

Vocational knowledge development during teacher-student interactions: exploring vocational conversations

H. Schaap, A. Khaled, M. Faber, N. Bijlsma, E. de Bruijn

Summary Vocational education aims to enhance students' vocational knowledge development. However, which pedagogies enhance such development is not self-evident. This article therefore explores vocational knowledge development during vocational conversations between teachers and students. Vocational knowledge development is viewed here from a cultural-historical stance, referring to its situated and social nature. The study is conducted in senior secondary vocational education in the Netherlands, in the domain of Sport Instruction. Four types of vocational conversations were identified, namely: performance-oriented conversations, concept-informed conversations, problem-based conversations and professional identity conversations. The conversations differ in their meaning, nature and context. Meaning refers to the vocational content of the conversations, nature to the way the conversations are regulated and context to characteristics of the learning environment and practical circumstances. Performance-oriented conversations and problem-based conversations were most frequently observed. Implications of these results are discussed from the perspective of teachers in their role as significant other.

Keywords vocational conversations, vocational knowledge development, teaching activities, student activities, senior secondary vocational education

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1 Introduction

Vocational education aims to qualify students for occupational practices in many countries worldwide, either as part of the education system or as part of the labor system or as a hybrid system of education and work (Billett, 2011; Williams, 2020; Chen et al., 2021). One of the main goals is therefore to enhance students' vocational knowledge development. However, which pedagogies help such development is not self-evident (Lucas, Spencer & Claxton, 2012). For example, due to different education systems (De Bruijn, 2019) and various vocational communities (Schaap, Van der Schaaf & De Bruijn, 2017), pedagogies differ between countries and occupations, which makes it more difficult to better understand practices for enhancing students' vocational knowledge development.

The discourse about pedagogies for students' knowledge development often includes rather simplified dichotomies like connecting theory and practice or putting it differently: enhancing transfer from school-based learning in vocational colleges to workplace learning during internships (Heusdens, Baartman & De Bruijn, 2018; Guile & Unwin, 2020). 'Theory' is perceived to be taught and learned during school-based learning so that students can 'apply' theory into work practices. However, a growing number of curricula in vocational education and training (VET) is strengthening the work-based part by stronger cooperation between school and industry and boundaries between school and work practices become vaguer (Bouw, Zitter & De Bruijn, 2019; Hagar, 2019; Nore, 2015). This means that VET-teachers must enact pedagogies in which they stimulate students to connect, integrate and personalize different types of knowledges (Billett, 2001), which they encounter during their vocational study both at school and at the workplace (Mohamad, Heong, Kiong, Mukhtar & Ahmad, 2019; Vähäsantanen & Hämäläinen, 2019).

Avis (2014) states that VET-teachers stimulate these processes through dialogic forms in which they question and interrogate students for deeper vocational understanding of experiences in everyday life and of disciplinary knowledge. However, this is only confirmed in a few empirical studies about dialogical pedagogies in VET (Kilbrink, Asplund & Asghari, 2020). Rather, research on conversations between VET-teachers and students tend to focus more on self-regulated learning, motivation or career choices (Cents-Boonstra et al., 2020; Mittendorff, Den Brok & Beijgaard, 2010). Students highly value direct conversations with their teachers, when they can talk for instance about future career plans, their strengths and study orientation (Ryökkynen, Pirttimaa & Kontu, 2020). Therefore, this article aims to explore vocational conversations between vocational teachers and students, to gain insight into pedagogies used in vocational education to enhance vocational knowledge development. Although VET is a substantial part of the educational system worldwide, vocational pedagogics and has suffered from a lack of scientific attention (Lucas, Spencer, & Claxton, 2012). Explorative studies show that vocational knowledge

is articulated during interactions between students and teachers, for example between specific vocational actions during welding (Asblund & Kilbrink, 2018) or during practical lessons when fixing cars (Saint-Georges & Fillietaz, 2008). Among others, Kilbrink et al. (2022) postulate that there is ample evidence for the content and nature of specific interactions between students and teachers in vocational education and that more studies are needed how students develop vocational knowledge during such interactions. The present study is situated in Dutch senior secondary VET, in the domain of Sport Instruction. Below, we present our theoretical framework, by elaborating on vocational knowledge development as dialogical activity, using a cultural-historical stance. Such a stance assumes that vocational knowledge development is a cultural, situational and social process in which learners are active members of avocational community of practice (Vygotsky, 1978). Schaap, Van der Schaaf, De Bruijn & Kirschner (2009) refer to this process of becoming a member of a vocational community of practice as internalization and socialization, further elaborated as meaning- and sense-making during which individuals develop meaning and make sense of social practices (Bijlsma, Schaap & De Bruijn, 2016).

2 Theoretical framework

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This article uses a cultural-historical stance towards vocational knowledge development, referring to how vocational knowledge develops, namely via continuous participation in interpersonal interactions that are embedded in social practices (Billett, 2001; Guile, 2019; Heusdens et al., 2018; Matusov, 2009;). Van Oers (2009) suggests the creation of polylogue: discussing multiple, sometimes conflicting, historically, culturally and socially important voices of the vocational community of practice. Students develop their vocational knowledge through participation in such dialogic activities (Vygotsky, 1978) during which they learn the written and unwritten rules, tacit and explicit knowledge and the values and beliefs as practiced by vocational community of practice (Schaap et al., 2009). At the same time, students must develop their own voice in relation to this community, asking themselves, for example, “What kind of Sport Instructor do I want to be?” (Billett, 2011; De Bruijn, 2019). From a cultural-historical stance these processes of learning to understand a vocational community of practice and developing an own voice are defined as processes of meaning- and sense-making (Colley, James, Tedder & Diment, 2003; Bijlsma et al., 2016). In this article, these reciprocal dialogues are being referred to as vocational conversations.

Vocational conversations are small-scale verbal and direct conversations of teachers and students in work-related contexts, who both personally and collaboratively negotiate meaning directly related to the vocational community of practice (Schaap et al., 2017). Verbal conversations are explications and

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articulations of thoughts of both students (Bijlsma et al., 2016) and teachers (De Vos et al., 2019) when they directly interact with each other (Schaap et al., 2011). During such vocational conversations teachers guide students in their process of meaning- and sense-making (Billett, 2014), by for example helping them to verbalize concepts, pose challenging questions, provide students with suggestions and hints when necessary, responding to students' ideas and giving feedback (De Bruijn, Overmaat, Glaudé, Heemskerk, Leeman, Roeleveld & Van de Venne, 2005; Hoek & Gravemeijer, 2011).

