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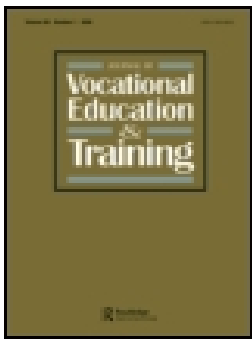
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Supporting productive collaboration in a computer-supported instructional activity: peer-feedback on critical incidents in health care education

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ABSTRACT

One important feature of vocational education is to provide students with solid conceptual knowledge along with substantial practical experience, acquired in school and workplace contexts, respectively. However, the research provided evidence that students do not spontaneously articulate the knowledge acquired in different contexts, and that specific instructional activities have to be designed and introduced. The present study deals with this type of activity conducted in a vocational school for health and social care assistants, which involved the use of collaborative writing about workplace critical incidents. The goal was to identify the patterns of interactions, and specifically the type of peer-feedback that engage students in productive collaboration. Qualitative analyses show that the writing productions could be categorized in four collaboration patterns differing in the level in which students would elaborate on their peers' experience and profit from the peers' suggestions in order to improve their understanding. On this basis, we propose a series of recommendations for implementing effective and instructionally relevant collaborative writing activities in vocational education.

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Vocational education and training; writing; computer-supported collaborative learning; wikis; peer-feedback

Introduction

Initial vocational education paths represent a very popular choice for young people finishing their compulsory schooling in various countries in and outside Europe. Generally, this type of educational path is characterised by the alliance of different learning settings, namely an educational institution (e.g. school, college, and university) and workplace, which aims at providing students with both theoretical knowledge and practical experience. As this paper focuses on the secondary-level vocational education proposed in Switzerland, which targets learners from 16 years of age, we will refer to the educational context as school, which presents students with the ideal way to perform a procedure, while the workplace allows them to observe and practice the procedure in the context, when it is subject to the real constraints met by professionals. Different studies (e.g. Billett 2001; Filliettaz 2010a), however, have highlighted how the connection and integration of the knowledge acquired

in these different learning contexts represents a challenge for apprentices. Filliettaz (2010b), for example, observes how 'transitions from school to work are to some extent far from smooth and unproblematic' (487).

A number of points exemplifying the differences between workplace and school contexts may explain this difficulty. Whereas the workplace requires apprentices to integrate into the workforce, be efficient and perform the required tasks that vary considerably across contexts, schools present students with all the theoretical knowledge necessary for the profession, without knowing whether they will actually experience the corresponding professional procedure (Ludvingsen et al. 2011). In addition, in order to offer students a more complete understanding of their future practice as well as the opportunity for further career advancement, schools include procedures and concepts in their curriculum that are not required for apprentices at the beginning of their working practice. In this sense, students will be taught procedures they will not or will rarely experience in an authentic context. Another issue emerging from the alternation of learning settings is that apprentices of one class will all work in different workplaces and experience a variety of conditions. Therefore, each student has a personal education path, constituted by all experiences encountered in the workplace, which is unique and specific to him/her (Billett 2004). This diversity can represent a challenge for collective school teaching.

Another asset of the inclusion of workplace internships in vocational education is the ability to integrate the social dimension of learning. Though learning is fundamentally defined as the progression of a person's knowledge and behaviour, it always occurs in a social context through interactions with others. This is especially true in workplace situations where apprentices have to perform tasks within a team or a social work organization. Billett (2006), framing the workplace learning theory, explains how the constitution of professional identity is composed of two distinct connotations: the personal and the social. The social engagement of apprentices in the communities of practice changes overtime, as initially they absorb and are absorbed by the 'culture of practice', thanks to which they develop an idea of what constitutes the practice of a given community and make this practice their own (Lave and Wenger 1991).

To sum up, the articulation between school and workplace learning does not occur spontaneously and specific instructional interventions should be organised to strengthen the relationship between these two settings, bringing the 'culture of practice' from the work context to the educational one. To this respect, Tynjälä and colleagues (Tynjälä 2008; Tynjälä and Gijbels 2012) proposed the *Integrative Pedagogy Model*, which reconciles the different types of knowledge acquired through vocational education: practical, conceptual, self-regulative and sociocultural knowledge. They propose the use of mediating activities that bridge different types of knowledge including tutoring/mentoring, discussion, collaborative learning and writing activities, involving both the school and the workplace.

Following this model, this paper presents a study conducted in secondary-level vocational school context involving writing about a critical experience that happened in the workplace and discussing it between peers in written form, before sharing it orally with the whole class. We were specifically interested in identifying what characterized the most productive written interactions between students in order to provide researchers and practitioners with recommendations for conducting such instructional activities.

State of the art

Learning through writing

Writing per se is considered a pedagogically rich activity, which, through the cognitive process mobilised during this task, can elicit the organisation and transformation of previously acquired knowledge (Hayes and Flower 1980; Bereiter and Scardamalia 1987), as well as the creation of new knowledge (Galbraith 1999, 2009). However, the literature shows that writing activities may or may not be conducive to learning, depending on the way they are organised and evaluated (Bangert-Drowns, Hurley, and Wilkinson 2004). Tynjälä, Mason, and Lonka (2001) list a series of conditions under which, in their opinion, writing represents an activity beneficial to learning. Among these conditions, they cite the following: (1) the task should require a conceptual change and the construction of new knowledge; (2) the task should take into account students' previous knowledge and beliefs; (3) the task should encourage students to reflect on their own experiences; (4) students should be encouraged to solve practical problems through theoretical knowledge; and (5) the writing task should be integrated into the school curriculum, and sessions should be organised around the activity, including class discussions and small-group activities.

