component (TPP) involves vocational knowledge students articulated related to the operational processes and primary activities of their occupation. This component involves knowledge about

what should be done, how this should be done, and what instruments or tools to use. For instance, a restaurant management student is required to know how to operate the online staffing schedule. In the data examples were found such as: 'I am slicing smoked salmon, this means, slicing it in equal, thin pieces. (...)'. This component further involves knowledge about techniques:

Ok, I am taking the skin of it (a tomato). I just made a shallow X on the bottom and when I put it in boiling water, the skin will come off. And then I put it in here (points at a bowl of ice water), it cools off. Then I can easily peel off the skin.

The Target Group component (TG) involves knowing your customers' preferences and responding to customers' needs. This component involves knowledge about all forms of interaction with a specific targeted group of customers, and knowledge in a more standardised form such as formalised procedures to deal with customers' complex problems. For instance, a restaurant management student is required to know how to handle customers' enquiries and complaints with excellent customer service because the group of customers served expects quality of service and an excellent dining experience. To illustrate, an example from the data is presented: '(...) a lot of people put bacon on it (i.e. a sandwich)'. Or: 'Because people, guests, do not like to wait for a long time. So, especially here, yes then ... Well, people come in here, in a hurry, during their lunchbreak. They just have 5 minutes'. Furthermore, the TG component involves knowing how to create an image of the product you want to sell the targeted group of customers. For instance:

Oh, yes, it has a little to do with product appearance. When I look at this sandwich lying here ... I would think: I am not going to eat that sandwich ...! But when you see something nice, you'll be more likely to eat it. So, that has something to do with, ehm, product appearance.

The Social Environment component (SE) is reflected in articulations involving interactions with colleagues. For instance, a restaurant management student is waving to get his colleague's attention. This is an example of how this student might want his colleagues to interact with one another, and illustrates the social relations in the restaurant. The social environment of each occupation is different and has different sets of rules. Therefore, the SE component involves knowledge of social interaction with colleagues and managers, formal and informal relations, and roles of colleagues or managers inside and/or outside a business organisation. Component SE does not include the target group (see above).

The data for the SE component showed examples such as:

Most of the time, they (i.e. culinary students) ask or let you know, like, for instance, I have never sliced smoked salmon, how do I do that? And sometimes they say they know how to slice smoked salmon, but that's not true. They do not know how to slice smoked salmon. And, yes, well, if they have a problem, they will come to me and then we explain how they have to do it.

Another example: '(...) actually, that is Margaret's job because she is in charge this week, financially. Or 'We just walk into the kitchen and tell them to prepare more.'

The Occupational Structure component (OS) is illustrated with articulations reflecting students' knowledge of their duties and responsibilities. In every occupation, the organisational structure will tend to differ. Therefore, the OS component involves knowledge of your rights, duties and responsibilities, and general work processes, information systems, management and cultural aspects. For instance, one of the duties of a restaurant manager is to be a role model to the staff and develop core restaurant policies and procedures. To illustrate with examples from the data: 'I am labelling products which just came out of the kitchen. This is important so we know when to throw it away. Usually, this is the kitchen staff's responsibility, but I always check whether it has been done'. In this example, the student additionally mentions a procedure. Therefore, this articulation illustrates an overlap with another component, namely, the TPP component. However, this articulation was labelled with the OS component because the student emphasised his responsibilities.

One of the students mentioned when she was managing her staff, she played into each person's individual strengths. The interviewer asked how she knew about each person's strength, for instance, how did she know the strengths of the colleague working next to her? Her response was:

If they look serious, that is one thing. Listen, if someone ..., for instance, if someone is not very serious and more, let's say, playful, then I'd rather have them work behind the bar than in the kitchen. In the sandwich bar, he can look around, move around, a little here and there.

The Occupational Environment component (OE) involves new developments relevant to the occupation-specific field of practice, and about general rules and regulations. For instance, in the hospitality industry, a restaurant management student should know about the new allergy labelling legislation and the consequences of this new law for his practice. The following examples from the data illustrate this component: 'In fish, there is a bacterium that can be transferred onto meat. And that is just not right. (...) Yes, those bacteria can cross. That's why it is called cross-contamination. This means, when bacteria on one product get onto another. It might make you sick'. Another example:

Just the other day we had a visit of someone from food inspection and safety. He told us the sandwiches in the bar can be displayed for a maximum of two hours. Furthermore, we should label them with the time of preparation. The sandwiches in the refrigerator can stay there all day but have to be thrown away at the end of the day.