Conversations here do not refer to formal meetings, with a supervisor and with a vast script, nor to career conversations (Mittendorff et al., 2010) or vocational training dialogues (Winters, Meijers, Kuijpers & Baert, 2009), since such conversations are aimed to coach students in their vocational orientations (e.g., including feedback, positive encouragements and practical tips for learning). Vocational conversations here are focused on shared meaning making and personal vocational knowledge development from a vocational frame of reference and as such embedded in vocational practice. They indeed refer to dynamic and context-specific small-scale dialogues which could take place within such more formal or informal contexts. In vocational education (Christidis, & Lindberg, 2019; Edwards, 2005) and beyond (Kuh & Su, 2001; Uden, Ritzen, & Pieters, 2014; Wubbels & Brekelmans, 2005), that frequent and meaningful conversations between teachers and students promote vocational knowledge development, student engagement as well as social and personal development (Bourdieu 1998; Lave & Wenger, 1991).

It is assumed that vocational conversations are present in learning situations during an internship as part of the workplace curriculum (Bouw, Zitter & De Bruijn, 2018; 2021). However, vocational conversations might also be present in VET-settings that include elements of the particular vocation, for instance the assignment or the interaction with an educator from practice. At the same time, they could serve as a safe space for practising (Gulikers et al., 2008). Vocational conversations could thus occur independent from the physical setting (i.e., in an internship or in a workshop within the vocational college). They include a variety of learning activities (such as conceptualization and contextualization, Bijlsma et al., 2016; Heusdens et al., 2018), foster crossing boundaries (between school and work, between different learning situations) and foster students to grow into a vocational community of practice (such as working together with all kinds of teachers and peers, Kyndt, Beusaert & Zitter, 2021).

In such learning situations, teachers are expert-participants as representatives of a vocational community of practice, and students are seen as novices who need to engage with the collective knowledge, norms and values of that vocational community of practice (Schaap et al., 2009). Aarkrog (2005), for example, recommends teachers to introduce students in vocational communities of practice and to negotiate meaning (Schaap et al., 2017). In

these processes of meaning making the teachers can act as representatives of the vocational community of practice and be the significant other (Edwards, 2005) by introducing students into concepts, values and beliefs, as they are embedded in the vocational community of practice, for example of Nurses, ICT specialists and Social Workers (Mortimer & Scott, 2005). It is also the teachers' role to demonstrate how to address different voices (e.g., of costumers, clients, supervisors, direct colleagues) and to develop responsible replies to them without expectations of agreement or emerging consensus (Matusov, 2011). As such, they can enhance student's articulation of their vocational knowledge (Beryand, 2009; Matusov, 2009), also in a role as peer, by engaging in a collaborative process of problem-solving (Khaled et al., 2021). Filliettaz, Saint-Georges and Duc (2010) and Filliettaz, Durand, and Trébert (2015) propose that vocational pedagogies, such as guidance by teachers, are interactional accomplishments because guidance is a social, cognitive and semiotic process that is mediated through the ongoing performance of verbal and nonverbal interactions between students and teachers (Tynjälä, 2008; 2013).

Following the cultural-historical stance, knowledge is social and situational in nature, as opposite to viewpoints in which knowledge is for example seen as feature of an individual or when it is seen as single, separated chunks that can be learned separately (Christidis, & Lindberg, 2019; Van Schaik, Van Oers, & Terwel, 2011). Different studies, like Aarkrog (2005), Schaap et al. (2017), Heusdens et al. (2018), Bijlsma et al. (2016), all show the dialogical nature of vocational knowledge development, and show that both teachers and students actively engage in interactions to gain meaningful insights and understanding (Billett, 2001). Further, knowledge is not only social and situational, but framed from a cultural-historical stance, it is inherently embedded in vocational practices. Types of knowledge could be formal knowledge (specific concepts which are representative for the vocational community of practice, in case of Sport Instruction for example strategic plan, safety rules and ADHD), procedural knowledge (how to perform specific professional activities, for example how to give a clear instruction during fitness activities or how to manage a group of clients properly), work process knowledge (the way how to perform professionally in a formal organization, for example adjusting to the culture in a fitness centre or camping, but also how to deal adequately with principals or sponsors) and vocational identity knowledge (knowledge about vocational development and lifelong learning, both formally, non-formally and informally, for example how to become a more experienced Sport Instructor or even manager, c.f., De Jong & Ferguson-Hessler, 1996; Stevenson, 2001).

Vocational conversations are small-scale dialogues in which teachers, in their role as significant others, guide students via external 'speech' in their vocational knowledge development. Note that 'teachers' in vocational education are not only or particular teachers with general pedagogical-didactical knowledge and

skills. Teachers are also members of the vocational community of practice for which the students are educated for. Moreover, teacher in vocational education often work (parttime) in a professional organization, besides the vocational college. As such, VET-teachers could vary between different roles, such as expert, coach or instructor, in which they all can represent different types of knowledge (e.g., formal knowledge, work process knowledge, practical knowledge, Barry, 2022). This could indicate that the 'triangle' of student, teacher and workplace could also be represented in learning environments in a school setting (Bouw, Zitter & De Bruijn, 2021). This article studies vocational conversations to gain more insight into how the content (i.e., what are the conversations about, the way how the conversations are related to the vocational community of practice) and nature (i.e., the contribution of both students and teachers, in terms of the activities of both students and teachers to regulate the conversations or how they reflect during such conversations) of such small-scale dialogues. The research questions of this study are: 1) Which types of vocational conversations can be identified in small-scale dialogues in the domain of Sport Instruction? 2) What are the contributions of teachers and students during different types of vocational conversations?

3 Method

Two answer the research questions, an explorative and descriptive qualitative study including direct observations of interactions was used. Observations were used since these include explications of internal thoughts of both students and teachers, as well as processes of negotiation of meaning (Schaap et al., 2017) in which they can reinforce each other or develop new insights (Smith, 2012). To increase the ecological validity this study used observations of real interactions between teachers and students. This study aims to capture situations in which teacher and students talk about relevant concepts and practices of the vocational community of practice they are educated for (i.e., becoming a Sport Instructor). In such situations, teachers and students then meaningfully interact with others, and in such a way develop vocational knowledge (Young & Guile, 2003).

In our study, the vocational college facilitated a fitness centre, in which students as prospective and novice Sport Instructors practicing their instructional behaviour on peers, other students, actors and real customers. Teachers, as supervisors, coach their students before, during and after the practicing, and as such, could stop the learning process ('time out') whenever they want to enhance reflection in- and on action. In other words, this study is about learning for vocational practices albeit in a school setting but in learning situations with elements from the vocational community of practice in roles and assignments (Bouw, Zitter, & De Bruijn, 2021).

