

Writing to share, sharing to learn: technology-enhanced learning activities to foster professional development in initial vocational education

ORTOLEVA, Giulia

Abstract

La formation professionnelle initiale demande aux apprentis de s'engager simultanément dans deux contextes d'apprentissage : l'école et le stage. Cette recherche analyse la mise en place d'un scénario pédagogique utilisant l'écriture et la collaboration médiatisée, pour articuler les connaissances acquises dans ces deux contextes. Le scénario vise à associer les effets cognitifs dérivant de l'écriture, tels que l'abstraction et la création de connaissances, avec une collaboration apportant réflexion et prise de recul par rapport à l'expérience personnelle. Trois études empiriques ont montrés un effet positif de ces activités sur la connaissance déclarative des apprentis, ainsi que sur leur sentiment d'efficacité personnelle. L'analyse qualitative des interactions montre que les apprentis sont capables de fournir des commentaires riches et élaborés, mais on plus de difficulté à intégrer ce commentaire dans leur réflexion. Ces résultats confirment le potentiel de l'écriture et de la collaboration médiatisée dans l'articulation école-stage.

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**FACULTÉ DE PSYCHOLOGIE
ET DES SCIENCES DE L'ÉDUCATION**

Section de Sciences de l'Éducation

Sous la direction de Prof. Mireille Bétrancourt

WRITING TO SHARE, SHARING TO LEARN: TECHNOLOGY-ENHANCED LEARNING ACTIVITIES TO FOSTER PROFESSIONAL DEVELOPMENT IN INITIAL VOCATIONAL EDUCATION

THESE

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par

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Doctorat en sciences de l'éducation

Thèse de Giulia Ortoleva

Intitulée : Writing to share, sharing to learn : technology-enhanced learning activities to foster professional development in initial vocational education

*

La Faculté de psychologie et des sciences de l'éducation, sur préavis d'une commission formée par les professeurs : Mireille Bétrancourt, directrice, TECFA-FPSE, Université de Genève, Daniel Schneider, TECFA-FPSE, Université de Genève ; Laurent Fillietaz, FPSE, Université de Genève ; Pävi Tynjälä, University of Jyväskylä ; Jean-Luc Gurtner, Université de Fribourg

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Summary

Vocational education requires apprentices to simultaneously engage in two learning environments: school and workplace. This research analyses the implementation of a computer-supported pedagogical scenario including writing and peer-collaboration as mediating instructional tools to articulate the knowledge acquired in these two settings. This scenario aims at combining the cognitive effects derived from the writing activity, such as abstraction and knowledge construction, with the reflection and shift of focus away from personal experience offered by collaborating with others. Three empirical studies showed that such activities can have a beneficial impact on apprentices' declarative competence acquisition, and can improve their self-efficacy beliefs (especially for 1st year students). Qualitative analyses of peer-comments brought to the identification of the characteristics of constructive interactions and highlighted a positive engagement of the participants, particularly in the collaborative task. These results indicate the interesting potential of computer-supported writing and peer-collaboration in the vocational context.

Résumé

La formation professionnelle initiale demande aux apprentis de s'engager simultanément dans deux contextes d'apprentissage : l'école et le stage. Cette recherche analyse la mise en place d'un scénario pédagogique utilisant l'écriture et la collaboration médiatisée, pour articuler les connaissances acquises dans ces deux contextes. Le scénario vise à associer les effets cognitifs dérivant de l'écriture, tels que l'abstraction et la création de connaissances, avec une collaboration apportant réflexion et prise de recul par rapport à l'expérience personnelle. Trois études empiriques ont montrés un effet positif de ces activités sur la connaissance déclarative des apprentis, ainsi que sur leur sentiment d'efficacité personnelle. L'analyse qualitative des interactions montre que les apprentis sont capables de fournir des commentaires riches et élaborés, mais on plus de difficulté à intégrer ce commentaire dans leur réflexion. Ces résultats confirment le potentiel de l'écriture et de la collaboration médiatisée dans l'articulation école-stage.

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Introduction

Initial vocational education, with its articulation of workplace and school learning, represents an interesting, yet challenging educational path for many young people finishing their compulsory schooling. These students are confronted with the task of bringing together the ideal procedures which are explained and showed to them in the school setting, with the real situations as they are lived and dealt with in the real world of their workplaces. This represents a challenge for them, who are not always able to perform this integration successfully, running the risk of underestimating the importance of the theoretical and generalizable knowledge that is imparted to them in school, in favour of the more applied, practical, and context-specific experience they obtain in their working environments.

The work presented in this thesis aims at proposing new solutions for the articulation of school and workplace learning in the initial vocational education context. This study was conducted in the framework of the Dual-T research project, a leading house funded by the State Secretariat for Education, Research and Innovation (SERI), aiming at using technologies in order to support students in initial vocational education patterns in bridging the gap between concept-based school learning and practical workplace training. The project, which involves four research partners around Switzerland, namely, University of Fribourg, Ecole Polytechnique Fédérale de Lausanne (EPFL), Swiss Federal Institute for Vocational Education and Training (SFIVET), and University of Geneva, covers a wide range of vocational path, going from carpenters, to cooks, pastry cooks, car mechanics and Social and Health Care workers, which represent our field of study.

In order to support vocational students in performing the connections between school and the workplace, in our project we consider two important instructional paradigms: the first, known as “writing-to-learn”, has observed the beneficial effects that writing has on the learning process. In this research field, writing is considered as a tool to promote reflection and knowledge transformation/constitution. This is made possible in reason of the abstraction and the explicitation required by the writing task. This type of activity would, therefore, support learners in reorganising previous knowledge, while at the same time, building new concepts and ideas. Though typically writing is considered as an individual activity, it may also be studied as a collaborative situation in which various people have to contribute to a common production. The second instructional paradigm we consider is the one of “collaborative learning”, and more particularly of Computer-Supported Collaborative Learning (CSCL). This research field, inspired both by social theories of learning and instructional psychology, studies how people collaborate and interact in order to design technology-enhanced learning environments, which promote productive interactions and trigger the cognitive

processes at the basis of learning. Peer-collaboration and feedback activities in this context are considered key in order to encourage vocational students in stepping outside of their own personal perspectives, embracing different points of view, while at the same time acquiring information about the working conditions of others in different workplaces. This type of scenario would encourage the collaborative knowledge construction, a process through which students interact in the creation of new shared concepts and ideas, in which they merge the knowledge imparted to them in the school setting, with the real-life experiences they encounter in their workplace practice.

Based on the literature on “vocational education”, “writing to learn” and “collaborative learning”, we consider that individual writing activities based on the redaction of critical situations encountered in the workplace in a computer-supported environment, accompanied by peer-exchange about these situations both in written and oral format, may represent an ideal way to support the connections between school and the workplace. This type of activity is, in our opinion, particularly relevant as it represents an ideal way of combining the individual and the collective dimensions of learning in vocational education patterns. In fact, learning can be regarded as a multidimensional process, which does not only engage personal dynamics of each learning individual, but involves also a social and collective dimension, since learners are engaged as a group and as part of a social environment. In the vocational education context, the interplay of individual and collective dimensions of learning is particularly relevant as both appear not only in the classroom, but also in the workplace setting. Apprentices work in a team composed by other professionals and therefore are part of a group (collective dimension), but are usually the only ones engaged in a particular phase of the learning process (individual dimension). In our opinion, both dimensions can contribute with different elements to the overall competence acquisition and learners’ professional development. Our project aims at designing and studying writing activities that engage both individual and collective dimensions of learning.

Our hypothesis is that the implementation of pedagogical scenarios, which brings workplace experiences in the school setting, through the use of reflective writing, peer-commenting and discussing workplace situations in the classroom, mediated by the use of a wiki environment, could have an impact on apprentices’ professional development. In this context, we will observe this development in terms of apprentices’ competences acquisition, as well as their self-efficacy beliefs and its adjustment throughout the implementation of the activity. Additionally, we are interested in observing the collaboration patterns of apprentices in this type of learning situation, as well as their attitude and evaluation of these pedagogical activities.

Moreover, it is important to mention that our study has a two-folded objective. Aside from the research questions and hypotheses that we verify in this context, related to the use of writing and peer-collaboration in vocational training, we also aim at designing an effective instructional scenario,

throughout the studies composing this research, which could be modified, adapted and reused in numerous learning contexts facing the same or similar challenges to the one observed in initial vocational education. We aimed, therefore, at formulating a series of recommendations and instructional design guidelines for the implementation of computer-supported collaborative writing activities in similar contexts.

This cumulative thesis, comprising four publications presenting the interventions and the theoretical investigations conducted in this framework, is structured as follows: the first part is dedicated to the theoretical framework of this research. This is articulated around three main axes, represented by the research on vocational education, describing its characteristics and specificities and the peculiarities of learning in this context. Additionally, the second research axis is represented by the studies dedicated to the field of writing research, which considers the beneficial effect that this activity may have over the learning process, while the third axis is organised around the research on collaborative learning and on the computer support in this type of learning setting. This last section will be complemented by a book chapter, describing the use of technologies to support writing activities aiming at professional development (Ortoleva & Bétrancourt, 2014a).