The five conditions listed above apply perfectly to the context of vocational education, demonstrating that this field is a potentially fertile context in which to implement writing activities. However, while advanced writing activities are extremely popular in higher education, they have so far been implemented less frequently in professional education. Accordingly, the research on writing in vocational education is scarce, regardless of the fact that writing has become a key activity in the majority of workplaces, due to the series of modifications, such as technological change, that have shaped organizations.

Fundamentally, writing is considered an individual activity, and few studies have observed writing as a collaborative task, among them the Integrative Pedagogy Model (Tynjälä 2008; Tynjälä and Gijbels 2012) cited above, in which collaborative writing activities are implemented in the context of professional education to support the integration of workplace and school learning. However, recent developments in technology and Internet connectivity have brought about the emergence of a number of tools supporting the collaborative writing process, thanks to sharing, version tracking and collaborative editing (see Bétrancourt 2007). The potential of computer technology as a means to support collaboration is even considered to be one of the most promising innovations for improving teaching and learning of the past decades (Lehtinen 2003).

Written peer-collaboration

Collaborative writing is a wide concept referring to a range of different activities and implying various types and degrees of collaboration. The writing activity can, for example, be conducted jointly by two or more people, with the objective of the production of a common text, or it can be individually driven, with space for the reviews, editing and feedback of others. Following Witney and Smallbone (2011), who defined collaboration as the co-ordination of efforts to accomplish a common task, we consider activities involving one or a group of people who edit and/or revise a text produced by another person as a collaborative task. This setting represents a particularly interesting form of collaborative writing in vocational

education contexts as it requires first explicating one's own perspective before stepping outside of it in order to consider and embrace the points of view of others.

One of the most typical collaborative writing tasks that begins with individually written texts and can be easily conducted with computer technology is peer-feedback. The use of peer-feedback has the effect of engaging students in a double evaluation because they assess both their peers' work and their own through a reflective process. This requires them to apply criteria to explain their judgements, thereby shifting the control over the feedback process from the teacher to the students. This activity would have the effect of reducing students' need for external feedback (Nicol, Thomson, and Breslin 2014), progressively enabling students to monitor their own learning, allowing them to evaluate the progress of their learning and to regulate its development (Nicol and Macfarlane-Dick 2006; Nicol 2009).

Even though the interaction between learners in this type of activity is sometimes limited, it offers learners the possibility of developing new knowledge and understanding in collaboration with others. For this reason, this type of activity is considered a collaborative learning activity (Shekary and Tahririan 2006; Kollar and Fischer 2010; van Gennip, Segers, and Tillema 2010). Different forms of peer-feedback have been implemented and studied on the basis of the idea that peer exchange can have important beneficial effects on the learning process (Davies 2002). According to Dochy and McDowell (1997), it can also support the development of important skills related to communication, self-evaluation, observation and self-criticism.

Two main types of peer-feedback can be identified in the literature: in peer-comment activities, learners are asked to provide more formative comments on the work of their colleagues, providing them with constructive criticism and suggestions (van der Pol et al. 2008; Gielen et al. 2010). On the other hand, in peer-assessment activities, participants are asked to evaluate and rate each other's performance, providing, therefore, summative feedback (van Gennip, Segers, and Tillema 2010; De Wever et al. 2011; Gielen and De Wever 2012). van der Pol and colleagues (2008) identified two main features associated with the use of peer-comment and peer-assessment: in the first place, learners can receive numerous comments on their work, rather than only one provided by the teacher (Gielen et al. 2010). The activity of peer-commenting is also interesting as it offers two contemporary learning opportunities to participants, since both providing and receiving comments can impact learning outcomes (Tseng and Tsai 2007).

Despite the high level of reliability of peer-feedback, which has emerged from various research studies (Tseng and Tsai 2007; Xiao and Lucking 2008; De Wever et al. 2011), it was observed that learners often have reservations about peer-assessment, as they do not appreciate their work being commented on by a peer, often considering it unfair and questioning the peer's qualification to take on this role (Kaufmann and Schunn 2010). In this sense, learners usually do not consider their colleagues as 'knowledge authorities' (Hanrahan and Isaacs 2001). Teacher feedback, on the other hand, is always accepted as such but may produce misinterpretation and miscommunication in some cases. Interestingly, reservations regarding peer-feedback may encourage students to engage in a process of *mindful reception* of feedback (Bangert-Drowns et al. 1991), pushing them to engage in discussions and to look for confirmation of the comments received in textbooks or other media (Yang, Badger, and Yu 2006). According to van Gennip et al. (2010), learners' initial hostility towards peer-feedback can be caused by insufficient introduction to the process. Students' conception of the activity positively evolves as they gain more experience with this type of assessment (Dochy

and McDowell 1997). In sum, peer feedback may be an effective way to engage students in social interactions that contribute to build a culture of practice bridging workplace and school contexts.