3.1 Participants

Participants in this study, both teachers and students, worked and learned in Senior Secondary Vocational Education (SSVE), in the domain of Sport Instruction, in the Netherlands. SSVE is education at level 4 of the European Qualification Framework, which students enter at the age of 16 (De Bruijn, Billett, & Onstenk, 2017).

Nine experienced teachers of a 4-year SSVE programme in the south of the Netherlands participated. The vocational college was part of the professional network of the fifth author. We asked the educational manager from the Department of Social Studies if there were teams of vocational trajectories who would like to participate in this explorative study. The team manager of the domain of Sport Instruction reacted positively and explained that the study program was revised in the previous years (i.e., towards more active participation of their students, increasing their motivation by using more authentic assignments) and he was interested in how teachers work with their students nowadays. He also believed that such a research collaboration could be an interesting way for enhancing a research- and learning culture. He asked his teachers who were interested in participating in this research project and who were willing to give full insight into their own teaching practices.

Ultimately, nine teachers responded positively, who all possess pedagogical-didactical knowledge, teaching experience as well as expertise in the vocation (e.g., work process knowledge, experience as Sport Instructor) for at least two years. 7 out of the nine teachers have about 10-15 years of experience with working as teacher in a vocational college and as professional in the domain of Sport Instruction, of which two of them own a private company for coaching and advice in Sport Instruction. The other two teachers have approximately 5-10 years of such dual experience, of which one works now fulltime in the vocational college (i.e., teacher 3, see Table 1). We asked the teachers for their main domain of expertise. These were: fitness (n=2), outdoor sports (n=1), movement therapy (n=2), sports recreation and tourism (n=2) and sports management (n=2). We were therefore able to expect that teachers possessed pedagogical as well as vocational expertise to enact the role of significant other.

The students involved in this study were in their third year and were between 17-20 years old. Students participating in this research were educated to become Sports Instructor in several contexts, for example in a fitness centre, outdoor sports centre, rehabilitation centre or at a camping. Within this field, instructors (1) guide and support clients or patients during movement activities, (2) organise sports events and/or leisure activities and (3) coordinate sports events they have organised. The students and teachers involved authorised permission to use the observations and transcriptions for research purposes (i.e., all participating teachers and students signed an informed consent form). The teachers and

students we observed participated in interactions about sports recreation and tourism, sport management, outdoor sports, fitness and movement therapy in a school setting but as part of their vocational programme.

3.2 Data collection procedure

The aim of the video observations in this study was to capture vocational conversations, which refers to contexts which are relevant or illustrative for the domain of Sport Instruction (e.g., reflection on a lesson in the sport centre, a conversation with a real client, simulations). We started the data collection with one or two video-taped interaction per teacher for practising purposes. We reflected with the teachers on the first experience with such filming, since the researchers was more present (i.e., walking around with the camera). Those observations were excluded from the final data set, since they were only used for training purposes.

All teacher-student conversations were videorecorder by one researcher (i.e., the fourth author) with minimal instruction beforehand (Frey, 2018). The teachers and students were also asked to act as they would normally do without the presence of a camera. Teachers and students explicated that they were used to the presence of camera's during their educational activities, since the vocational college uses that as means for professional development. The fourth author videotaped nine experienced vocational teachers during various vocational education practices resulting in an original database including 174 conversations in total.

3.3 Analysis

The total procedure included different consecutive steps, including both inductive and deductive elements. The analyses were performed at two ontological levels, being direct verbal utterances and fragments. Utterances refer here to direct and observable (i.e., explicit) teacher- and student verbal articulations. The main unit of analysis were thus single utterances (i.e., explicated or articulated internal thoughts of both teachers of students) or fragments (i.e., interactions between teachers and students).

Step 1. Preparation. The first three authors each watched 20 fragments independently. During a calibration session, the researchers discussed the conversations and set the inclusion- and exclusion criteria. Taking the explorative purposes of this research into account the inclusion criteria were: 1) there must be direct and verbal interactions between teachers and students (e.g., meetings with direct instruction and theoretical underpinnings, practicing, work processes, skills, simulations), 2) the conversations needs to include at least two turns from both the teacher and the students, and 3) the content

of the interaction is directly related to the vocational community of practice (e.g., refers to vocational problems, dilemma's and activities directly relevant and representative for the domain of Sport Instruction). Fragments were excluded when they contain primarily social talk (e.g., talking about the program in general) or homework- and practical instructions. In addition, fragments that were not understandable, due to for example background noise, were excluded. During a second round, all 174 fragments were equally divided and screened by the first three authors resulting in a selection of 58 fragments for each researcher. In the third round, those 58 fragments were divided by the researchers and accurately screened for a second time. Doubts about inclusion or exclusion were discussed in a calibration session. Eleven fragments were excluded here because it appeared that they indeed were not content related (i.e., related to the domain of Sport Instruction), they often included practical information about administration and organization of internships. In total, 47 fragments were selected, taking 5.44 minutes (SD=4.21) on average.

Step 2. Identifying types of vocational conversations based on knowledge integration. The videotaped fragments (n=47) were analysed based on their content, indicating the meaning of the conversation in terms of the domain of Sport Instruction. Only one fragment appeared to be not exclusively subscribed to one of the four types of vocational conversations, since it was too general in nature (e.g., not specific for the vocational community of practice). This fragment was therefore excluded. A content analysis was used, based on the different identified aims (if explicated by the teacher) and ways of knowledge integration of the different conversations (Hsieh & Shannon, 2005). The first three authors then studied 15 out of the 46 randomly selected fragments in depth by reading and re-reading them independently. We noticed different ways of vocational knowledge integration, namely focussed on connecting practical knowledge to specific vocations actions, combining work-process knowledge with theoretical knowledge and experiences and relating formal knowledge with own experiences. This resulted in a first typification, namely conversations about vocational performances (actions), about vocational concepts (theory-informed) and authentic problem discussions. We subsequently read the remaining 31 fragments independently, searching for different configurations of vocational knowledge. All 46 conversations were noted on a ticket. We used a large table to divide the 46 tickets physically over the three identified aims (i.e., categorization). All tickets could be placed in one of the three aims, but we noticed that the first aim was too general in nature. As a consequence, tickets of different nature were placed in this category. Taking a closer look, we identified two different aims within this category, namely reflecting on one's performance (i.e., in- and on action) and enhancing one's professional identity development. The three researchers agreed to split this aim into two different aims. The analysis ultimately resulted in four types of vocational conversations with each

a different main aim, namely: performance-oriented conversations, concept-informed conversations, problem-based conversations and professional identity conversations. The distribution of the conversations over the nine different teachers is presented in Table 1 below.