After this review, we will dedicate a section to the presentation of our research plan. This will include not only the description of the research in terms of its questions and hypotheses and the introduction to the Design-Based Research approach applied in this context, but also the representation of the scenario used in the different studies, and its evolution throughout them. Additionally, a section of the chapter will be dedicated to the description of the research context, the vocational education field of Social and Health Care Assistants. This will consider the specificities of the profession, and the particular challenges that apprentices have to face throughout their education towards this professional role.

Successively, a chapter will be dedicated to the presentation of the first intervention we conducted in the framework of this project. This will include an introduction to the study conducted in this framework, as well as an article (Ortoleva, Schneider, Bétrancourt, 2013a) presenting our research questions and hypotheses, the scenario we implemented and the procedure we followed for this research, as well as its main results.

The following chapter will then introduce our second study, based on the second intervention conducted in the framework of this research. Introducing this study we will present the new instructional scenario and detail its evolution from the previous implementation. The other modifications made to the materials and the procedures of the research will be detailed in this context. This second study focuses on the quantitative analysis associated to this new implementation of our scenario. This chapter will be based on the publication: Ortoleva & Bétrancourt (2014b).

The next chapter will describe our third study, which is also based on the second intervention we implemented. In this case, instead of focusing on the quantitative analysis performed for this research, we will focus on the exploratory qualitative analysis conducted in order to observe the type of collaboration and interaction patterns adopted by learners in this instructional scenario. This chapter will be structured around the publication: Ortoleva & Bétrancourt (2014c).

Finally, the last chapter of this thesis will consider the main results of these studies and articulate a discussion around them, both in terms of their implications for the research in the fields concerned by our scenario, but also in relation to the key issues emerged in terms of the design of the pedagogical scenario and the recommendations associated to its implementation. The limits of our research and the perspectives traced by this work will also be considered.

The structure of this manuscript aims at accounting for the process we followed in the elaboration of our research, from its theoretical basis, to the implementation of our studies and the extraction of its fundamental conclusions. It allows, therefore, describing the main results emerging from the two objectives of this work, characterised by the answer to the research questions we defined and the design of a functional instructional activity, to be adapted and tested in different professional education contexts.

1. Vocational Education: Characteristics and specificities

1.1 Vocational education: Learning in school – learning in the workplace

Vocational education is an educational path preparing learners to integrate a profession, and is based on the articulation between school teaching and workplace experience. Various formats depending on the modalities associated with this articulation exist. More precisely, we can cite here as examples two models of VET programmes: the dual system, which represents the predominant form and is organised around a regular articulation of workplace practice, in reason of three to four days a week, and school education, for the remaining one to two days. This mode of learning also includes a third learning place, constituted by cross-company courses hosted by professional associations, which aims at complementing the knowledge acquired in the workplace with essential practical skills. A second type of VET system is called the school-based vocational training, structured around full-time school periods alternated with internships, in which the learners get to experience workplaces for a variable duration of time. If in the dual education system, learners are therefore already actively engaged in a workplace, in quality of apprentices, and usually they experience only their own working environment throughout their education, in the school-based system they are mainly students, who spend some periods of time as interns in a varied number of workplaces (depending on the particular type of educational path). In this sense, they get the opportunity to experience different working conditions, while, on the other hand, not being completely inserted in the reality of a working environment, as is the case for dual apprentices.

The main feature of vocational education is, as mentioned above, represented by this alliance of the two learning settings, school and workplace, which aims at providing learners with both theoretical knowledge and practical experience. Apprentices are therefore required to integrate the learning outcomes of these two environments, which have different focuses. If learning in school is oriented towards students' comprehension of the procedures that are taught to them in this context, workplace practice is focused on the performance, as vocational students have to become efficient in performing the required procedures. Moreover, if the school setting provides students with an ideal representation of the procedures that will be asked to them in the workplace, the workplace setting shows the real, authentic situations as they are lived and dealt with in the real world, with all the eventual constraints associated with their practice. This feature is considered one of the major strengths of the vocational education system, as the combination of these two settings is particularly relevant for the education of future professionals: formal education is intended to provide skills and knowledge transferable to the real workplace experiences, in order to prepare and enable students to adapt to virtually any working situation. On the other hand, workplace practice would offer to students a number of situations in which to observe, contextualise and practice these generic skills in real contexts. The generic skills

imparted in school, as well as the context-specific situations observed in the workplace, taken alone, would be very limiting and this explains the importance of a close collaboration between education and work (Tynjälä, 2008).

Even though the articulation among the school and workplace is considered one of the fundamental features associated with vocational learning, this represents also a challenge for learners engaged in this type of educational path. Different studies (e.g. Billett, 2001; Filliettaz, 2010a) however, have highlighted how the connection and integration of these different learning settings represents a challenge for the learners. Filliettaz (2010b), observing two main issues, namely the delayed access to upper secondary education, and the high level of drop-out, non-completion and change in apprenticeship programs, concludes that 'transitions from school to work are to some extent far from smooth and unproblematic' (pp.487). In particular, Filliettaz in his research refers to studies analysing the reasons for the high drop-out rate, involving between 20% and 40% of apprentices entering the VET system (Lamamra & Masdonati, 2009; Jordan, Lamamra & Masdonaty, 2009). According to these enquiries, poor working conditions, low support from trainers and workplace relations, accompanied by insufficient training opportunities in the workplace, are the main reasons for apprentices' drop-outs.

In our research, we came to identify a number of points exemplifying the differences of these learning settings, explaining why their integration can be difficult for learners (Ortoleva & Bétrancourt, 2014b): in the first place, while workplaces are production-oriented, schools are learning-oriented. This means that in the workplace apprentices need to integrate the workforce, being efficient and performing the required tasks. This makes it difficult to foresee the set of procedures that will be required to them. In school, on the other hand, learners are presented with all theoretical knowledge needed for the profession, without knowing whether apprentices will experience the corresponding professional procedures (Ludvingsen et al, 2011; Stenström and Tynjälä, 2009). Secondly, schools include in their curriculum procedures that are not required to apprentices in the beginning of their working practice. The reason for this choice is to offer a more complete understanding of their tasks as well as the opportunity for future career advancement. Learners will be taught procedures they will not or rarely experience in the authentic context. Suisse vocational education system tries to overcome this problem by designing school curricula in agreement with the professional associations, as it is schools' primary responsibility that their curricula are always up-to-date with occupation and professional requirements (Tynjälä, 2008). Domain theory thought in schools is therefore selected as relevant by professionals in the domain, making it more consistent with the activities performed in the workplace. One additional issue emerging from the alternation of learning settings is that apprentices of one class will all work in different workplaces, experiencing a variety of conditions. This represents an additional challenge for standardised school learning, particularly in consideration of Tynjälä's (2008) observations on how workplaces differ in terms of the support they provide to learning. More elements

about the specificities of workplace learning and its relation with traditional school education will be provided in the next paragraph.

1.2 Introduction to the Swiss vocational system

Switzerland offers to young adults completing their compulsory schooling, a large number of possibilities, among which they can choose (or are addressed to) the more appropriate option to either continue their way to high-schools, leading to higher education in Universities or Hautes-Ecoles, or to enter a profession, by choosing an initial vocational education option. The latter represents the most popular form of upper-secondary level education and training, as, according to the 2014 report of the State Secretariat for Education, Research and Innovation (SERI), up to two third of young people in Switzerland are involved in such a training system. This curriculum is designed with the objective of enabling young adults to enter the labour market and to be qualified in a specific profession, in order to become efficient workers and have the opportunity to grow in their career in the future.

An ever-growing number of professions offer vocational education opportunities, and up to 230 different options are presented to students at the end of their compulsory schooling. VET programs are designed with the objective of matching the needs of the labour market, both in terms of the skills developed in them, and in relation to the number of available positions within each one of the professional choices. Additionally, some options are provided to learners who decide, after VET education, to further advance into tertiary level of education. The vocational careers opportunities offered by the Suisse system comprehend various choices, going from 2 years programs, leading to a federal VET certificate, to 4 years programs, leading to a federal VET diploma. The latter offers the opportunity to access directly to a tertiary education, while apprentices obtaining a VET certificate can directly join the longer pattern, in case they are interested in continuing further their education. Figure 1 shows the possible path and choices associated with a job-related continuing education and training option in Switzerland.