Instructional effectiveness of collaborative learning

Collaborative learning offers opportunities for students to engage in deep learning processes. According to Jermann (2004), in addition to sharing and benefitting from each other's knowledge, learners have to make their thoughts explicit and to argue for their position in order to be understood. However, having students learn together will lead to better learning only if learners engage in 'productive' interactions (Stahl, Koschmann, and Suthers 2006). Collaborative research suggests that one critical determinant of productive interactions, leading to knowledge constructions is the capacity to take into account other learners' perspectives in one's own reasoning, a capacity which is called *transactivity* (Teasley 1997; Weinberger and Fischer 2006). Gielen et al. (2010) identified three characteristics considered particularly important for the effectiveness of peer-feedback: in the first place, the more the feedback is constructive, the higher the impact on performance (for students who initially had a low performance). Additionally, confirming previous research (i.e. Narciss and Huth 2006), the presence of justification of the comments and observations provided also appeared to be an important characteristic of peer-feedback. Finally, accuracy was also revealed as being very important.

Another critical determinant of instructional effectiveness, particularly for collaborative activities, is the adequate scaffolding of the activities in which participants are asked to engage, as collaboration is generally not spontaneous and needs to be guided (Kollar and Fischer 2010; Gielen et al. 2010), particularly when computer support is involved (Dillenbourg and Fischer 2007). Gielen and De Wever (2012) conducted an experimental study with Educational Sciences students to observe the impact of structured peer-feedback on learning. They compared a condition in which no particular instruction was provided for the feedback process with one in which students were provided with a structured form to improve the quality of their feedback. Even though they were not able to observe a significant difference in the learning effect between the two conditions, the results revealed that students who provided and received structured peer-feedback showed a more critical attitude in the feedback process. Moreover, students working in the structured feedback condition had a better perception of the feedback received from others and considered it more profound and detailed.

In the light of the literature reviewed, peer-feedback in the form of peer-commenting seems ideally suited to help students bridge the gap they perceive between school and workplace learning and between what they learn in one workplace compared to existing practices. Following the integrative pedagogy model (Tynjälä 2008), we developed a learning scenario in which students first write individually about a critical situation encountered in the workplace and subsequently share these texts with their colleagues to receive and provide comments and suggestions. In this sense, writing and discussion are used jointly as mediating tools that link practical, conceptual and self-regulative knowledge, thereby allowing students to work collaboratively on individual experiences based on real-life practice. However, merely organising peer-commenting does not guarantee that productive interactions (Stahl, Koschmann, and Suthers 2006) will take place between students. This

research aims to identify the different patterns of interactions emerging in such a collaborative writing scenario, in order to recognize effective ways to scaffold peer-commenting activities, to trigger effective interactions among students, enhance apprentices' participation and induce a real exchange of ideas and shared knowledge construction. The data were collected during a real school activity with students in the health and social care domain. The qualitative analysis of the students' written interactions will be carried out in light of previous research on the key elements associated with effective peer-feedback in order to identify the type of comments and answers that allow for connections between practical and conceptual knowledge.

In the framework of our research, technology affordances represent a fundamental component of our pedagogical scenario, as they constitute the environment and tool that make our design possible, supporting the different steps that constitute it. It is not, however, the central aspect of our research around which our research questions and hypotheses are designed. In this sense, the use of technology won't be analysed and discussed per se, but will be considered as one necessary support to the quality and implementation of the scenario (Depover, Giardina, and Marton, 1998).

Context

The study took a design-based research approach as described by Reeves (2006), which seeks to design reusable instructional interventions that answer the needs of practitioners in the field and provide new results to support the theory. The data discussed in this paper were collected during an experimental instructional intervention co-designed with teachers and implemented in the context of a school for health and social care assistants (Assistant en Soins et Santé Communautaire [ASSC]) in Geneva. ASSC is a relatively new professional role in Switzerland, which combines basic tasks of primary health care, previously performed by nursing auxiliaries (e.g. washing patients, taking care of their environment) with more technical and advanced procedures (e.g. collecting blood samples, replacing catheters). Professionals in this role can operate in different situations and conditions, such as hospitals, retirement homes and homes for disabled people, as well as in patients' residences. This variety of working environment adds up to the difficult task of school to provide apprentices with a full overview of the various working conditions. This change in workforce role in the health care sector is not specific to Switzerland but represents a general evolution of the health care sector in developed countries, inducing organizational, professional and social challenges (see e.g. Spilsbury and Meyer 2001; Nancarrow 2004; Nancarrow and Borthwick 2005).

Taking into account the characteristics of this context, it was particularly important to organize instructional activities that helped the students to articulate workplace and school learning, not only fostering their understanding of specific situations, but also promoting the construction of sociocultural knowledge, together with a feeling of belonging in a new profession.

Method

Participants

The participants were apprentices in the school for health and social care assistants (ASSC) in Geneva. Twenty-one second-year apprentices (17 women and 4 men) between 18 and

31 years old (mean age = 22.24) participated in the activity. This group represents the whole population of second-year apprentices involved in this educational path in the Geneva canton.

Instructional activity and procedure

The writing activity analysed in this article represents the first session of a longer term scenario, over several weeks, that is described in full detail in Ortoleva and Bétrancourt (2015).

The present session was composed of three main phases. Students were first asked to access a computer-supported environment that was created for this purpose using Wikispaces, a wiki Web service allowing for collaborative edition, which was selected for its ease of use and for the possibility of limiting access to the website.

In the first phase of the activity, students were asked to describe, on their personal page created for this purpose on the platform, a critical incident they had encountered in their workplace practice in relation to a specific topic: the relationship with their patients. Teachers selected this topic because they considered the capacity to handle effectively the relationship with patients as a key competence that apprentices needed to acquire during their second year of vocational education. It was specified that the concept of *critical incident* referred to situations that were particularly difficult for or important to the apprentices and made them reflect on their practice. In accordance with the critical incidents technique (Flanagan 1954; Schluter, Seaton, and Chaboyer 2008), students were asked to individually write about these situations following three guiding questions:

- (1) What happened?
- (2) How did you react?
- (3) What were the consequences of this situation?