Table 1

Distribution of the conversations over the different teachers

Teacher	Performance-oriented	Concept-informed conversations	Problem-based conversations	Professional identity conversations	Total
Teacher 1	1	-	-	3	4
Teacher 2	2	-	-	-	2
Teacher 3	1	-	1	1	3
Teacher 4	-	1	2	-	3
Teacher 5	1	-	12	-	13
Teacher 6	3	3	1	-	7
Teacher 7	8	-	-	1	9
Teacher 8	2	-	1	-	3
Teacher 9	1	-	-	-	1
Total	19	4	17	6	46

The authentic setting of the four conversations is further elaborated in Table 2, the appearance is presented in Table 3.

Table 2

Group composition and settings of the four types of conversations

Type	Aim of the conversation	Group composition	Educational setting
Performance-oriented conversations	Enhancing students' reflection to improve their performance as Sport Instructor.	1 teacher, 6-8 students	Conversations take place during or direct after complex (own) performances in practice (in authentic settings (i.e., on a practice court, in a fitness centre, in an instruction room for gymnastics)). Such conversations take place in smaller groups of students. The conversations were aimed to reflect directly on the performance of one of the students, who performed an authentic task (e.g., giving an instruction for a fitness exercise, or guiding a group of clients during a leisure activity). Students were actively asked to reflect on their own performance and received feedback from the group members. Feedback was informed by pre-structured forms with performance criteria.

Concept-informed conversations	Deepening students' personal knowledge base as Sport Instructor.	1 teacher, 15-20 students	They take place in formal and plenary educational settings in classrooms. The teachers have a central position in the classroom. They used formal presentations (including PowerPoints, short knowledge clips and videos) in an interactive way, they ask students to reflect on the theories presented and to share their workplace experiences. The also shared own experiences and their vision. Students were making notes. Teachers are experts and challenge students to deepen their understanding with concepts.
Problem-based conversations	Preparing students to work together on complex tasks (such as vocational core problems).	1 teacher, 1 stakeholder 2-4 students	Problem-based conversations take place in formal educational settings, often in small groups. Different small groups of students were working on their project plans and where successively asked to get in front of the class to have a conversation with a teacher and a stakeholder (e.g., an expert or sponsor involved), to increase the authenticity of the project or task and to give students information and context which they needed to conduct their project plan.
Professional identity conversations	Enhancing the development of a positive and stable professional identity, by reflecting in the process of becoming a Sport Instructor.	1 teacher, 10-15 students	Professional identity conversations often take place in reflective meetings in small classrooms settings. Teachers guide their students during reflective activities, sometimes prompted by student's workplace experiences (for example a negative experience with a client, a tension with a stakeholder or a different vision with their workplace supervisor) or by reflective questions of students or their teacher (such as: what is for you a good Sport Instructor?).

However, when further looking at the distribution of the remaining 46 fragments, we noticed that more in-depth analysis was needed to reveal differences and similarities between the conversations, but also to reveal the specific nature of each identified conversation. We therefore decided to include additional analysis (on utterance level, see step 4 and further).

Step 3. Identifying knowledge integration in the four conversations. The framework of De Jong and Ferguson-Hessler (1996), further applied by for example Schaap et al. (2009) and Van den Bogaart, Schaap, Hummel and Kirschner (2017) was used to identify the different types of knowledge articulated in the identified conversations. Specifically, the types of knowledge that the teachers and students verbally referred to, since the knowledge base of a vocation is

made up of different types of knowledge (Billett, 2001; Griffiths & Guile, 2003). We were therefore looking for different combinations or integration of different types of knowledge, which were specific for that particular conversation (Heusdens, Baartman, & De Bruijn, 2018). The first three authors formulated qualitative descriptions of the integrated knowledge that was referred to in the conversations, with a specific focus of different combinations of knowledge. In other words, different types of knowledge were not separately addressed, which is likely a threat for the ecological validity of the study. It was found that knowledge was addressed differently across the 46 fragments (Table 3).

Step 4. Conducting coding schemes for coding student and teacher activities. After having identified four types of vocational conversations, we noticed that for further exploring the interactions and activities going on in the conversations, more deeper understanding was needed. We therefore decided to include both student and teacher utterances. Based on theory about processes of vocational knowledge development (Heusdens et al, 2018), a coding scheme with six coding categories of student activities and examples from the domain of Sport Instruction was constructed (Appendix 1). Categories are memorizing, integrating, specifying, relating, articulating and asking. Regarding teaching activities, we are aware that teaching is a combination of cognitions (consisting of knowledge and beliefs; Fillietaz et al., 2015) and actual behaviour (De Bruijn, 2012; Khaled et al., 2021). Just as the student activities, the teaching activities were divided into directly observable spoken behaviours of teachers in the fragments. The coding scheme of teaching activities consists of the codes: 1) explaining, 2) asking, 3) summarizing, 4) telling, and 5) explicating own opinion (Appendix 2).

Step 5. Coding and calculating student and teacher activities. Again, the 46 conversations were equally allocated across the first three researchers, and they coded student and teacher utterances following event-sampling techniques (Cohen, Manion, & Morrison, 2018). The fragments were coded for teaching activities and then for student activities, resulting in frequencies of both teaching activities and student activities per conversation.

Step 6. Selecting and describing exemplary conversations. To further illustrate the four conversation types, the first two researchers each selected at least one exemplary conversation for two conversation types. Thereafter, both researchers discussed whether the selected conversations represent the conversation types adequately. The fifth author checked the representativeness of the selected fragments for the entire dataset.

In all steps, the first three authors were constantly exchanging their experiences and possible difficulties in coding and analysing the data. For example, before starting to code the data for the teacher- and student activities, the first three authors analysed five randomly selected conversations on utterance level. The authors discussed each other's interpretations, analysing

process and findings until consensus on the was reached. The fifth author participated in a final discussion about the coding results. Another example was the search for different ways of knowledge integration for identifying different types of vocational conversations. This discussions between the authors can be considered as intensive form of peer debriefing (Guba, 1981).

4 Results

4.1 Types of vocational conversations

The results show four vocational conversations, which are elaborated in Table 3, which shows that n=46 fragments can be distributed over the four identified types of vocational conversations.