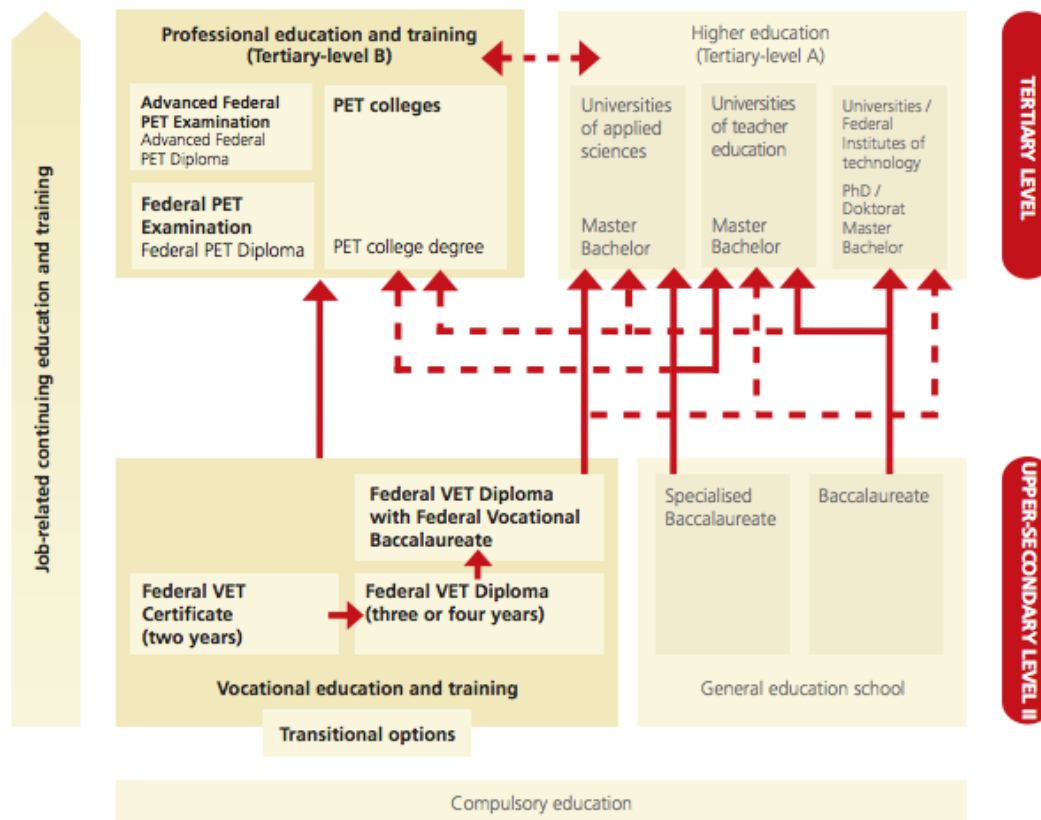


Figure 1. The Suisse educational system for job-related continuing education and training (State Secretariat for Education, Research and Innovation (SERI), 2014, p. 5).

1.3 Specificities of learning in vocational education

1.3.1 Workplace learning characteristics

Various attempts have been conducted in order to try and describe precisely what type of learning is associated with the direct participation and experience of a working environment. Throughout these pieces of research, it reveals highly challenging to trace a comprehensive list of the specificities associated with the learning happening in school and the one proper to workplace experience. Workplace and school learning present a series of specificities that make these two environments different from each other, although some similarities are also observed. Tynjälä (2008) in her review of the perspectives into learning at the workplace presents an account of the most important theories and views on this subject: first of all, she points out the fact that the process of learning in school and at the workplace are both similar and different from each other. She refers here to Resnick's (1987) research who tried to highlight the most important characteristics of these two environments, identifying some relevant differences: on the one hand school-learning is an *individual* activity, while workplace learning is a *socially-shared* situation. This point, which is highly relevant for our research,

will be further explored later in this chapter (see section 1.3.3 The social and the collective dimensions of learning in vocational education). Additionally, if in school the objective is for learners to acquire general knowledge, both imparted in general education courses, and in more professionally oriented one, in the workplace the aim is to develop situation-specific competences. In this environment, apprentices are, therefore, asked to participate to the genuine activities of their profession, with the guidance of a supervisor. This process supports the creation of their professional identity (Gurtner, Gulfi, Genoud, de Rocha Trindade & Schumacher, 2012). In this sense, school particularly values the comprehension associated with the underlying concepts and ideas of the procedures discussed, while the workplace focuses on the performance, in terms of its effectiveness and efficacy. Gurtner et al. (2012) also provide an interesting list of the main contrasting characteristics of learning in school and in the workplace. In this list, they cite, for example, the fact that if in school the aim is the learning of the apprentices, the workplace focuses on production. On the other hand, the sense of belonging of the students to these environments can vary considerably, as it is quite high for the workplaces, while the sense of belonging to school is often lower. Additionally, in school learners are confronted with artificial situations and problems, while the ones they deal with at work are authentic, making the situations they live often more interesting for them. In school, additionally, mistakes are considered as part of the learning process and are in this sense accepted, whereas the workplace environment does not have the same reaction to errors, which are forbidden in this context. Moreover, the help-seeking behaviour of asking questions is always welcome in school, when help is needed, and tolerated even when unnecessary, while if in workplaces it is expected that learners seek for help when they need it, this type of behaviour is not welcome when unnecessary. Tynjälä (2008), on the basis of Resnick's (1987) and Hager's (1998) conceptions, summarizes the main differences between these environments, asserting that school learning is traditionally considered as *formal, planned, explicit, intentional* and *uncontextualised*, while workplace learning is usually seen as *informal, unplanned, implicit, incidental, unintentional* and somehow *unpredictable*.

Stephen Billett (2004) criticizes, on the other hand, these types of definitions of workplace learning based on its negative characteristics (based on what this type of learning is not: formal, planned, intentional, predictable and so on). In particular, firstly, this author considers that individual engagement in work activities should be considered as highly structured and intentional, rather than unplanned and lacking structure. Additionally, according to this author, workplace learning would not be incidental, as the workplace experience produces concrete outcomes of high importance for the continuity of the working environment. In this sense, the author considers that it is the quality of the learning environment that determines the richness of the learning outcomes, and that it is a mistake to assume that the needed qualities are only to be found inside educational institutions. Secondly, Billett asserts that workplace activities are highly structured and regulated, and therefore have pedagogical properties. In this sense, it is the workplace's goals and practice that determine the tasks and activities

performed by the workers. Finally, he also questions the traditional definition of workplace learning as being an informal learning environment, which implies the existence of a deterministic relation between the learning circumstances and the successive changes in the individuals. He considers, therefore, that the use of words as *formal* and *informal* learning should be avoided. Tynjälä (2008) replies to Billett's observation by concluding that learning both in school and in the workplace practice, contains formal and informal aspects. She adds that in each setting different weights are attributed to these elements. Finally, she considers that three modes of workplace practice can be distinguished: 1) incidental and informal learning, happening as a side-effect of the working practice; 2) intentional, non-formal learning, as intentional practicing of particular skills or tools; and 3) formal training. In this sense, formal learning would also be part of workplace learning practices, not being reserved to the institutional setting of education.

In order to explain the type of learning processes occurring in school and in the workplace and their differences, it is interesting to refer to the metaphors of learning created by Sfard (1998). In the view of this author, learning can be conceptualised as an *acquisition process*, in which learners store new information and acquire knowledge, as well as a *participation process*, where learning occurs thanks to the participation of individuals in their social communities. More recently, Paavola, Lipponen and Hakkarainen (2005) added a new conceptualisation of learning, which considers it as a *knowledge creation process*. According to this metaphor, in line with the participation one, learning is a social process. On the other hand, in this case, it is considered that learning aims at developing new practices rather than acquiring existing ones, which was the case for the previous metaphor. These different views of learning can be associated with Hager's (2004) idea that the *standard paradigm of learning*, viewing the learning as a process focused on mind, interior and transparent, cannot explain the type of learning occurring in the workplace. This type of paradigm, associated with the *acquisition metaphor* would be rather appropriate to describe school-learning. In order to account for the type of learning processes involved in the workplace contexts, Hager refers to an *emerging paradigm of learning*, in which learning is seen as an action in the world, producing a change not only in learners' mind, but also in their environment. This type of paradigm, associated with the *participation* and the *knowledge creation metaphors*, accounts for the type of learning taking place in workplaces.

When discussing about the specificities associated with learning at the workplace, it is important to refer to the fact that all workplaces present their specificities, offering more or less occasions and encouragement for their workers and apprentices to acquire new knowledge and experience different situations. In order to trace the different conditions provided by the working environments to their workers and apprentices, Fuller & Unwin (2004) presented a continuum between expansive and restrictive work communities on which all workplaces could be placed. Expansive workplaces offer their learners three main types of learning opportunities: 1) the participation in different communities of practice; 2) the opportunity to co-construct knowledge and expertise; 2) the opportunity to work on

their theoretical knowledge in off-the-job trainings. However, Billett (2004) underlines how, even in different workplace learning conditions, the way individuals engage in the learning opportunities offered to them during their practice remains central to determine the learning outcome of their workplace experience. In particular, he mentions the fact that learning new knowledge is effortful, and requires refining previous knowledge, as well as values and ideas. He considers therefore that learning is the result of a combination of workplace affordances and individuals' knowledge and attitude towards learning opportunities offered by the environment (Billett, 2001). Additionally, the author produced a list of conditions that, if met, could improve workplace learning: 1) in the first place, workplaces should be invitational to learning; 2) the workplace learning curriculum should be shaped on the needs of the enterprise and consider the role played by both learners and guides (e.g. mentors, supervisors); 3) the workplace should encourage the active participation of both actors: learners and guides; and finally, 4) the learning guides should be appropriately selected and prepared to the task. All these aspects together would create a learning environment favourable, if combined with a constructive attitude of learners, to the learning of workers and apprentices. In the next paragraph we will consider the type of knowledge and expertise that represents the objective of learning in the workplace: the professional development.