The Personal Development component (PD) involves the personal development and learning of a student. For instance, a restaurant management student might want to advance his career to managing his own restaurant one day. Therefore, this student must be aware what kind of management style he prefers and in what way he wants to interact with his employees to get the best results. In the data, none of students' articulations could be rightfully attributed to the PD component. Nor did any of the articulations in the category 'not applicable' match the definition of the

PD component as defined by Schaap et al. (2011) distinctively enough. Therefore, illustrations of this component are not provided.

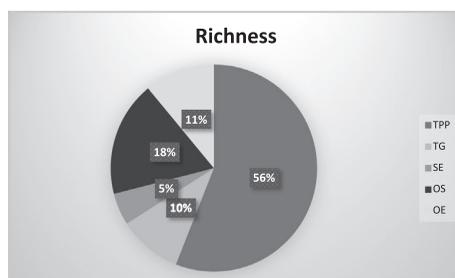
### ***Dimension 2: qualities of vocational knowledge***

Students' articulations of vocational knowledge of the remaining *five* knowledge components were analysed for their richness, complexity and specificity. For richness, the results show students' articulations are distributed over five knowledge components (see Figure 1). Richness does not necessarily mean students are capable to interconnect different knowledge components. For instance, a student could cover three knowledge components and make strong connections between them, or cover all six and interpret them as separate components.

The TPP component is the most identified component (56%), followed by the OS component (18%). The OE component was identified in 11% of the articulations, the TG component in 10% and 5% of students' articulations involved the SE component. Overall, 67% of all articulations involve knowledge required for operational processes and primary activities (i.e. the TPP and TG components), against 33% of the articulations which indicate knowledge of different aspects of the occupation-specific environment (i.e. the SE, OS and OE components).

Overall, the results for complexity show that students' articulations involve factual statements and explanations in almost equal proportions, respectively 51.4% and 48.6%, all five knowledge components taken together (see Table 2). Comparing the two categories of complexity (i.e. factual statements and explanations) per knowledge component, the TG, SE, OS and OE components involve more explanations than factual statements. This means, when students talk about customers, their colleagues, duties and responsibilities, or about new rules and regulations, students tend to explain more than to make factual statements. However, when students talk about technical processes and procedures, they tend to make more factual statements about what they are doing than to explain their actions.

Specificity reflects the relevance of students' vocational knowledge and adds to complexity. It involves the number of occupation-specific terms or detailed elements students use. Occupation-specific terms for the hospitality industry involve



**Figure 1.** The quality Richness.

**Table 2.** The quality complexity.

| Complexity | Factual statements |      | Explanations |      | Total frequency |
|------------|--------------------|------|--------------|------|-----------------|
|            | Frequency          | %    | Frequency    | %    |                 |
| 1 TPP      | 331                | 68.2 | 197          | 42.9 | 528             |
| 2 TG       | 32                 | 6.6  | 68           | 14.8 | 100             |
| 3 SE       | 20                 | 4.1  | 24           | 5.2  | 44              |
| 4 OS       | 65                 | 13.4 | 106          | 23.1 | 171             |
| 5 OE       | 37                 | 7.6  | 64           | 13.9 | 101             |
| Total      | 485                | 100  | 459          | 100  | 944             |

relevant culinary terms, or elaborations and examples about cooking, the use of management jargon etc. All articulations were analysed for the number of occupation-specific terminology (terms) used, regardless of the knowledge component the articulation was classified in.

Overall, the results show most articulations belong to the first category of specificity (56%) (See Table 3). In this category, students use 1–2 occupational-related terms per articulation. To illustrate this result with an example from the data, consider the following: 'I use an office knife'. The second category involves 35.9% of the articulations, in which students use 3–5 occupational-related terms per articulation. 8.1% of the articulations is in the third category in which students use > 5 occupational-related terms when they articulate their vocational knowledge.

The results for the three categories of specificity per knowledge component are presented in Table 4. The most remarkable results are presented here. The TG, OS and OE components have most of the scores in specificity category 2 (i.e. 3–5 occupation-specific terms used per articulation). The TPP component has the highest percentage of scores in the first category of specificity (67.4%). The SE component has an equal percentage in both categories 1 and 2 of specificity. This indicates, when students talk about the social environment they equally use either 1–2 occupational-related terms or 3–5 occupational-related terms per articulation.