After this initial task, in the second phase of the activity, the peer-feedback was initiated. Each student had to access the page of two colleagues to provide them with comments and suggestions on their situations. This way, students would read and comment on two situations and receive feedback on their situation from two colleagues. Other prompts were provided in order to guide the peer-feedback:

- (1) Ask questions (King 2007).
- (2) Formulate comments and suggestions on other possible ways to handle the same situation.
- (3) If a similar situation was already encountered, describe it and explain your reaction, otherwise, imagine how you would react to this situation in the future (Kuhn, Shaw, and Felton 1997).

Finally, in the third phase, apprentices were instructed to access their own page and read the comments and questions they received. After answering them, they were asked to explain how they thought they would react to a similar situation the next time it occurred. In order to distinguish the text written in the different moments of the activity, apprentices had to use different colours for each of the phases. This way, each individual page would have the form of an asynchronous written dialogue in which the various interventions were easy to identify.

Table 1. Analysis grid of peer-feedback.

Categories	Feedback type	Specific application
Contextual questions	Questions type	Comprehension (specification) Thought provoking (new info, reasoning, opinion)
Providing knowledge/shared-problem solving	Comments type	General (new info) Explicit evaluation (justified, non-justified)
		Encouragement Provide suggestion
	Suggestion Personal experience	Imagined Lived
	Positive/negative aspects	Consideration of positive aspects Consideration of negative aspects Both
Formal aspects	Structure	Complete, following instructions Partial, elements missing
	Style/formulation	Appropriate for the context Non-appropriate Unclear text

Table 2. Analysis grid of apprentices' conclusion on their own pages.

Categories	Conclusion type	Specific application
Shared problem-solving	Answers to questions	Agreement with comments Disagreement Non-consideration of comments
	Type of response to comments	
Summing-up/discovering solutions	New strategy	Based on suggestions/comments Non-based on suggestions/comments
		Confirmation of previous strategy used
Formal aspects	Structure	Complete, following instructions Partial, elements missing
	Style/formulation	Appropriate for the context Non-appropriate Unclear text

Our interest was precisely in analysing the interactions emerging in this activity. We analysed, therefore, the second and the third phases of the session. The individually written incidents described by apprentices were, in this scenario, considered as the context where the interaction took place.

Developing the coding schemes

In order to evaluate participants' interactions, we reviewed the literature to identify the main aspects determining an effective peer-feedback (phase 2 of the session). Gielen et al. (2010) produced a table summarising the criteria used to define and evaluate 'good' peer-feedback in different studies (Kim 2005; Sluijsmans, Brand-Gruwel, and van Merriënboer 2002; Prins, Sluijsmans, and Kirschner 2006; Gielen et al. 2010). In addition, we included a few studies that considered variables appropriate to our research (van den Berg, Admiraal, and Pilot 2006; Hämmäläinen and De Wever 2013). On this basis, we elaborated the analysis grid used to evaluate the quality of each peer-feedback the students provided (Table 1). The elements belonging to our grid, which took into account the aspects emerging from the cited literature that were applicable to the activity implemented in this context (in reason of the structure

of our scenario and of the prompts provided to the apprentices), represent a list of the key aspects that constitute an effective peer-comment in this context. In order to organise the various aspects considered in our grid, we followed the categories created by Hämäläinen and De Wever (2013). Various aspects were taken into account from the more formal, such as the way students followed the structure indicated in the prompts and their use of an appropriate style for this type of peer-exchange, to aspects related to content, such as the questions they asked and their ability to provide comments and ideas to suggest how to solve the situation.

After the peer-commenting phase, the students had to write a conclusion at the end of their episode in response to the comments and questions they received and to indicate how they would react if they faced a similar situation in the future (phase 3). A new grid, containing the most important elements for evaluating an effective and complete conclusion, was, therefore, elaborated (see Table 2). This new grid is very much dependent on the specific structure and prompts provided to learners in our scenario. As for Table 1, we used some of the categories identified by Hämäläinen and De Wever (2013) to structure our grid.

Data analysis

All the apprentices' interactive productions were individually analysed using the software Atlas.ti. The analysis was conducted following the grid shown above, which permitted to explore the behaviour of each student in terms of (a) the comments they provided to others and (b) the conclusions they produced in response to the comments they received. The analysis was organized in three separate stages, starting from the consideration of the students' comments to the critical situation described by the colleagues using the grid presented in Table 1. A second stage of analysis evaluated the conclusion that each participant wrote in response to the comments received from colleagues on the basis of the grid presented in Table 2. In the last stage, the complete interactions were considered as a sort of written dialogue composed of the two comments provided to each student by the colleagues and his/her conclusion to the situation. In this case, it was, therefore, the whole interaction that was considered, rather than the individual performance of one of the students involved. For this analysis, we explored the *transactivity* level of the interactions, identified in the literature as one fundamental indicator of argumentative knowledge construction (Teasley 1997; Weinberger and Fischer 2006). Transactivity was defined here by the capacity of students to consider and include in their texts the suggestions, ideas and comments provided by their colleagues.