1.3.2 Professional development

Along with all the characteristics and specificities mentioned above, vocational education is also characterized by the fact that apprentices need to acquire both "hard skills" related to the theory of the domain and to the execution of practical procedures, and "soft skills", associated with the behaviour, the communication standards and other interpersonal skills associated with the profession. In this sense, the development of professional competence has been associated with the integration of knowledge, skills and attitudes (Eraut, 1994; Kaslow et al., 2007). Baartman & de Bruijn (2011) provide interesting definition for these three elements. Even if knowledge can be defined in various ways, generally a very important distinction involves two main aspects: declarative and procedural knowledge (Anderson, 1982). Declarative knowledge refers to the factual information that a person knows and that are, in this context, needed to perform a task, while procedural knowledge is related capacity of using the pieces of declarative knowledge. A third type of knowledge is often recognized, the metacognitive knowledge, which represents the knowledge associated with the specific situation as the task, the context, and oneself. These authors, additionally, consider the skill to be the sequence of goal-directed activities performed to achieve a certain results, and according to them, these skills are interwoven with knowledge. Finally, attitudes represent the ways of responding to given situations and are based on beliefs and assumptions. Attitudes, therefore, pertain to the affective domain, influencing the way people choose to act. All of these three components play an important role in the definition of professional development of apprentices in a vocational setting. This integration is considered as a fundamental component of professional development as, once terminated their studies, learners

become professionals and they need, therefore, to develop a professional identity during their apprenticeship, which is composed of a set of skills and professional knowledge, as well as an adequate self-efficacy representation related to the execution of their work (Bandura, 2006). As seen before, according to Lave & Wenger (1991), the development of this identity is associated with a progressive movement from the periphery of the community to full and legitimate participation to it, thanks to the progressive acquisition of practices and customs of the professional domain (in line with the participation metaphor of Sfard, 1998).

Two studies investigating the use of project-based learning (Helle et al., 2007; Tynjälä et al., 2009) explored which are the most important skills and knowledge IT professionals need in their job. In order to do so, they administered questionnaires and interviewed a sample of professionals and concluded that the most valued knowledge in this context are domain-specific knowledge, as well as generic working life skills (which can include project management, as well as social competences, as communication and negotiation with others), both provided by work-based project learning. Additionally, this would also impact the development of learners' professional identity, composed of their identification in their professional role, the creation of a career plan, as well as the increase of professional self-efficacy. This development is also very much valued by the professionals in this domain, and we expect that could be generalised to other professional fields. Similar investigations were indeed conducted comparing professional requirements associated with other professions as these were perceived by their university students (teacher education, educational sciences, computer sciences, and pharmacy). The results emerging from this research (Tynjälä et al. 2006) are consistent with the previously mentioned ones. Additionally, this research highlighted one very interesting finding, which is that the occupations traditionally considered as more “technical” are requiring more and more social skills, while, in parallel, the jobs which were mainly characterised by social interactions are requiring progressively more technical competences. In these sense, on the one hand, technical skills and, on the other, social skills, are becoming cross-cutting professionals' competences.

In the research presented in this thesis, we have focused our analysis on two main components associated with apprentices' professional development and professional identity definition: 1) competence acquisition, 2) the development of self-efficacy beliefs.

1.3.2.1 Competence acquisition

One fundamental component associated with the professional development of learners involved in vocational education programs, refers to their acquisition of the professional competences they will need in order to perform their tasks in the workplace. One interesting definition of competence was provided by Le Boterf (2000), who considers that this is the ability to mobilize, while performing a task, different resources, as theoretical knowledge, procedural knowledge, know-how and experiential

knowledge, together with different environmental resources. Competence is therefore the results of the combination of these various types of knowledge in one given situation.

Discussing about the concept of professional competence and skills, it is interesting to refer to Anderson's model of skills acquisition (1982), in which he conceptualises the development of what he considers as the two main components of knowledge: declarative and procedural. In the model ACT-R (Adaptive Control of Thought—Rational), Anderson (1993) asserts that procedural knowledge is always developed on the basis of declarative knowledge. The acquisition of declarative knowledge precedes therefore the development of the procedural one. Weill-Fassina and Pastré (2004), on the other hand, conceptualise the development of procedural knowledge as a process organised around three phases: In a first phase, novices learn a set of rules, which are modelled around a typical situation. Subsequently, in the second phase of the process, they understand how to distinguish different situations, in order to select the more appropriate behaviour to each one of them. In the last phase, an abstract representation of the task results from the creation of various operative concepts, permitting to handle efficiently a large number of situations, including new and unpredictable ones. This phase is associated with the development of expertise (Jasper, 2006; Vanhulle, 2005). Gavota and colleagues (2010) assert that the development of procedural knowledge produces a modification in the way an activity is performed *and* conceived. In this sense, what evolves over time is not only the capacity of performing the task, but also the way in which situations are diagnosed, in order to decide a strategy of action.

In the perspective of cognitive psychology, Anderson (1993) asserts that while formal education settings can provide declarative knowledge, procedural knowledge is acquired through the implementation of the declarative knowledge in practice and results therefore from experience and feedback. In this sense, declarative knowledge is the vehicle for the development of procedural knowledge, as the development of this second type of knowledge is always characterised by the practical implementation of previously acquired declarative concepts. According to this author, workplace practice represents therefore an ideal vehicle for procedural knowledge acquisition. This consideration is consistent with Resnick's (1987) conceptualisation of the main differences between school and workplace learning mentioned above, in which she mentioned how school learning aims at the acquisition of more general skills and principles, while workplace settings provide situation-specific and contextualised knowledge. Gavota et al. (2010), building on Anderson's theory, consider that professional skill mastery may also be reinforced in school context, when time can be dedicated to reflect on learners' actions, comparing different situations and considering alternative procedures. This type of reflective practice is fundamental, in Schön's theory (1983), to stimulate meta-knowledge, which allows for the development of self-regulation. This author moves from the premises that practitioners possess an important amount of implicit knowledge, without being aware of it. He was therefore one of the first authors to emphasize that reflection represents a key tool professionals have

to develop in order to become aware of their knowledge and learn from their experience. More precisely, he specified that the reflection-in-action (during the execution of a task, supporting its finalisation) or on-action (*a posteriori*, once the task is concluded) is usually the results of an unanticipated event happening as a consequence of one action. In this sense, expert practitioners tends to concentrate on unexpected consequence of their action, while if the execution of a task produces the expected consequences, it does not become the object of a reflection. In contrast, novices are inclined to apply procedures and rules, as these were taught to them, in a mechanical manner. According to Schön, it would be important for these novices to reflect on their practice, taking time to consider the situations they encounter from a distance. When discussing about reflection in the context of practice, it is important to make reference to the concept of metacognition. This concept, which is sometimes considered as a synonymous of reflection, refers to the individuals' awareness of their cognitive processes (Mayer, 2003). The cognitive processes involved in metacognition are of all sorts, including perceptions, actions, emotions, and so on. On the basis of Gavota and colleagues (2010), our idea is that it would be possible, with activities designed for this purpose, to support novices in the implementation of this reflexive practice in the school setting.

1.3.2.2 Self-efficacy beliefs

Another important component of the professional development of workers or apprentices is associated with the progresses and evolutions in their self-efficacy beliefs. The concept of self-efficacy, elaborated by Bandura (1977), refers to the personal judgment people have on their capability in performing the courses of actions required to attain designated goals. Self-efficacy is considered as the foundation of motivation and of personal accomplishment, as these beliefs provide people with the sense of agency motivating them through the use of self-monitoring and self-evaluation activities, as well as of self-regulation, supporting the setting of goals and the selection of strategies (Zimmerman, 2000).

Self-efficacy beliefs are characterised by three main dimensions: the *level* refers to how these beliefs are dependent on the difficulty of the task; the *generality* considers the transferability of self-efficacy to different activities; and finally, the *strength* is associated with the certainty about performing one particular task (Bandura, 1997). In order to measure these properties of self-efficacy, questionnaires are composed by a series of task-specific items, considering different levels of difficulty and capturing the respondents' degree of confidence (one example, applied in the case of this research, is to use scales going from 0 to 100%). This type of questionnaires focuses on learners' perception and anticipation of their performances, rather than on personal physical or psychological qualities and characteristics (Zimmerman, 2000). The measurement of self-efficacy beliefs have been applied in any field, from school tasks to professional procedures, as well as to measure the confidence in personal and social competences. Bandura (2006) developed specific guidelines for the creation of self-efficacy

beliefs questionnaires, which were used to conceive and implement these types of tests in virtually any area.

According to Bandura (1997), self-efficacy beliefs have four main sources: 1) the first one is constituted by *performance accomplishments*. In this sense, self-efficacy derives directly from practice and personal experience. Success and failures would, therefore, respectively enhance and reduce the perception of one's capabilities in attaining a certain goal. It is important to underline that single successes or failures would not impact a well-developed sense of efficacy, which means that their impact is particularly relevant when they occur early in the learning process or if they happen repeatedly (van der Bijl & Shortridge-Baggett, 2001). 2) Another source of self-efficacy is associated with the *vicarious experiences*. Observing others performing a task in a successful manner also impacts learners' feelings of competence, as this can provide both examples and information on the difficulty of the task. 3) Additionally, *verbal persuasion* is a common source of self-efficacy. van der Bijl & Shortridge-Baggett (2001), referring to health care professionals, affirm that this verbal persuasion is often used to convince professionals that they can succeed in difficult tasks, through the use of instructions, suggestions and advices. 4) Finally, also *physiological information* is an important source of self-efficacy. In this sense, in order to judge one's own capacity in performing a task, a series of emotional and physiological factors, as tension, fatigue, pain, etc. will be examined and interpreted. When forming a judgement about competence in performing specific tasks, people have to integrate the information coming from all these different sources, associating different weights to each one of them (Bandura, 1986).