Table 3

Description of four types of vocational conversations, elements of knowledge and settings they occur in

Type	F*	T	D	Integration of vocational knowledge
Performance-oriented conversations	19	8	4.19 (SD=3.56)	A combination of work process knowledge and procedural knowledge is used to conceptualise professional behaviour. It is about 'how' own behaviour (i.e., specific actions during outperforming vocational procedures or protocols) can be improved.
Concept-informed conversations	4	2	6.11 (SD=3.16)	Formal knowledge is used as starting point for the interactions. General examples or personal experiences of the students and teacher are used to illustrate or specify formal theories (i.e., contextualization). It is about 'why' and 'how' things generally work. This latter is an amalgam of work process knowledge and professional knowledge.
Problem-based conversations	17	5	6.32 (SD=4.27)	Work process knowledge and procedural knowledge are used to guide students in performing complex tasks (like organizing projects). It is about 'how' to manage complex tasks prospectively and in a guided meeting. Creativity and regulation by students are important, since no vast solutions are available; students are responsible for outperforming the project.

Professional identity conversations	6	3	7.57 (SD=4.41)	An integration of professional knowledge and work process knowledge is typical for this conversation. It is about 'how' to become a professional and 'how' to deal with tensions and reflect upon them accordingly. Work process knowledge is used to stimulate thinking about one's role as professional sport instructor.
Other	1	1	-	-

* = F (number of fragments), T (number of teachers) and D (Average duration and standard deviation).

Performance-oriented conversations (n=19) and problem-based conversations (n=17) are most frequently identified. Different teachers were involved for the fragments included per type of vocational interaction, which in other words mean that the types of interaction do not depend on specific teachers. Mainly in the problem-based conversations, not only teachers but also different stakeholders were involved (e.g., a manager from a camping or a skating track who would like to organize a large event for different customers like kids and their parents). Professional identity conversations show the highest duration, while Performance-oriented conversations are relatively short. Teacher and student activities during different types of vocational conversations

Table 4

Four types of vocational conversations and teaching activities within

Type	Explaining	Asking	Summarizing	Telling	Explicating
Performance-oriented conversations	24.7%*	28.3%	5.5%	37.8%	3.6%
Concept-informed conversations	21.1%	44.6%	10.3%	16.5%	7.5%
Problem-based conversations	16.6%	41.1%	3.9%	24.3%	12.5%
Professional identity conversations	15.6%	63.5%	2.5%	13.6%	0.8%
Total**	19.5%	44.4%	5.5%	23.1%	6.1%

* Percentage per teacher activity; 100% per type of vocational interaction

** Average percentage, 100% for all types of vocational conversations

Table 4 shows that asking (44.4%) is the most frequently identified teacher activity, followed by telling (23.1%) and explaining (19.5%). Performance-based conversations mainly include explaining (24.7%), asking (28.3%) and telling (37.8%), while the latter is also most frequently observed in problem-based conversations (24.3%). Further, asking is the most frequently used activity during professional identity conversations (63.5%).

Table 5*Description of four types of vocational conversations and student activities within*

Type	Memorizing	Integrating	Specifying	Relating	Articulating	Asking
Performance-oriented conversations	16.9%*	3.5%	40.7%	6.3%	7.7%	11.9%
Concept-informed conversations	12.5%	3.6%	41.2%	8.3%	4.2%	12.5%
Problem-based conversations	6.8%	7.6%	35.2%	0.3%	9.5%	23.4%
Professional identity conversations	6.7%	14.6%	31.1%	2.2%	22.2%	2.9%
Total**	10.75%	7.32%	37.1%	4.3%	12.7%	12.7%

* Percentage per student activity; 100% per type of vocational interaction

** Average percentage, 100% for all types of vocational conversations

Table 5 shows that specifying is the most used student activity in all four vocational conversations (37.1%). On the other hand, relating is relatively few used (4.3%). Taking a closer look to the performance-oriented conversations, besides the specifying activities, memorizing (16.9%) and asking (11.9%) are the most used activities by students. As such, asking is also the most frequently reported student activity in the problem-based student activities (23.4%). In the professional identity conversations, articulating (22.2%) and integrating (14.6%) are the most frequently used activities by students, which seems to be exclusively for this fourth type of vocational interaction.

4.2.1 Performance-oriented conversations

The performance-oriented conversations, one of the two most frequently identified type of conversations, mainly show explaining, asking and telling activities of teachers and specifying, asking and memorizing activities of students. These activities give insight into the general nature of this type of vocational interaction, in which for example teachers coach their students (e.g., by asking students) and therefore offer them different types of knowledge (e.g., communicated via telling and explaining) which they can use in future actions. Consequently, students are likely fostered to process such knowledge via actively asking questions and attempts to make the knowledge more specific or personal.

Illustration of an exemplary fragment. The teacher (Teacher 1) and approximately 12 students are sitting in a circle in the gym. They just simulated and modelled a sports group activity, the teacher acted as the Sport Instructor and the students as the athletics. The teacher evaluates the activity with the students and focuses on his ways of instructing. He starts the conversation ad-

addressing formal and procedural knowledge “Can you tell the different instruction styles during the activity?”. The students guess styles such as focussing on mobility. Apparently, there were two instruction styles, which the students had to differentiate; mobility focussed and socially focussed. The teacher asks students to give examples and ways to act as an instructor: “Can you give me an example? How does it appear that I am personally concerned?” Next, the teacher says that he acted as a “bully”. He explains that this was on purpose to make them feel the effect of a bully instructor style. A student asks: “How does this count for training during swimming classes?” The teacher explains why he thinks you should a bully instructor style in some settings. This latter explanation is marked as an indicator for work process knowledge. This fragment is illustrative for Performance-oriented conversations, since it includes direct professional behaviour, which is practically discussed in a small group setting.

4.2.2 Concept-informed conversations

Within concept-informed conversations, dominant activities are asking by teachers (44.6%) and specifying by students (41.2%), which are not exclusively for this type of interaction: they are for all four types of the most frequently reported activities. One specific characteristic of this conversation is that teachers use summarizing more than in the other three conversations. Further, students use relating more in those concept-informed conversations than in the other three. This could be characteristic for concept-informed conversations, for example that teachers summarize theoretical stances, models, point of views and that students are active in relating such insights to own knowledge or relevant practical experiences during workplace learning.