In order to verify the reliability of the analyses conducted on participants' interventions (peer-feedback, conclusions and overall interactions among apprentices), two independent coders participated in the research. More precisely, the first author of this article (coder 1) proceeded with the analysis of all the written exchanges of this activity (composed of 42 peer-comments, 19 conclusions and 21 complete interactions) on the basis of the analysis grid. Afterwards, she assigned overall students' interactions, as well as the individual comments and conclusions, to one of the four behavioural patterns that were identified as emerging from this analysis (see below in results for a detailed description). A second independent coder (coder 2) was then involved in the process. After being presented with the activity and the coding scheme, he was asked to evaluate a sample composed of 10 students' exchanges (composed of 20 peer-comments, 10 conclusions and 10 complete

interactions, representing 48% of the total number of exchanges). Once the evaluation was complete, the inter-rater reliability was calculated using Spearman's correlation. The results of the correlation showed a reliability level of .824, which is considered satisfactory. The disagreements between the coders were afterwards resolved through discussions, and a final agreement on the evaluation was achieved.

Results

The analysis conducted with the support of the grids presented above allowed for the identification of four patterns according to the level of elaboration of the students' interactions. Each of the phases of the activity was organised according to these four patterns. A detailed description of the evaluation of each phase of the activity, with the resulting categories, is detailed below. In Appendix 1, four examples of interactions are presented representing different levels of elaboration of each phase of the exchange. In the results listed below, we will refer to these examples.

Evaluation of apprentices' peer-comments

The analysis of the students' comments (second phase of the activity) was conducted by considering the level of elaboration of each category appearing in Table 1. This allowed us to categorise these comments into four groups that differed in the elements the students provided in their text and whether they followed the prompts provided, including suggestions, personal experiences and so on.

Participants whose interaction was classified in the *minimal elaboration* category provided comments in which various elements were missing or incomplete (e.g. only comprehension questions were asked, or, when comments were provided, they did not contain a real explanation or justification). In Vanessa's¹ critical incident (see Appendix 1), Rebecca provides one example of peer-comment falling in this category.

Did you read all info about the patient before? It is normal to be scared, without showing it. Did you call before going there?²

This comment was categorised as *minimal elaboration* because, in this case, Rebecca asked comprehension questions and provided only one very general and vague comment with no detail about personal experience of a similar situation or a suggestion.

The comments in the *partial elaboration* category presented more elements, including, for example, an interesting suggestion. However, these comments are not completely elaborated. In this sense, they do not offer the receiver the possibility of reusing the idea proposed in a constructive manner. One example of this type of comment is one that Edith proposed to Amanda:

You should find another subject to distract her or understand why she talks all the time about that.

What Edith suggests may represent interesting advice, but she does not provide any real indication of how this can be implemented in practice, especially in consideration of the complex situation described by the colleague. In this sense, this comment remains vague and difficult to implement in practice.

In the *sufficient elaboration* category, comments are more complete, and various elements, if not all the prompted ones, are included and explained, making it possible for the receiver to reuse some ideas. Such a comment was provided by Helen to her colleague Albert. After asking some questions, she said:

You should try to proceed slowly, step by step. Maybe you should talk to her about the fact that she will move to the daytime retirement home, and take some time to listen to her feelings, making her participate in your treatment, to understand her needs and choices.

This type of interaction provides the receiver with a more justified and comprehensible point of view, therefore, the level of elaboration is higher (even if, in this case, the comment provided did not include questions).

The comments categorized as *advanced elaboration* are the more complete ones, as apprentices exploited all the prompts provided, asked colleagues thought-provoking questions and included detailed suggestions by drawing on personal experiences and justifying their comments. In example 4 (Appendix 1), Melissa provides such a comment to her colleague Deborah by giving her a series of constructive elements to consider and integrate in this situation.

What are the different approaches you tried with her? Did you ask yourself why she is always mad? What happened to her? Why does she need your assistance? To provide her with the medications? To wash her? I think I would have reacted in the same way, trying to discuss with the patient, asking why she is so aggressive and what she feels when I come to take care of her. I think it is smart to make reference to the doctor, but why wouldn't you try to explain what are the problems with her health, and therefore why she needs her medications? Always trying to avoid getting too close, in case she hits you.

From a quantitative point of view, each peer-comment provided by the 21 apprentices participating in the activity was classified in one of the emerging clusters. This means that all apprentices had two independent peer-comments that were attributed to one of the four categories. This makes a total of 42 peer-comments that were distributed as follows: 7 comments were attributed to the *minimal group*, 9 to the *partial group*, 12 to the *sufficient group* and 14 to the *advanced group*. Globally, the results of this evaluation revealed high levels of interaction in this part of the activity: 16 interactions corresponded to a fairly low elaboration level (the first two categories), while 26 were considered more elaborate with respect to the scaffolds and inputs provided. It is very interesting to point out at this stage that the two comments each apprentices provided to two of their colleagues were very often different in their elaboration levels. More precisely, only 4 of the 21 apprentices provided two comments that were considered in the same category of elaboration, while the other 17 provided comments of different levels. This suggests that the quality of the comments does not depend so much on the student's individual attitude towards the task or capacity but varied depending on the context.

Evaluation of apprentices' conclusions

As with the peer-comments, the conclusions written by the apprentices in their personal pages (the third phase of the activity) were classified into four groups. The same categories used in the previous analysis were applied here, based on the level of elaboration of students' text. Additionally, the transactivity level emerging in these conclusions was also taken into account. More precisely, the *minimal-level* category corresponded to conclusions with various

missing elements, such as the lack of a response to part of the questions or to comments received by the colleagues in the peer-comment phase and the fact that no new solution to the critical situation encountered was identified. Vanessa's conclusion belongs to this category (see Appendix 1) because in response to her colleagues, she did not elaborate on the suggestions and the idea proposed.