In various studies conducted in the academic context, a correlation between help-seeking behaviours and self-efficacy beliefs has been observed. More precisely, learners with high self-efficacy levels tended to seek for the help of others more than learners with low self-efficacy (Williams & Takaku, 2011; Nelson & Ketelhut, 2008). This result is particularly interesting and somewhat surprising, considering the fact that it could be imagined that learners with high self-efficacy could consider they do not need help from others. In this sense, this result suggests that learners with high self-efficacy would have a more adaptive behaviour than colleagues with a lower sense of capability, and this would be a predictor of their academic success (Williams & Takaku, 2011; Lent et al., 2008, Pajares & Usher 2008). In some occasions, however, it was observed how students with a high level of self-efficacy revealed reluctant in seeking help from others even when they needed it (Cleavenger, Gardner, & Mhatre, 2007). This behaviour may be associated to a number of reasons, one could be that learners would feel this may represent a treat to their egos (Karabenick, 2003), while another possible explanation may be associated to the fact that some students tend to overestimate their self-efficacy (Pajares, 2002). It is interesting to notice, in the perspective of our research that the behaviour associated with an overestimation of one's capabilities in performing a task appears to be particularly prominent in writing classes (McCarthy, Meier and Rinderer, 1985). Igo (2002) suggested that the

over-estimation of self-efficacy observed could be due to a lack of feedback from the teachers, as well as to a tendency to praise and reward students for their participation in the writing activity, rather than for the quality of their work. On the other hand, another research conducted on the writing process (Sanders-Reio, Alexander, Reio, Jr., Newman, 2014) has shown how writing self-efficacy may be a predictor for writing performance. This study has tested the impact that beliefs about writing, self-efficacy related to the writing activity and writing apprehension have on performance. The results of this research showed that the beliefs about writing predicted the writing outcomes, as did the self-efficacy beliefs related to this task (although more modestly). Writing apprehension did not reveal a direct impact on students' performance.

An interesting and unexpected effect observed in the development of self-efficacy in learning and training context is associated with the fact that this is not a linear process, as a progressive decline of this type of beliefs over a period, often followed by a slow new increase in these values, has been noticed. Various studies observed this type of effect in the academic context, and in particular in relation to the self-regulatory efficacy beliefs (Caprara et al., 2008) and to the beliefs in efficacy for academic achievement (Britner & Pajares, 2006; Harter, 1996). Caprara et al. (2008) conducted a longitudinal research on high school students, following them over 10 year, starting from high school, into their subsequent occupations. Questionnaires measuring their perceived efficacy for self-regulated learning, as well as their academic achievement, were provided to these participants 6 times during the 10 years of research. The authors conclude that the observed decrease in learners' confidence in performing academic tasks may be attributed to a number of reasons: in the first place, while students advance in their career the complexity in the demands may increase, shaking learners' sense of efficacy. Additionally, students slowly gain new information about the nature of the activities they are required to perform, and this can bring them to reassess their level of ability in the execution of these tasks, making them feel more uncertain. This decline in the sense of efficacy, observed also in teachers (Bandura, 1997; Postareff, Lindblom-Ylänne, & Nevgi, 2007), is often counterbalanced by the real experiences and the progresses and career advancements, thanks to which individuals tends to regain trust in themselves (Bandura, 1997). Postareff and colleagues (2007), in a research investigating teacher in higher education, found out that those who did not have any pedagogical training scored higher in terms of self-efficacy beliefs than those who have just or recently begun their studies. Only after some additional training (about one year), self-efficacy starts to increase again. In this sense, it would not be surprising to observe, and this in different fields, beyond academic environment, a non-linear progress of self-efficacy beliefs, starting often quite elevated, to decrease with the acquisition of initial experience and/or training, followed by a slow increase and regain of confidence in individuals' capabilities of performing the procedures and tasks demanded, which is due to the exposition to the task and/or to the further training received.

1.3.3 The social and the collective dimensions of learning in vocational education

Particularly interesting from the perspective of this research, among the various differences between school and the workplace, identified and discussed above, is the vision that sees learning at school as an individual process and learning at the workplace as a collective one. Resnick (1987) refers to the idea that at school students are usually evaluated on the basis of individual productions, whereas in the workplace they are usually collaborating with other professionals, in a collective situation. Conversely, in our research (Ortoleva, Bétrancourt & Morand, 2012) we argue that learning at school can also be considered as a collective process, as there is a group of students who are at the same (or a similar) stage of development and who can engage in discussions with peers in the same learning situation. On the other hand, in the workplace, apprentices draw a personal education path, constituted by all experiences lived in the workplace, which are unique and specific to each one of them (Billett, 2004). Even if, in the workplace, apprentices are usually working with other professionals, they will often be the only ones in the apprenticeship condition. This vision is supported by the research of Virtanen, Tynjälä & Collin (2009), reporting that students sustain that in the workplace they learn more often by working alone than with others.

Despite appearances, we consider that these two different perspectives about the individual and social dimensions of learning associated with school and the workplace, are actually compatible, as they are looking at these learning environments from different perspectives. Our theory focuses on the learning process per se, in which learners are more accompanied by teachers and classmates in school, and are alone experiencing different working situations in their internships. On the other hand, Resnick's idea looks at the outcome of the process: the evaluation in school and the execution of tasks during the internship. In this sense, indeed, apprentices are evaluated individually while in school (even though progressively more collaborative activities are in place), whereas they perform their task in collaboration with other colleagues in the workplace.

As seen, the duality between these two components of vocational education has generated an animated debate and many, sometimes contrasting, views can be found in literature (e.g. de Saint-Georges and Filliettaz, 2008; Billett, 2009). In our vision, the individual and the collective dimensions of VET are both highly relevant and should be taken into account, as they represent different aspects of learning processes and outcomes. In line with this argument, Tynjälä (2008) also emphasizes the relevance of both the individual and the social dimensions implied in learning in the workplace. In particular, she refers to the fact that learning at work can be described according to two different perspectives. More precisely there is an individual dimension of learning in this context, associated with the observation of what students learn and through which type of activity. On the other hand, it is also interesting to consider how individuals learn in the interaction with other people, as co-workers, supervisors and so on: the social dimension of learning. This type of observation is at the basis of the theory of the legitimate peripheral participation (Lave & Wenger, 1991), observing precisely how new workers

access a social community, starting from a marginal participation to move progressively more towards the centre of the professional group. Tynjälä refers then to the idea that learning depends also on the social and cultural context in which it occurs, and it is in this sense intrinsically social. Bereiter and Scardamalia (1993) add that the expertise is not only associated to individual, but also applies to the functional unities represented by work groups and communities of practice. In this sense, workplace learning has also an important social component. Comforting this idea, Billett (2006), in his workplace learning theory, explains how the constitution of professional identity is composed of two distinct connotations: the personal and the social ones. More precisely, the social identity is represented by the process of taking on the values and norms of the professional group the person is joining.

In reason of all the theories illustrated above, we consider that school should propose activities that articulate and integrate these different dimensions of learning. In our opinion, the challenge encountered by vocational education schools is two-folded: on the one hand, schools should enable apprentices to integrate workplace experiences with the theory that is taught in the classroom into a coherent whole. On the other hand, the school has to provide to all apprentices, regardless the experiences they live in the workplace, the same level of expertise in the domain. The duality among individual and collective dimensions of learning is, therefore, central in vocational education, as the school has to consider the individual and varied experiences apprentices encounter in the workplace, taking into account the social environments encountered by apprentices in the various workplace settings, and integrate them in the collective environment of the classroom.

1.4 Pedagogical models to integrate workplace and school learning

In recent years, various researchers working in the field of vocational education and workplace learning have elaborated pedagogical models aiming at supporting the integration of workplace and school learning. Among these models, we will expose two particularly relevant to our research: the first one is the *Erfahrungsraum Model* (Dillenbourg & Jermann, 2010; Schwendimann et al., 2014), aiming at connecting workplace and school learning through the use of technologies designed and elaborated at this purpose. This general model can apply to virtually any type of learning situation in which a workplace and a school setting are to be integrated in a cohesive manner. Additionally, we will explore the *Integrative Pedagogy Model* (Tynjälä et al, 2006; Tynjälä, 2008, 2009; Heikkinen, Tynjälä & Kiviniemi, 2011), which offers a view of how theoretical knowledge and practical experience could be integrated through the use of a number of mediating tools, such as writing, mentoring and class discussions, stimulating the use of the self-regulative knowledge of learners. Finally, we will present the model we have elaborated in the context of this research, aiming at two objectives, on the one hand the integration of workplace and school learning, accompanied by the consideration of both the

collective and individual dimensions associated with learning in school and in the workplace in vocational education settings.

1.4.1 The Erfahrungsraum Model: Technologies to integrate workplace and school

The Erfahrungsraum Model, conceptualised as a mean to bridge the gap between the outcomes of workplace and school learning, considers how technologies could serve as a tool to connect these two environments by bringing elements from school to the workplace and vice versa. This instructional design model was conceptualised in the framework of the Dual-T project, the same research project within which the research presented in this thesis was conducted. The conceptualisation of the Erfahrungsraum model was based on the observation of a number of gaps existing between school and workplace learning that the apprentices involved in vocational education curricula perceived as challenging (Eteläpelto, 2008; Taylor & Freeman, 2011). These learners complained about the weak relationship between what they learn in school and what they face in the workplace (de Bruijn & Leeman, 2011). Schwendimann et al. (2014), inspired by other models discussing the integration of workplace and school, such as the expansive model, the connective model and the integrative pedagogy model (which we will present later), consider that two key concept can be identified as means to overcome the issue of the relationship between school and the workplace: the *reflective practice* on experience and the concept of *boundary-crossing* processes.