Illustration of an exemplary fragment. Approximately 15 students are sitting in a U-form in a classroom and the teacher explains (Teacher 6), by using a PowerPoint presentation, what cerebral prelease (CP) and PDD-NOS are and what you need to do as Sport Instructor when you have a participant in your activity with such characteristics. After the explanation, the teacher asks the group: “What do you recognise in your current internship?”. One student talks about his experiences, for example about the importance of direct instructions and safety. The teachers react: “This is indeed important. Often, people with CP or PDD-NOS have lower abilities to concentrate”. Another student explains: “During an activity, we choose that the person with CP could not do some intensive and heavy exercises, due to safety reasons”. The teachers again confirm that safety is important and further explains that people with CP both could over- and underestimate own capabilities. He also uses an example from his private life, his little boy has CP. The students listen to this story and some of the students make some notes. The teachers end this part of the lesson by concluding: “It is important for you as Sport Instructor to keep in mind what CP and PDD-NOS are and what you can and can’t do”. This fragment is labelled as a concept-

based conversation because theoretical concepts (like CP and PDD-NOS) are explained by the teacher and are used to conceptualise own practices.

4.2.3 Problem-based conversations

Problem-based conversations, with Performance-based conversations the most identified type of interaction, mainly consists of asking (41.1%) and telling (24.3%) activities of teachers and specifying (35.2%) and asking (23.4%) activities of students. In comparison with the concept-informed conversations, students are asking more questions. Asking question seems to be the dominant activity during problem-based conversations, as performed by both teachers and students. This could be explained by the context of solving complex problems, which can foster students to clarify what teachers are telling or (indirectly and directly) asking. At the same time, teachers seem to intentionally foster students' critical problem-solving skills by asking critical, reflective and suggestive questions. The problems addressed here are not problems faced during direct conversations, they are often regular and common challenges in the form of an integrative project with a supervisor. As such, students are participants of a project, and this could foster them to apply the input offered by their teacher in their own project.

Illustration of an exemplary fragment. This conversation takes place in a computer room, in which subgroups of 3-4 students have time to work on their projects. The teacher (Teacher 5) acts as supervisor and consults each group for about 5-10 minutes about the progress and ideas of their project. This conversation is with three students who aim to organize a social activity with children for charity purposes: they would like to organize a sponsor-running event. One student starts: "We would like to organize a running event with kids. The kids will seek sponsors and the more rounds they run, the more they earn for their charity organization". The teacher asks several practical questions and ultimately reacts: "I think it is a brilliant idea, but also very ambitious: how do you get enough sponsors? How could you make the children enthusiastic for such an event? What is your plan of communication? Did you already have contact with some sponsors? Maybe you can organize a prize giving?". Another student agreed with the points made by the teacher and explains: "We would also like to organize a closing party, including food, for instance with pancakes". The other student adds: "maybe we can do something with a central theme, for example Christmas?". The first student now reacted more critically: "I think these are all nice ideas, but how can we manage this?". The teacher reacts directly: "You need a sound plan, including your ideas, the communication, a planning, the roles of you three as project leaders, the risks, and the financial part". The teacher looks at the concept plan of the group and notes that it is still very premature and that the group need to work hard to realize such an event on time. This fragment is typified as a problem-based conversation, since the

students are confronted with an ill-structured problem (i.e., organizing a social activity) and have much freedom to make own plans and decisions. The teacher in this fragment uses its expert knowledge to guide and coach the students.

4.2.4 Professional identity conversations

This fourth type of vocational conversations shows some specific features in terms of teacher and student activities, besides the dominant activities asking by teachers (63.5%) and specifying (31.1%) by students (i.e., which are in nearly all four types of conversations the dominant activities). However, almost 64% of the teaching activities include asking reflective questions, which is exceptionally high in comparison to the other three types of vocational conversations. Professional identity conversations also include explaining (15.6%) and telling (13.6%) by teachers and asking (14.6%) and articulating (22.2%) by students. The latter seems to be typical for this type of conversation. Teachers are trying to foster students' reflection on the development of their professional identity, which at the same time foster students to reflect and discuss own performances, actions and decisions. This seems to refer to a type of reflection on professional identity development via a more behavioural approach, referring to students' professional behaviour as stimulus to reflect on who they are and how to act as a professional Sport Instructor as well as on how they want to become as a professional Sport Instructor.

Illustration of an exemplary fragment. This fragment takes place in a classroom with 21 students and a teacher (Teacher 3); the tables are arranged in a U-form. The students had to interview their neighbour and ask what skills from their internship supervisor they are jealous of. The teacher asks: "What is student B jealous of?" Student A: "Making contact with the group". The teacher asks: "And what is your interpretation of this answer?" Student A explains: "I think student B experiences difficulties in making contact with persons and that the supervisor easily makes contact with persons." The teacher verifies this and asks student B: "Do you have an idea why he is easy in contact?" Student B articulates: "Trust, because he is working there for such a long time". The teacher keeps on asking: "Do you have another idea why this supervisor is easy in contact?" "What does the supervisor need to build upon?" Student B specifies: "Many experiences, he has many experiences with clients and situations". The conversation ends with a reflection on why trust and building relationships with clients is important for Sport Instructors and how both students feel that they are competent in this, at this moment. Such a reflection on own feelings and images is representative for professional identity conversations.

5 Conclusions and discussion

5.1 Conclusions

Following a cultural-historical stance on learning, this study aims to add knowledge about pedagogies in VET-practices. We therefore set out an explorative study about the content and nature of vocational conversations including direct and verbal teacher and student interactions during small-scale dialogues.

Exploring almost fifty conversations between teachers and students during vocation-related learning situations in the domain of Sport Instruction led to the identification of four types of vocational conversations: performance-oriented conversations, concept-informed conversations, problem-based conversations and professional identity conversations. Performance-oriented and problem-based conversations were most frequently identified. While performance-oriented conversations have a more feedback and coaching nature primarily aimed at improving specific vocational behaviour (e.g., emphasizing procedural knowledge), concept-informed and problem-based conversations indicate first of all orientation on the complex vocational problems that need to be addressed, from respectively a conceptual and formal view (e.g., how can one explain specific behaviours or what are effective techniques which are known from theories?) or from a situational point of view (e.g., what are the different stakeholders, what is the target group, what are practical circumstances to keep in mind?). Professional identity conversations show more reflections on own (vocational) behaviour and making explicit why students performed vocational related tasks as they did.

It is concluded that vocational conversations, as small-scale dialogues, differ in their meaning, nature and context, but all address vocational knowledge development (Guile & Unwin, 2020; Heusdens et al., 2018). The results show that the four conversations include different configurations of vocational knowledge, but all with the aim to give personal meaning to it. This is for example indicated by the high amount of ‘asking’ as teaching strategy and ‘specifying’ as student activity. Such a combination of strategy and activity implies that teachers intend to activate students thinking, making their personal knowledge explicit, while students try to negotiate meaning by specifying more general insights or feedback into their own knowledge base.