Students' conclusions that fall into the *partial elaboration* category included more elements but did not take into account all the aspects mentioned by the two colleagues, and no alternative solution was identified. The level of elaboration and the transactivity level remained very low.

The conclusions in the *sufficient elaboration* category are more complete, presenting a more productive reutilisation of what colleagues wrote. In this sense, students in this category usually replied to the comments and questions received in a positive and constructive manner. On the other hand, the author did not always come up with new ideas or alternative solutions to handle the situation, based on the suggestions of others.

Conclusions in the *advanced elaboration* category, on the other hand, contained all the important elements that were mentioned in peer-feedback. The apprentices were able to consider new possibilities, or even confirm previously chosen strategies and take into account the aspects emerging from their colleagues' texts. The transactivity level is therefore, in this case, very high. One example of this type of conclusion is the one proposed by Deborah (Appendix 1), who replied thoroughly to the questions received and considered alternatives to her behaviour, as suggested by her colleagues.

We ask the doctor to help quite regularly. On the other hand, I would not like to use the negotiation system you suggest (if you do that, I don't bother you with that ...) because she could take advantage of the situation. What I will do is that I will try and explain her as much as I can her treatment and its importance for her health and that I am there for her, and if she refuses me, I will leave. When she really needs my help, she will ask me to come.

In this case, Deborah did not consider the comment provided by her colleague as appropriate for the situation she encountered, explaining her concern with the solution proposed. On the other hand, she elaborated on a different way of dealing with the situation.

Two students did not participate in the conclusion phase of the activity. We, therefore, evaluated the conclusions provided by 19 apprentices that distributed as follows: five apprentices were attributed to the *minimal* category, three apprentices to the *partial* category, seven to the *sufficient* category and four to the *advanced* category. Compared with the productions in the peer-feedback exercise, the number of apprentices' conclusions classified in the two lowest categories was higher. In addition, while they produced 185 words on average ($SD = 73.4$) for the peer-feedback part, they produced 113 words on average ($SD = 78.5$) for the conclusion. This suggests that either students struggled more with this final task or they did not feel as motivated. It is important to remember that all these exchanges took place during the same school session. Therefore, the activity may have created fatigue, resulting in this part of the exercise being less developed.

The complete interactions

Once the evaluation of the individual phases of the exercise was conducted, we evaluated the complete interactions composed of two peer-comments and the original authors' conclusions. As mentioned, the criterion for this classification was based on interactions' *transactivity*

levels. Each interaction was evaluated globally, taking into account the individual analysis of each element. This new analysis was derived from the analysis of the individual elements presented previously, but only partially. Often the interactions are composed of comments belonging to very different categories (a very highly elaborated one together with another one in which only comprehension questions are asked). At the same time, the conclusions do not always reflect the quality of the comments received, as even when students received interesting comments and suggestions, they may struggle to incorporate them into their own conclusions. In this sense, the analysis does not simply represent the summary of the previous ones but considers the interaction as a whole, including its diversity, and looks for the elements that elicit more productive interactions. This resulted in the identification of four groups, varying according to the level of transactivity. See Appendix 1 to consult excerpts from the four examples of full interactions, exemplifying the four groups emerging from our analysis.

“Bare minimum” interactions

Interactions in this category are succinct and do not present much content. Students seem to participate in the activity for the sake of the exercise without offering personal experience or providing new elements to feed the discussion. The interactions taking place on Vanessa’s page (example 1) represent this category.

“So-So” interactions

The interactions in this group presented limited exchanges in terms of transactivity, as they did not produce real identification of new solutions or integration of the perspective of others. The interaction observed in Amanda’s page (example 2) belongs to this category. Even if the colleagues provided some basic suggestions on how to handle the situation and commented on the way she reacted, she did not fully consider the aspects mentioned by her colleagues in her reactions, giving quite brief responses to what was said.

“Getting there” interactions

In this group, the exchanges are more transactive, with students adding new elements from their experience, taking into account each other’s perspectives and engaging in a constructive discussion. However, the conclusion provides solutions to problems without building on the elements raised in the discussion.

The situation described by Albert (example 3) initiated an interaction of this type. Both colleagues who participated in this interaction provided him with some interesting ideas (‘With demented people it is important to take it slowly and always be accompanied by a nurse the first times’ and ‘Maybe you should talk to her about the fact that she will move to a retirement home soon’) to which he replied explaining his position. However, the strategy identified by Albert in his conclusion to deal with the situation does not build directly on the suggestions received.

Productive interactions

In this case, the transactivity level is considered complete. The main difference with the previous category lies in the conclusion, in which the authors of the incident formulate elaborated considerations of how they plan to react in the future, making explicit reference

to the role the comments received played in their newly envisaged strategy. This is the case in the interaction about Deborah's situation (example 4).

The interactions generated by the apprentices during this activity distributed homogeneously into the four groups that emerged from this evaluation. More precisely, four interactions were associated with the *Bare Minimum group*, while six belonged to the *So-So group*. The same number of interactions (six) was considered as the *Getting There* type, while five were associated with the *Productive group*. Basically, the same number of interactions was attributed to the lowest transactivity categories (10 interactions belonging to the *Bare Minimum* and the *So-So groups*) as to the higher transactivity-level categories (11 interactions in the *Getting there* and *Productive groups*). This partially reproduces the distribution of the conclusions and may be explained by the fact that the way the author of the texts receives the comments and replies to the questions of others, as well as his/her ability to produce new strategies on the basis of the ones proposed, plays an important role in determining the level of transactivity of the exchanges. On the other hand, it is important to point out that, in some cases, the conclusions provided by the author and the complete interactions were considered to belong to different categories.