## Discussion and ramifications

This article aimed to describe what characterises students' vocational knowledge. In an earlier study, the nature of students' vocational knowledge was conceptualised as an ongoing learning process to do justice to its complex nature and intimate relationship to action. To capture and characterise what students know, the present study introduced and used the analytic

**Table 3.** The quality specificity overall.

|                            | Frequency     | Percent |
|----------------------------|---------------|---------|
| <i>Specificity overall</i> |               |         |
| Category                   | 1 (1–2 terms) | 56      |
|                            | 2 (3–5 terms) | 35.9    |
|                            | 3 (>5 terms)  | 8.1     |
| Total                      | 944           | 100     |

**Table 4.** The quality specificity per knowledge component.

| Knowledge component        | Category 1 | Category 2 | Category 3 |
|----------------------------|------------|------------|------------|
|                            | (%)        | (%)        | (%)        |
| 1 Technical procedures     | 67.4       | 28.8       | 3.8        |
| 2 Target group             | 41         | 44         | 15         |
| 3 Social environment       | 42.7       | 42.7       | 14.6       |
| 4 Organisational structure | 38.6       | 43.2       | 18.2       |
| 5 Occupational environment | 41.6       | 50.5       | 7.9        |
| Total                      | 100        | 100        | 100        |

framework developed by Schaap et al. (2011), and explored its usefulness to describe vocational knowledge characteristics. The significance of this study for theory is its contribution to theories of learning concerning the nature of students' vocational knowledge, and the development of a theoretical framework to characterise students' vocational knowledge and its intimate relationships to action. The practical relevance lies in the implications of the findings, which may contribute to the development of effective assessment and aligned teaching strategies to enhance students' learning in the context of VET.

### ***Findings about knowledge components and qualities***

The two-dimensional approach to characterise students' vocational knowledge in terms of occupation-specific knowledge components and qualities has proved empirically useful. The findings suggest the framework served its purpose; five knowledge components and three qualities were identified in the data. To analytically distinguish knowledge components and qualities allowed us to make meaningful distinctions in students' articulations, and contributed to insights into the meaning and relevance of their vocational knowledge.

Specifically, the findings about knowledge components and qualities showed to what extent the vocational knowledge of the participating students can be characterised as rich, complex and specific. For instance, the quality richness illustrated how students' articulations were distributed over the five occupation-specific knowledge components, meaning, all knowledge components were identified in students' articulations. However, the results further showed how students' articulations were not equally distributed over the knowledge components; more than half of students' articulations were related to the technical processes and procedures component (TTP).

The results show how the participating students articulated predominantly contextually specific applications of knowledge tied to the context rather than articulating appropriate applications of knowledge from disciplinary systems of meaning. Possibly, a focus on primary activities such as knowledge of taste, ingredients and product appearance, is easier for students to picture and deal with than focusing on the broader context. Furthermore, knowledge of procedures and processes may be the kind of knowledge mostly addressed in practice-based

settings, and this knowledge is applied in – more or less – similar ways in different occupational practices. Aspects such as motivating your team or understanding the implications of a new law for your own practice are harder issues to picture. Furthermore, knowledge about a target group, or the social, organisational, and occupational environment, tend to differ from one place to another. Therefore, such knowledge components involve more abstract concepts and require a higher level of conceptual understanding (Ashley, Schaap, and de Bruijn 2017). In addition, some of the interviewers' questions about specific events or interactions might have invited students to articulate detailed explanations, and be more specific rather than to articulate single statements. For these reasons, we must consider the potential influence of these aspects on the elaborateness of students' answers.

### ***Challenges and directions for future research***

In this article, it was argued the quality concreteness was not distinctive from the three other qualities, and therefore, not included in the data analysis. However, we suggest further exploration is necessary to explore this quality's possible value with the aim to improve the framework. Furthermore, in the data, the personal development component (PD) was difficult to distinguish and no illustrations of this component were presented. The PD component is about knowledge related to the process of becoming a practitioner (see Billett 2011), and student's ability to learn. Therefore, the development of relevant vocational knowledge involved in the knowledge components (i.e. the TPP, TG, SE, OS, OE components) is dependent on students' ability to learn and develop as a practitioner (i.e. the PD component). Possibly, the PD component was difficult to distinguish because of its different nature compared to the other five knowledge components. Further research into the PD component may be worthwhile to explore how this component can better fit its purpose and cohere with the other five components.

The results of this study did not illustrate whether the participating students knew how to differentiate between kinds of knowledge, or how students interconnected knowledge stemming from the five knowledge components, or whether the knowledge components were relevant to them. In retrospect, we question whether the rather reductionist way of analysing the qualities complexity and specificity was the most suitable way to gain insight into students' cognitive elaborateness and relevance of their vocational knowledge. Each articulation was labelled separately, therefore, the results did not illustrate how students might have interconnected concepts with other concepts, or concepts and action. Although characteristics of students' vocational knowledge specifying the three qualities were described and illustrated, further research is necessary to refine these research findings.