It is also concluded that all conversations relate to elements of vocational practice as educated for, in this particular study in the domain of Sport Instruction. For example, the concept-informed conversations included important concepts representative for the domain. The performance-oriented conversations are directly related to vocational actions or activities (e.g., modelling specific fitness exercises), while problem-oriented conversations are more focussed on constructing plans and policies for activities which one need to prepare as Sport

Instructor (e.g., large events). Professional identity conversations might have a general nature (e.g., literature about reflection is often general in nature), but its manifestation is related to vocational practice since specific ways of becoming a Sport Instructor are central (Colley et al., 2003). Concept-informed conversations are for example more focussed on acquisition in a constructed learning environment, while performance-oriented conversations are more focussed on participation in vocational practices. Problem-based conversations and conversations about one's professional identity development could be typified with an emphasis on participation in a constructed way. As such, this article helps to understand how learning on the boundaries between school and work could be enhanced in a school setting as part of a vocational programme (Bouw, Zitter & De Bruijn, 2021; Griffiths & Guile, 2003).

5.2 Discussion

The identified types of vocational conversations gain more insight into the role of teachers as significant others during small-scale dialogues. For example, from previous studies performed in Finland (Ryökkyne et al., 2020), the Netherlands (Schaap et al., 2017; Van Schaik, Van Oers & Terwel, 2010), Denmark (Aarkrog, 2005), Sweden (Kilbrink et al., 2021), Australia (Billett, 1994) and England (Guile, & Unwin, 2020), we know that teachers often provide knowledge, being an expert in the field, rather than guide their student or invite them to regulate their knowledge development or guiding them towards negotiation of meaning (Smith, 2012). Two of our four vocational conversations (i.e., concept-oriented and problem-based conversations) indeed contain a more teacher- than student centred or regulated approach. Those two other conversations (i.e., performance-oriented and professional identity conversations) seem to be more student-regulated or based on a more equal amount of participation. However, such different contributions of teachers not exclusively mean that students are passive or are not guided. Students seem to be active learners and in all four types of conversations, but in different ways.

The question is then, how can for example vocational teachers as well as students expand their activities used during vocational conversations? Identical to our findings, Kilbrink et al. (2021) postulate that vocational interactions could be more beneficial for student learning when *“involving the student to a higher extent in the interaction, the teacher could create better conditions for a mutual understanding of the object of learning”* (p. 22). They show in Swedish vocational education, in the domain of Plumbing, that not only alternating between whole tasks and parts of tasks and a deep task orientation are beneficial for student learning, but that also the use of a variety of (semiotic) tools can have positive impact. The teachers in our study used a variety of (semiotic) tools (Christidis &

Lindberg, 2019), for example their own speech and body language, technical features like signboards and portfolio's but also a wide range of vocational specific tools and objects (e.g., fitness equipment, safety fuses). It could be worthwhile to increasingly use a variety of tools and to explicitly articulate the value and use of the tools. Moreover, our findings show that students are focussed on only parts of the task (foremost in the performance-oriented and problem-based conversations), without having a clear idea of a whole professional task (e.g., organizing a sport event for pupils) or activity (e.g., explain a fitness exercise to an injured sporter). It could be then beneficial to 'zoom out' and reflect on the whole idea and purpose of the task or activity, closely related to ones (beginning) role as Sport Instructor (Guile & Unwin, 2020). This could change or increase the perception of students, seeing their teachers (both in vocational schools and workplaces) as significant other (cf., De Bruijn, 2019). Being a significant other could for example mean that teacher in all identified conversations, articulate their thoughts, beliefs in a way students can learn the collective knowledge base of the profession as educated for (Schaap et al., 2009).

Another issue is to what extent the four identified types of vocational conversations could enhance pedagogies in VET. Being careful with too generous and straight assumptions, we believe that a variety of vocational conversations could be relevant for enhancing student vocational knowledge development. This is based on the basic idea that the initial educational trajectories should represent the vocational community of practice as educated for (i.e., vocational alignment). Educational developers, managers and teacher leaders could reflect on their current curriculum, for instance, from the perspective of this variety. Another implication could be that educational trajectories in vocational education could enhance vocational identity formation, as a crucial or fundamental view on becoming a full-fledged professional (Colley et al., 2003) who are 'ready' for lifelong learning (De Bruijn et al., 2015). Our results might suggest that conversations about vocational identity formation are subordinate to the other three conversations. Too much attention to more instrumental ways of learning (e.g., a dominant focus on formal knowledge or summative assessment of such knowledge) could distract teachers and students from the process of becoming a professional (e.g., by growing into the vocational community of practice), of identifying oneself with the vocation and to meaningfully reflect in such a process (Chan, 2013). Among others, with identifying vocational conversations this article could add to the long-needed request for more insight into specific pedagogies for VET-practices.

5.3 Limitations and Suggestions for Further Research

This research has several limitations. Although the main aim of this explorative study was to reveal different types of vocational conversations, further research

in different and other VET-contexts is needed to investigate the context-specific nature further in depth. For example, the performance-based conversations all took place during or immediately after real-life practices in for example gyms of the vocational school or outside the school in practice areas. Alternatively, the problem-based conversations all included a formal principal from an organization in the vocational schools' network. This implies that there is a possibility that both personal (e.g., teacher preferences, teacher intentions) as well as situational factors (e.g., assessment program, student learning needs) could affect the frequency and occurrence of the types of conversations and the knowledge development within. For example, Table 1 might suggest that the occurrence of primarily performance-oriented conversations problem-based conversations (i.e., respectively teacher 7 and 5) highly depends on individual teachers. However, without no exception, the learning situations in which the data collection took place were independent from the teachers observed in this study. Putting it differently, it were representative interactions for this program, as shown by many teachers in the entire teacher team. Within our study, we provided more detailed understanding of how teachers use and align their activities to student activities during vocational conversations (i.e., the how). However, while using observations for collecting vocational conversations in situations, this does not make it possible to investigate whether teacher consciously intended to perform or choose for specific teaching activities (i.e., the why, Kilbrink et al., 2021) in a safe learning environment (Ryökkynen et al., 2020).

With the identification of the four different types of vocational conversations, it is now possible to conduct new studies with types of vocational conversations, framed by vocational knowledge development as cultural-historical learning process, for revealing meaningful learning in vocational education. It is also interesting to reveal how the student- and teaching activities of each vocational conversation interact differently in various occupational domains. For example, at least in the domain of Sport Instruction, the variations of the student- and teaching activities were relatively limited, with some specifications. Another possibility is to explore patterns of interaction within the vocational conversations. Patterns could include for example temporal (e.g., how do students and teachers interact during a vocational conversation and how is do the four vocational conversations differ?) but also cumulative elements (e.g., how do students and teacher react on each other, contain vocational conversations more cumulative and meaningful talk and how are objects and tools used to deepen the interaction?).