Discussion and conclusion

This research investigated the instructional relevance of collaborative writing activities to help students of vocational education in building integrated professional knowledge, articulating practical knowledge acquired in the workplace and conceptual knowledge discussed in formal education, especially in school. Following Tynjälä's model (2008), as well as the literature on peer-feedback, the instructional activity involved an initial phase of individual writing about a critical situation encountered in the workplace, followed by peer-feedback and the writing of a conclusion from the author of the situation to recap their understanding of the situation and how to react next time. The writing activity was designed according to Tynjälä, Mason, and Lonka's (2001) recommendations for effective writing tasks. While writing should foster explicitation and abstraction of experiential knowledge, the peer-comment phase should allow stepping back from individual experience and gaining knowledge from others' perspectives. A Web-based text editor (Wiki service) was used to enable smooth collaborative editing and revision, through distributed access, track changes and management of versions. A qualitative analysis was conducted to explore how students coped with the peer-comment instructions: Did they reach what the literature identified as productive interactions, leading to a new understanding of the situation and collaborative knowledge construction? A subsidiary goal was to describe the characteristics of the most transactive interactions to formulate instructional recommendations.

Characteristics of productive comments and transactive interactions

On the basis of the literature on peer-feedbacks and collaborative learning (Sluijsmans, Brand-Gruwel, and van Merriënboer 2002; Kim 2005; Prins, Sluijsmans, and Kirschner 2006; van den Berg, Admiraal, and Pilot 2006; Gielen et al. 2010; Hämäläinen and De Wever 2013), a coding scheme was developed to assess the level of elaboration of the peers' questions and comments, in terms of relevant external perspectives on one's personal situation. The results show that the majority of students, who were second-year apprentices, were capable

of producing comments with a sufficient or advanced level of elaboration. Concretely, the comments included thought-provoking questions that went beyond details but still tried to identify the underlying causes that led to the difficult situations. Moreover, they included detailed suggestions in how to interpret the situation and/or to handle the situation, drawing on their personal experiences.

Elaborate comments were supposed to elicit a reflective attitude and take a broader perspective enriched by the peers' experience and knowledge. However, were students able to construct a new understanding of the situation from their peers' suggestions? In order to answer this question, the transactivity level (Teasley 1997; Weinberger and Fischer 2006) of the whole written interaction between the three students was evaluated, taking into account the capacity of the three students to build on each other's knowledge and experience. Four categories emerged, showing that half of the interactions were sufficiently to highly interactive. Interestingly, not all students were able to take advantage of elaborated comments. This observation is in line with Kaufmann and Schunn's (2010) consideration that students confronted with peer-feedback instruction may be initially reticent to fully engage in the activity, and may question the competence of their peers to evaluate them. In this sense, it may be easier and more directly profitable for students to provide comments to their colleagues (Dochy, Segers, and Sluijsmans 1999; Topping 2003) than to accept observations and suggestions made by others (Kaufmann and Schunn 2010) and integrate them into their own discourse, as they may question the competence of their colleagues in providing them with feedback on their behaviour.

Instructional implications

This research provides a set of instructional recommendations for the design of the activity and the scaffolding elements to be used to obtain effective peer-feedback and constructive complete interactions. The highest transactivity level in the overall interactions was observed when students in their peer-feedback provided concrete suggestions or reported personal experiences in similar situations. Questions and generic comments were also interesting elements of discussion and, in particular, questions were an excellent way of performing the activity in a progressive manner. On the other hand, the apprentices were able to come up with new concrete alternatives to their behaviour and engage in the most complete interactions when they were faced with concrete new solutions to an issue. The fact that the same student could produce two feedbacks that differed in their level of elaboration leads one to assume that engaging in productive interactions is not just a question of capability but can be triggered by the context.

In this sense, both types of scripts identified by Weinberger et al. (2005), i.e. epistemic and social scripts, are of great relevance. In particular, epistemic scripts are of key importance to specifying and sequencing knowledge construction activities and defining the strategy for the execution of the task, both in the individual (description of the critical situation) and the collaborative (peer-commenting task) phases of the scenario. Social scripts, on the other hand, sequence the interaction of the students in productive exchanges. In this sense, epistemic scripts structure the task of facilitating knowledge construction, while social scripts facilitate the interaction among students. We believe, therefore, that both these types of scripts should be adopted when setting up a writing and peer-commenting activity.

In addition, we believe that the collaboration with others, building on the social dimension of learning, was a great motivator for students. We observed a high level of participation in the task, with students writing quite long texts both to describe their situations and to provide comments to their colleagues. Additionally, they declared that they appreciated the task they were asked to perform (see Ortoleva and Bétrancourt (2015) for a full account on the students' formal feedback on a similar activity). The teachers who collaborated in the design and implementation of the activity were also satisfied by the participation of the apprentices and their attitude towards the task. In particular, they declared that they were expecting students to show more resistance towards the task of writing on the basis of other individual writing tasks previously proposed to them ('I was positively surprised, at the beginning I thought that they would not engage in the activity, but in the end they really participated and seemed to enjoy'). Additionally, the professional behaviour that students revealed in the task was satisfying to the teachers ('I was really surprised to see that they were more serious and professional in commenting each other than I expected and that they seemed to be during the class').