The reflective practice is particularly valued in this context in reason of various theories asserting that, even if learning by doing has a central role in this type of education, experience per se is not sufficient for learning. In this sense, reflection on this experience represents a key activity for knowledge acquisition (Schön, 1983). However, this practice is not spontaneous for apprentices and needs to be encouraged by the learning setting in which they operate (Taylor and Freeman, 2011; Raizen, 1994). As this type of activity is considered more suitable for the school setting than the workplace environment (Van Woerkom, 2011), the Erfahrungsraum model proposes to bring experiences lived in the workplace to school, where learners will be allowed time to reflect on their practice and on specific situations encountered in their workplaces. This is currently not a common didactical practice (Schaap et al, 2012). Additionally, boundary-crossing processes are considered of key relevance in this model, as in learning settings based on different environments what is learned in one context remains often strictly connected to it, making it difficult for learners to transfer this new knowledge in a different environment (Renkl, Mandl & Gruber, 1996). Crossing boundaries, students are encouraged to overcome socio-cultural differences (Engeström, Engeström & Kärkkäinen, 1995) reflecting on their activities and gaining understanding on their learning in the different contexts, developing the ability to work in changing and new situations. Schwendimann et al. conclude that these connexions between learning environments is not spontaneous (Eraut, 2004), and this type of processes requires a specific design of the learning environments, that could be guided by the model they propose, in which

technological tools are designed in order to support learners in this process of bridging the gap between workplace and school situations.

The world *Erfahrraum* is a neologism, deriving from the union of two German words: *erfahrung* meaning experience and *raum*, room. This model strives at creating an environment, in school, where to reflect and discuss experiences, encountered in the workplace. In this sense, the authors of this model consider that dual education should provide learners with dedicated space and time to integrate the learning outcomes of both environments, while at the same time maintaining and valuing the specificities associated with each one of these settings. Technologies, in this model, are expected to provide the ideal support for the creation of this space for reflection on experiences.

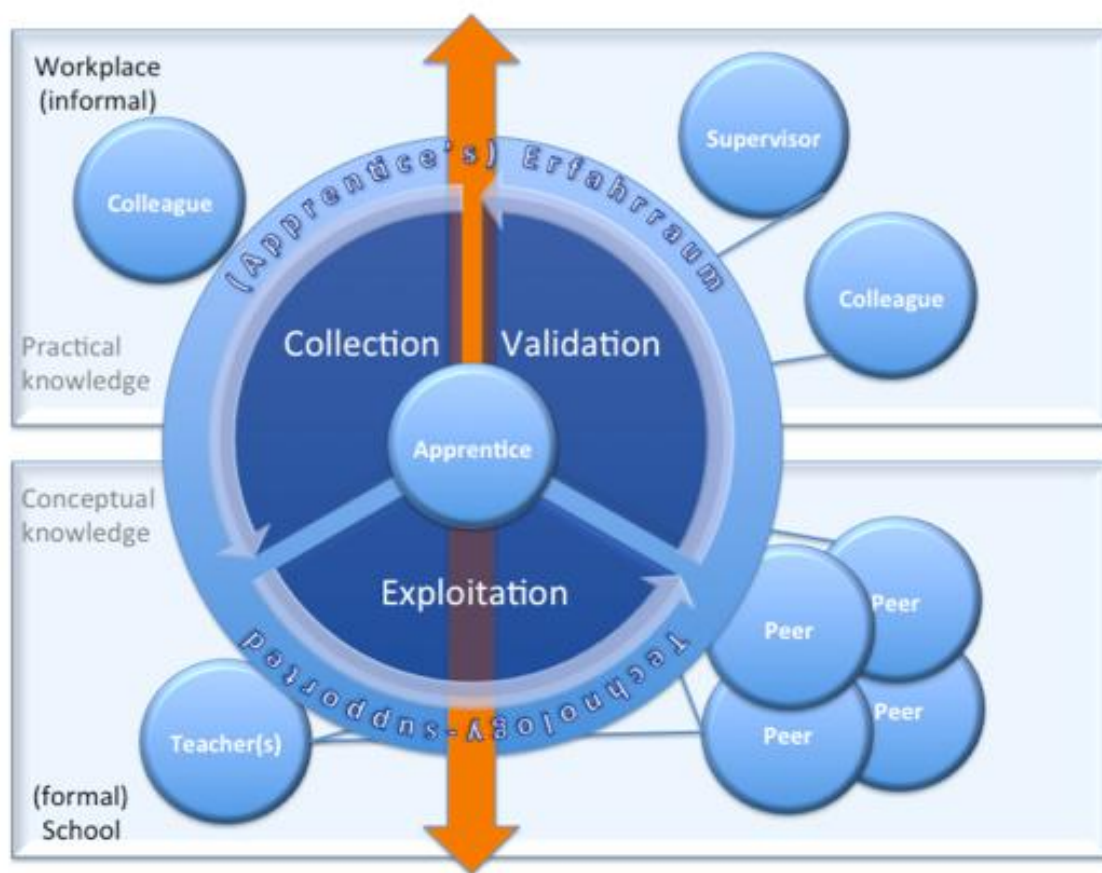


Figure 2. The three phases of the Erfahrraum Model (Schwendimann et al., unpublished figure)

The Erfahrraum model, represented in figure 2, is a circular model, organised around three key phases:

1. *Collection*: This phase takes place when learners are involved in their workplace practice. In this context, they are required to store elements of their experience, which will be used as the basis for their reflection in the next phases of the activity. In order to collect these situations, they can use a number of tools to capture various elements. In this sense, technologies provide various possibilities, as cameras which can be used to take pictures or videos, recording

directly what happens in the working environment, or other types of platforms (as wiki, for example) allowing learners to take notes about their experience, which will be accessible in the future from different settings. The type of tool that will be used to collect experiences will strongly depend on the workplace and its specificities. When working with physical objects for which it is key to record the procedure (as cooking or repairing cars, to make some examples) or to capture the end result (again cooking, or baking), the use of cameras may reveal more appropriate. On the other hand, when working with people, as in the health care domain, severe restrictions considering the rights associated to the privacy of the patients have to be observed. In this case, writing may reveal particularly helpful. The collection phase is not only based on this capture of particular moments through the use of technologies, but implies also the selection and organisation of this material, which will be used later on.

2. *Exploitation*: This phase, in contrast with the previous one, takes place in the school setting. Here, the teacher and the learners exploit the material that was previously collected in the workplace, in order to reflect on it. Firstly, the teacher analyses the material, in order to determine whether it is appropriate for the learning purpose. Afterwards, a number of different activities can be conducted on the basis of this set of experiences: they can be shared, compared, analysed, used to provide and receive feedback from peers and the teachers, and so on. Particularly useful, for the author of this model, are platforms as eportfolios and similar technologies, providing a context where to collect, organise, store and rework the material collected in the preceding phase of the activity.
3. *Validation*: The last phase of this model foresees that learners should make sense of the results of the exploitation phase, composed of their interaction with others (teachers, colleagues) and their reflection on the situation, in order to bring this new knowledge back to the workplace. In this context, it will be practiced and assessed again, so to determine its effectiveness and real value in this setting. The effectiveness of this cycle will be measured in this last phase, as it aims at improving the quality, speed and satisfaction of workplace activities.

This model, which was applied in a number of vocational education settings, with various professional roles, revealed particularly interesting. One important aspect associated with it is related to its flexibility, as adapting the type of technology used and the mean used to capture experiences during the workplace practice, it can be used in virtually any type of vocational education or even higher education curriculum based on the coexistence and integration of learning in different settings.

1.4.2 The integrative pedagogy model: integrating theory and practice through self-regulative knowledge

If the Erfahrungsraum model makes more general reference to the use of technology as tools to bridge the gap between school and the workplace, the Integrative Pedagogy model (Tynjälä et al, 2006; Tynjälä, 2008; Heikkinen et al., 2011; Tynjälä and Gijbels, 2012) focuses more on the use of specific tools,

which are considered as key mediating elements between theory and practice, such as writing, mentoring and discussion. This model moves from the premises of the different models of work experience identified by Guile and Griffith (2001). The five models are: 1) *The traditional model*, in which learners are inserted in a workplace without particular guidance. The collaboration between the learning environments involved in the process is limited, producing a net separation between the formal and the informal learning contexts. 2) *The experiential model*, in which the focus is the development of learners through the direct experience of the workplace. The accent is therefore put on the reflection on workplace situations, and the collaboration between school and the workplace becomes more relevant, as the school setting aims at preparing and debriefing learners respectively before and after their insertion in the workplace setting. 3) *The generic model* emphasises the importance of learning outcomes, as work experience is considered as the key moment in order to provide learners with the generic skills they will need in their future work. The role of school is to support learners in self-manage their competence acquisition, through a set of possible tools, including, for example, portfolios. 4) *The work process model* focuses on the development of a holistic understanding of the workplace environment. This model requires both theoretical and practical knowledge, which implies that a close collaboration of school and workplace is needed. Finally, 5) *The connective model*, consists of the idea of bringing learners to make a connection between formal and informal learning, focusing both on learners' conceptual development and on their capacity to work in changing and new environments. This model, which is considered as the ideal way to exploit workplace experience, requires a strong collaboration between school and workplace.