Another challenge can be found in the interview technique to invite students to reflect in real-time action by both a teacher and a researcher. We must consider how this interventionist strategy (Bronkhorst et al. 2011) might have invited

students to use less specific jargon language when addressing the researcher than when responding to the teacher's questions. For instance, a student might have articulated his knowledge in a highly specific manner and explain things accurately to the teacher, however, this student may have used lay language out of courtesy when addressing the researcher. Furthermore, in a student-teacher relationship there is always the risk of students trying to get 'the result' the teacher is expecting (van Kan, Ponte, and Verloop 2010), rather than focusing on understanding the process of running a business. This means, although students' articulations can be considered as a valid form of vocational knowledge, we must consider whether the role of the interviewers as interventionists may potentially have influenced the results.

The challenge of the interview technique to invite students to reflect in real-time action was simultaneously its strength. The results showed how the participating students were quite able to explain and justify what they were doing and for what reasons, sometimes even to students own surprise. This technique challenged students to articulate their knowledge to the best of their abilities. Therefore, the results showed how the technique has proven an appropriate method to grasp and reveal students' vocational knowledge with the aim to characterise this kind of knowledge. Furthermore, to purposely invite students to reflect in real-time action has the potential of a promising teaching strategy (see, e.g. de Bruijn 2012). Aligned teaching strategies are necessary to teach students how to access different kinds of knowledge during performance in occupational practice, and how to recognise knowledge in occupational practices. We therefore strongly suggest future research to explore this method as a pedagogic strategy.

A final challenge of the study can be found in the role of affect and intuition. The role of affect and intuition were not take into consideration in the analyses. We acknowledge intuition and notions of hunch and feeling present essential components in performance in occupational practice for many occupations (Harteis and Billett 2013; Harteis, Koch, and Morgenthaler 2008). Therefore, a goal for future research could be to explore the possibilities to introduce intuition as a form of knowledge, and broaden the focus of the framework on the dimension of knowledge components with intuition to fully grasp and understand students' vocational knowledge.

A rather unexpected, but promising finding is the potential use of the structure of knowledge components and qualities to serve as an assessment tool for teachers (van den Bogaart et al. 2016; Schaap et al. 2011). The two-dimensional frame might help teachers to monitor knowledge development at both an individual and group level. Monitoring the development of vocational knowledge in such ways may provide teachers with a tool to enhance students' thinking and integration processes during performance in occupational practice. To monitor knowledge development group wise, enables teachers to emphasise knowledge components during students' training programmes, adapted to their course level and occupation-specific field of practice. Hence, it may be worthwhile for future research to explore the potential of the framework as a tool for teachers and, consequently, adapt the requirements

of teacher training programmes to include learning to conduct group interviews, and to use the results to map students' vocational knowledge.

Additionally, the structure of knowledge components and qualities may serve as a self-assessment tool for students to gain insight into the interconnectedness of complex and interdisciplinary bodies of knowledge, and monitor their development of relevant vocational knowledge to improve their vocational knowledge. Hence, a structure of knowledge components and qualities could enable both teachers and students to gain insight into the extent to which students are capable to express themselves and their ideas in the language of the occupation-specific field of practice, and act according to its norms (Bakker and Derry 2011).

To contribute to the development of an useful instrument to characterise vocational knowledge in terms of a process, we aimed to better understand students' learning processes, and we might have provided information for a potential tool for teachers and educators to monitor students' learning processes, and explore how students' vocational knowledge during performance in occupational practice can be influenced. Although this study has not revealed all aspects of students' vocational knowledge, the exploration itself yields results which other researchers can use to carry insights about students' learning even further in the future. For future research, it would be interesting to explore how the two dimensions of the framework are useful to better understand knowledge-action relationships. All things considered, this study has contributed to insights into the extent of students' vocational knowledge, and possibly, presented a potential tool to determine whether students 'know everything from soup to dessert'.

## Notes

1. This episode derives from a study on students' vocational knowledge development that is part of our overall research project. All names of persons are pseudonyms. When the label 'student(s)' is used, this label is interchangeable with learner(s), candidate(s) or participant(s), both male and female.
2. International Standard Classification of Education, a department of UNESCO.
3. See note 2.

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No potential conflict of interest was reported by the authors.

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