Limitations and future research

The research presented here was based on a single implementation, involving few students. In addition, the teachers conducting the activity were also involved in the design, which may have led to a positive bias, in terms of engagement and enthusiasm. Nonetheless, provided that the instructional conditions and the guidance offered to apprentices are designed and scaffolded in a constructive manner, the results obtained in this research present some very encouraging elements. This is particularly true if we consider that this was the first implementation of this activity, and Dochy and McDowell (1997) observed that the attitude towards peer-feedback tends to positively evolve with the practice of this type of interaction. As participants were distributed quite homogeneously in the different categories of interaction in this first attempt, we believe that, if they acquire more confidence with this practice, it will positively affect their ability to integrate each other's perspectives and to learn from colleagues' experiences. To explore the possible evolution in students' capacity to learn from each other over time, further research should investigate the engagement of students in peer-feedback tasks when implementing this scenario multiple times.

To conclude, an essential component of expertise development is associated with the capacity to analyse a novel situation to adapt one's behaviour and to learn from its consequences. In addition, professional practice is rarely individual, and the capacity to take into account another's perspective and build on the knowledge of the community is one key to professional development (Lave and Wenger 1991; Billett 2006). Peer-commenting activities in relation to students' practical experiences, as implemented in this study, not only help students to acquire the basics of the practice, but also promote key competences for ongoing professional development.

Notes

1. All the names of the students were changed to protect their privacy.
2. All excerpts from the apprentices' texts were translated from the French. Text translation and punctuation are as similar to the original text as possible.

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Appendix 1. Interaction examples

Below there are four examples of apprentices' interaction exemplifying different types of exchanges. The situation is briefly explained (our account, not the original text), while the underlined text corresponds to comment 1, the bold text to comment 2 and the italic to the author's answer. The interactions were translated from French. Misspellings and other linguistic errors were not reported.

Example 1 – Interaction on Vanessa's critical incident

Situation: Home care service, Friday afternoon. Vanessa was asked to visit and take care of a patient she did not know. Once she got to his house, the patient refused to open the door. Vanessa called her chief nurse, and she confirmed that this situation had already happened with this patient.

R: Did you read all info about the patient before?

V: Yes, I did, but to really know the person you need more than that, you need to see them, once at least.

R: It is normal to be scared, without showing it.

R: Did you call before going there?

V: *No, I did not think to call her.*

Example 2 – Interaction on Amanda's critical incident

Situation: Amanda had to take care of a patient who was extremely slow and talked all the time about

her mother. This made her late for the other patients she had to attend.

J: Does she take any medications? You should discuss about her mother while you take care of her.

E: You should find another subject to distract her, or understand why she talks all the time about that.

A: *The patient is schizophrenic, you can listen to her talking about her mother and she will repeat over and over again.*

J: You should leave her some time and ask for a psychologist.

A: *She is in treatment with a psychologist.*

Example 3 – Interaction on Albert’s critical incident

Situation: Albert had to visit an elderly patient suffering from dementia at her home. Albert had to provide usual treatments and assist to her departure in a daytime retirement home happening that morning. The patient was feeling stressed and got disturbed by the presence of Albert. to the point that he could only partially execute his task.

J: I think that the patient was right in refusing your assistance, as you were a intern. If she does not know you, it is understandable. With demented people it is important to take it slowly and always be accompanied by a nurse the first times.

H: You should try to proceed slowly, step by step. Maybe you should talk to her about the fact that she will move to the daytime retirement home, and take some time to listen to her feelings, making her participate in your treatment, to understand her needs and choices.

A: *I was there with a nurse during my first visit and even with them it is very. She gets very nervous when we talk about moving to the retirement home. I should have probably consulted her daughter who knows how to deal with her.*

Example 4 – Interaction on Deborah’s critical incident

Situation: Deborah had to take care of a schizophrenic patient, with an aggressive behaviour. She had to provide her with the medications she needs, but the patients did not want them and started acting in a very aggressive manner. Deborah tried various approaches with this patient, without finding a way of calming her down a little bit. Once the situation became too dangerous, Deborah left the apartment.

M: What are the different approaches you tried with her?

D: *I tried to be strict, to reframe the situation, to take to her with a firm but calm voice...*

M: Did you ask yourself why she is always mad? What happened to her?

D: *I read her file carefully, asked colleagues and observed her entourage. I.*

M: Why does she need your assistance? To provide her with the medications? To wash her?

D: *She is schizophrenic and suffers from a cancer. She is not able to follow the treatment on her own and needs assistance with that and her personal hygiene.*

M: I think I would have reacted in the same way, trying to discuss with the patient, asking why she is so aggressive and what she feels when I come to take care of her. I think it is smart to make reference to the doctor, but why wouldn’t you try to explain what are the problems with her health, and therefore why she needs her medications? Always trying to avoid getting too close, in case she hits you.

F: I think I would have reacted in the same way, but also trying to get her family involved in the situation (if she has one), as well as the doctor.

D: *We ask the doctor to help quite regularly. On the other hand, I would not like to use the negotiation system you suggest (if you do that, I don’t bother you with that...) because she could take advantage of the situation.*

What I will do is that I will try and explain her as much as I can her treatment and its importance for her health and that I am there for her, and if she refuses me, I will leave. When she really needs my help, she will ask me to come.