If, according to Guile and Griffith (2001) all models, but the connective one, can be found in the vocational education systems in use in different European countries (and within the same countries, as different models may be associated with different professional domains, Virtanen & Tynjälä, 2008), Tynjälä (2008), with her Integrative Pedagogy model (Fig. 3), designs a way to apply specifically the connective model in the vocational setting.

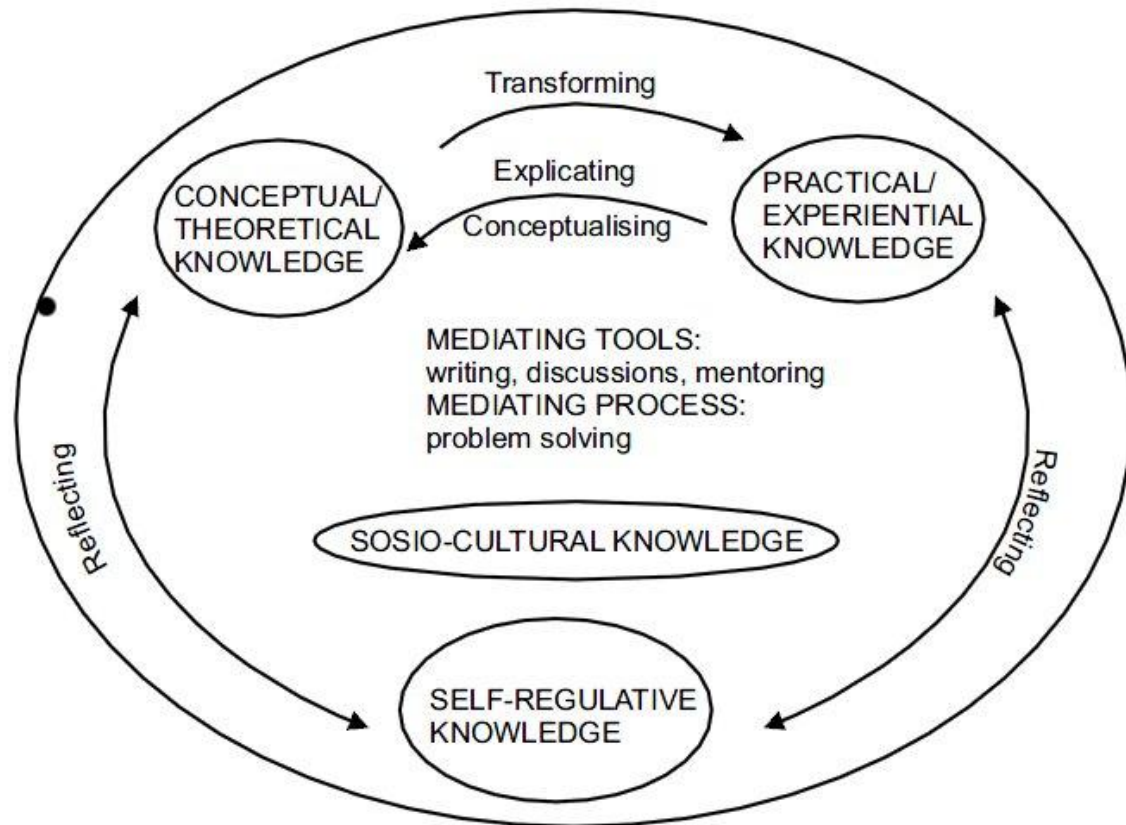


Figure 3. The Integrative Pedagogy model (Tynjälä & Gijbels, 2012)

According to the Integrative Pedagogy model, professional expertise is constituted of four main components, which are conceptual/theoretical knowledge, practical/experiential knowledge, self-regulative knowledge and socio-cultural knowledge. Theoretical knowledge is mainly constituted by the knowledge acquired in school, which is universal, formal and explicit, whereas practical knowledge is represented by the procedures and skills acquired through workplace practice, which can be defined as implicit and tacit, as well as contextualised in the specific workplace situation. The third type of knowledge involved in this model, the self-regulative knowledge, comprehends metacognitive and reflective skills (Bereiter, 2002; Bereiter and Scardamalia, 1993), which are activated through the use of mediating tools essential for the process of linking theoretical and practical knowledge. A strong self-regulative knowledge is constituted by reflective evaluation of one's own activities, awareness of one's own strengths and weaknesses, and development of competence. Finally, the fourth type of knowledge, the socio-cultural knowledge, represents all the knowledge that is embedded in the social practices of workplaces and is learned through participation in these practices. The arrows visible in the representation of the model (Fig.3) characterize the relationship between these types of knowledge. If both conceptual and practical knowledge can relate with self-regulative knowledge through the use of reflection, the relationship between the other two is slightly more complex. Conceptual, theoretical knowledge can be transformed so that it becomes available to be used in practice, while practical, experiential knowledge has to be explained and conceptualized in order to be

related to theoretical concepts. The socio-cultural knowledge appears more separated from the other types of knowledge, as it is embedded in the practice and not always explicit. Additionally, this type of knowledge, in contrast with the other three, is not personal to each individual, but proper to a workplace environment. However, it plays an important role as it is always in the background of the other types of knowledge, having connection with the three of them.

While traditionally these four types of knowledge have been treated separately, Tynjälä (2008) asserts that modern pedagogy should integrate them in a coherent whole by teaching them together. According to the integrative pedagogy model, theory should be considered in light of practical experiences and vice versa. To encourage this process and to prompt the self-regulative knowledge, different mediating tools, which activate reflection and meta-cognition, can be used. Among these tools are tutoring/mentoring, discussion, and writing activities. Tynjälä (2008) identifies three types of implications associated with the implementation of this model to learning situations implying direct workplace practice: 1) The development of professional expertise is a process which requires both theory and practice and the two of them cannot be considered separately. 2) When involved in problem solving processes (which is one key activity in which learners need to integrate the formal knowledge acquired in school with the experiential knowledge developed in practice; Bereiter & Scardamalia, 1993), learners have to be provided with both theoretical and practical experience. 3) The participation in real working situation is a necessary condition to develop professional expertise, but is not sufficient, as theoretical, practical, self-regulative and socio-cultural knowledge are all needed for learners' professional development.

1.4.3 Computer-supported collaborative writing for professional development

In consideration of these two models, aiming at the integration of workplace and school learning, in the context of our research, we elaborated a new conceptualisation of how school learning and workplace experience can be brought together, while, at the same time, respecting the relevance and importance of both the social and individual dimensions of learning that, as said earlier, have a key role in both settings involved in vocational education. Elements emerging from both the Erfahrungsraum and the Integrative Pedagogy were taken into account, in order to build a concrete example of how to support learners in bringing to school experiences of the workplace, in order to reassess and rework them, so that they will be ready to be reinserted in practice. In order to do this type of exercise, learners use writing activities to reflect individually on the difficult situations they encountered, in order to, afterwards, submit them to the collective dimension of their classroom, and receive comments and ideas from others, while, at the same time, providing interesting reflective elements to their colleagues facing other types of situations.

This new model conceptualising the use of computer-supported collaborative writing for professional development is presented in figure 4.