Another suggestion for further research is to expand the four identified types of conversations to other occupational domains. Our study was situated in the domain of Sport Instruction, which could both have domain specific as general features of the curriculum and vocation as educated for. Following studies like

Schaap et al. (2017) or Rintala and Nokelainen (2020), it can be assumed that vocational identity conversations more frequently occur within more socially oriented vocational trajectories like Nursing or Child Care. On the other hand, it can also be assumed that performance-oriented conversation can occur more frequently in more technical oriented vocational trajectories, like ICT or Business Administration (Schaap et al., 2017). Among others, different scholars show that vocational communities of practice are specific in nature and therefore difficult to compare with each other. In other words, how for example hairdressers, ICT-specialists, cooks, plumbers or social workers develop their vocational knowledge highly differ (Aarkrog, 2005; Bijlsma et al., 2016; Billet, 1994; Bouw, Zitter & De Bruijn, 2021; Heusdens et al., 2018; Kilbrink et al., 2021; Schaap et al., 2017). Besides, it is at least relevant to repeat our study and contextualize the four types of vocational conversations, in other vocational domains or in different years of study. It is worthwhile to include different vocational domains in future studies, and to explore further how the four types of vocational conversations manifest differently (or not). We suggest that the 'grain size' is actually important. The four types of vocational conversations could likely be identified in other domains, but their manifestation (at a micro level) is assumed to be different, since the occupation as educated for is different from the domain of sports (e.g., the knowledge, the culture, the practices, the affordances).

Future research could provide more insights into teacher considerations (e.g., intentions, choices, thoughts) during vocational conversations, and how such considerations are related to their actual teaching activities. One useful method could be stimulated recall interviews with teachers (Lyle, 2003). This is generally known as an introspective method, developed as a substitute of thinking aloud during acting. One can use stimulated recall interviews to reveal teacher beliefs about their activities, related to a specific moment or overarching (De Bruijn, 2012; Khaled et al., 2021). Based on video recordings of teachers during vocational conversations, teachers could be asked to articulate his or her thinking about their activities used. Questions can be for example: Can you explain what is happening here? Why do you use these activities in this situation? And considering the work of Kilbrink et al. (2021) again: what kind of tools did you use to enhance the interaction?

The four identified types of vocational conversations could be used as frame of reference in teacher training programs, to increase awareness of teachers in which teaching activities (e.g., scaffolds) they can use and which student activities they could expect in response. For example, fragments of own lessons could be observed by using the four-conversation framework, to reveal the type of conversation and if this was the original aim of the teacher. It would then be possible to raise teacher awareness of their role of significant other for enhancing students' vocational knowledge.

Korte Verklaring over de Data en Analyses

More detailed information on the coding schemes can be found in the Appendices

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Abstract

Ontwikkeling van beroepskennis via interactie tussen docenten en studenten in het middelbaar beroepsonderwijs: verkenning van beroepsgerichte gesprekken

Het middelbaar beroepsonderwijs heeft als belangrijk doel om beroepsgerichte kennisontwikkeling van studenten te bevorderen. Echter, welke pedagogisch-didactische aanpakken deze ontwikkeling bevorderen is niet evident. Dit artikel presenteert daarom een studie naar kennisontwikkeling binnen beroepsgerichte gesprekken tussen docenten en studenten. Ontwikkeling van beroepskennis wordt benaderd vanuit een cultuur-historisch perspectief, verwijzend naar de situationele en sociale aard van die kennis. De studie is uitgevoerd in het domein van Sport & Bewegen (mbo-niveau 4). Vier typen beroepsgerichte gesprekken werden geïdentificeerd, namelijk handelingsgericht, theorie gestuurd, probleemgestuurd en gesprekken over professionele identiteitsontwikkeling. Een verdere verkenning

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van de vier typen gesprekken laat zien dat ze verschillen in inhoudelijke betekenis (welke aspecten van het beroep worden besproken), de aard (wie de gesprekken reguleerden) en de context waar de gesprekken plaatsvonden (de leeromgeving, maar ook de praktische omstandigheden). De handelingsgerichte- en de probleemgestuurde gesprekken kwamen het vaakst voor. Eén van de implicaties van de studie is dat docenten, in hun rol als significante ander, een belangrijke rol kunnen spelen in de ontwikkeling van beroepskennis binnen deze beroepsgesprekken.

Kernwoorden beroepsgesprekken, kennisontwikkeling, docentstrategieën, studentactiviteiten, middelbaar beroepsonderwijs

Appendices

Appendix 1

Coding schemes for analysing student activities

Student activity	Types of verbal utterances
Memorizing	Summarizing facts, concepts or procedures Reproducing facts, concepts or procedures Recalling facts, concepts or procedures
Integrating	Referring to other subjects Referring to knowledge used in classrooms Referring to experiences during class Referring to personal experiences Relating to another context
Specifying	Observing practices by naming means, products and other artefacts Explaining adequate use of concepts or jargon in a specific but familiar situation Explaining adequate use of concepts or jargon in another of new situation Asking feedback intending to make something more concrete
Relating	Relating concepts (theories, vocational jargon, professional language) to describe situations Explaining own behaviour by using academic and/or occupationally contextualized knowledge Articulating how conceptual principles align with new or other situations
Articulating	Put process of finding solutions into words Asking critical questions by used solutions Formulating alternatives for a solution Explicating other choices
Asking	Asking more clear explanations Asking experts to explicate his/her professional opinion Asking teachers to give feedback in their solution/process Looking actively for feedback concerning specific themes

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Appendix 2

Coding schemes for analysing teaching activities (Heusdens et al., 2018; Khaled et al., 2021).

Teacher activity	Types of verbal utterances
Explicating own opinion	Thinking aloud on problem solving activities Explicating one's own mistakes and improvements Explaining professional processes and procedures Showing how to solve a complex problem Explaining reasons to choose for a specific performance Making own reflections explicit
Telling	Explicating own observations Formulating advice Summarizing core concepts
Explaining	Stimulating to do a task Explaining a task by giving direct instructions Formulating learning goals Offering hints for students Explaining what is crucial for successful performance on a task Structuring tasks for students
Summarizing	Stimulating reflection of students on their process Looking from a distance to the learning process of students Asking students to explicate their progress Stimulating students to show their skills in practice
Asking	Using open questions during conversations Asking students to explicate what they have learned Explicating prior knowledge of students Investigating what students already know about a certain topic Revealing how students would solve a problem Asking students to articulate alternative ways of tackling a problem