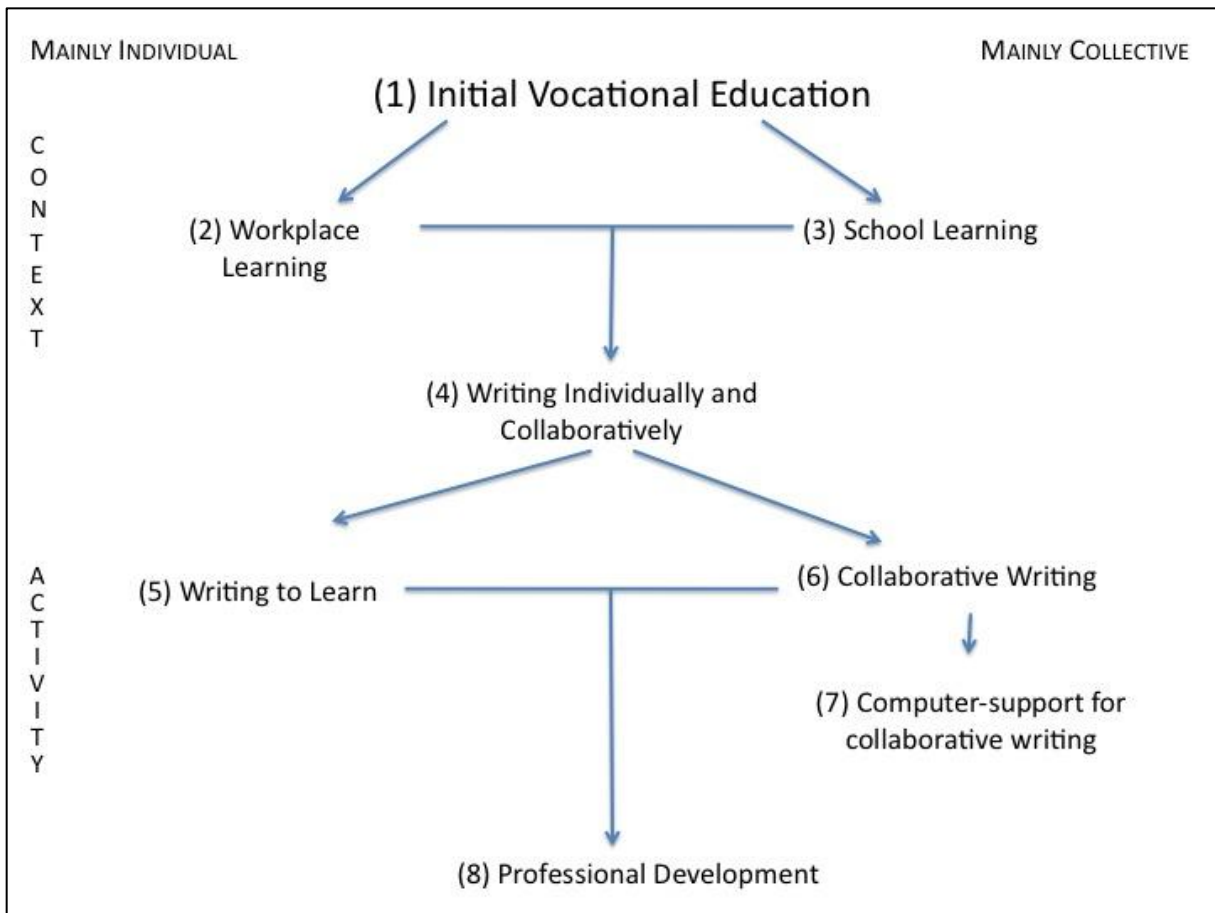


Figure 4. Conceptualisation of the use of computer-supported collaborative writing for professional development

This model moves from the observation that, in the vocational education context (point 1, in the schema above), learning in the workplace is often a mainly individual task (2), in which learners are confronted with a series of situations that will constitute their own portfolio of experiences and practices, and that will differ from the one encountered by any other apprentice in a different, or even in the same, workplace situation. On the other hand, school learning (3), in this model is considered as a collective process, as in this context learners are inserted in a group of peers, progressing together in their educational path (Ortoleva, Bétrancourt & Morand, 2012). As mentioned above (see section 1.3.3 The social and the collective dimensions of learning in vocational education), we are well aware that other very interesting, but contrasting, views may perceive school as an individual process and workplace learning as a more collective one (e.g. Resnick, 1987), but as here we would like to focus on the learning process, rather than on the activity per se, we will stick to our perspective in which the social and the individual dimensions of learning are respectively associated to the school and the workplace practice (even though we recognize that both social and individual learning play a role in the two settings).

In consideration of these two dimensions of learning in vocational education, and of research determining how pedagogical scenarios should not only include collaborative group-learning activities

but also individual and collective ones (Dillenbourg & Jermann, 2010), we elaborated an instructional scenario, in which individual and collaborative writing activities (4) provide learners with the opportunity of working individually on experiences encountered in their practice, in order to, in a following step, share them with fellow learners in a more collective and collaborative setting. In this sense, this activity is organised around two main phases: in the first phase, learners are asked to write individually (5) about a critical situation encountered in their workplace practice (following the critical incident technique; Flanagan, 1954). The main idea of this activity is based on a number of theories considering that the writing process *per se* has beneficial effects on learning. These theories belonging to the *writing to learn* research paradigm, consider that the writing activity supports reflection on experience, bringing to the reorganisation of previously existent knowledge, as well as the creation of new concepts and ideas (Tynjälä, Mason & Lonka, 2001; Galbraith, 1999). In order to elaborate these personal and individual experiences in a more collective manner, this model suggests using collaborative writing activities (6), in which learners will share and discuss the situations they encountered in their workplace, in order to receive others' points of view on the challenges they encounter, as well as to allow learners to have a more extensive view of the workplace conditions encountered by their fellow learners in their workplaces. In this sense, the idea of collaboration is perceived as having some important beneficial effects on the learning process (Davies, 2002), by, for example, provoking and mediating a socio-cognitive conflict between learners (Bereiter & Scardamalia, 1994). Technologies supporting collaborative writing (7) play a key role in the scenario, as they permit to orchestrate this process of moving from the individual to the collective dimensions of learning in a smooth and easy-to-orchestrate manner. The theoretical background connected to writing both individually and collaboratively (4), and more specifically, its three fundamental aspects in the scenario, associated with the use of writing as a learning activity (5), with collaborative writing tasks (6), and with the technologies aiming at supporting collaborative writing (7), will be detailed in the next chapter.

The overall outcome of this scenario would be, in our view, the production of a change in apprentices, characterised by the elaboration of previously existent knowledge and understanding, accompanied by the construction of new concepts. Also, their participation in a community of learners, through the written exchange encountered in this model, would account for a modified perception of their role in the professional community, impacting learners' self-efficacy beliefs as well as their professional identity. Therefore, globally, this type of scenario is supposed to impact learners on different dimensions constituting their professional development (8), as it was described above (see section 1.3.2 Professional development).

As said, the scenario we propose is strongly inspired by both the *Erfahrraum* and the *Integrative Pedagogy* models. More precisely, the idea of using writing as a mean to capture difficult experiences encountered in the workplace and to reuse and exploit them in the classroom setting embraces the

cycle proposed by the Erfahrungsraum. The situations are collected in an interactive platform, and even if this is not done directly in the workplace, as learners write down the situations they encounter while they are in school, this is nevertheless a way of capturing workplace situations. After this collection phase, there is a moment in which learners are required to share these situations with others, in order to receive their comments, while at the same time, providing their feedback to others. This allows, not only to learn from the comments, ideas and criticism others have on the way each one handled one situation, but also to acquire new knowledge and expertise through the task of providing comments to others, trying to imagine the more appropriate reaction to a situation. Contemporary, this allows acquiring new, more accurate perspectives on the working conditions of others. The validation phase of this scenario is reflected in the idea that learners will elaborate new strategies in their working situations, in order to handle these critical incidents, while contemporary prepare themselves to situations they have never encountered, but that were treated in the episodes reported by their colleagues. This validation again does not take place directly in the working environment, but is postponed to the next implementation of the scenario in the school setting. In this context, learners will be asked to consult again the episodes previously described and read, in order to describe if they had the opportunity of applying the suggestions obtained by others and implementing the conclusion to which they arrived in the classroom. Globally, we consider, therefore, that even if this scenario is conducted in the classroom, without direct intervention in the workplace activity, it still represents an ideal manner to relate and bring together workplace learning with the school setting. This is particularly relevant because, as we will see later on, we implemented this type of pedagogic activity in the context of a vocational school for health care professionals. This has two important implications, which are reflected in the way we modelled this scenario: on the one hand, there are extremely strict rules to protect the privacy of the patients, which means that no direct capturing as taking pictures or videos of a procedure can be allowed in this context. Additionally, the work performed by apprentices in this setting is mainly relational; in this sense they happen to face, on a daily basis, critical situations with patients activating their emotional reaction, together with their professional skills and expertise. The idea of capturing critical events through writing in the classroom, therefore not immediately after the incident happened and in a different setting, can reveal particularly useful for emotionally rich events, where the learners may need some detachment from the moment itself, in order to collect their ideas and be able to write down the issue they encountered and discuss it, being eventually open for constructive criticism.

In consideration of these limitations in terms of direct capturing of incidents and events from the workplace, other activities had to be considered and writing was selected in consideration of the role this process plays in the integrative pedagogy model. As we saw earlier, in the integrative pedagogy model, writing is considered as a mediating tool between theoretical knowledge and practical experience. Additionally, another mediating tool considered by Tynjälä in her model is represented by

discussion and mentoring. The idea of sharing the critical experiences with others in order to collect their comments and suggestions represents a way of encouraging a written dialogue, therefore implementing the mediating tool of peer-discussion in this setting. Through this scenario, we aimed at following the concepts expressed by the integrative pedagogy model, adapting them to the specific situation of our vocational learning context. Additionally, Tynjälä (2008) inspired by Bereiter and Scardamalia (1993) asserts that activities as problem-solving and collaborative learning represent ways to narrow the gap between theoretical and practical knowledge, therefore creating bridges between school and workplace learning.

2. Computer-Supported Collaborative Writing

The model we developed to support the integration of workplace and school learning, in initial vocational education in Switzerland, postulates that the use of computer-supported collaborative writing activities represents an ideal way of encouraging learners in performing links and connections between the different learning environments with which they are confronted. Additionally, we consider that both the individual and the social components associated with learning, in school and in the workplace, play a role in the acquisition of new knowledge in the vocational education context. In this sense, in this activity, writing individually critical situations encountered in the workplace and sharing them with colleagues, through a reciprocal written peer-feedback task, represent the ideal way of supporting the integration of individual and collaborative learning processes, bringing professional practice inside the classroom.

In the coming paragraph, we will explore the literature on the domain of writing as a learning activity and of collaborative learning and collaborative writing in particular. We will focus, in this sense, on peer-feedback and peer-commenting activities, which are particularly interesting to consider in the perspective of our study. Additionally, we will discuss the support technologies can provide to both writing and collaborative writing activities.

2.1 Writing as a learning activity

The topic of writing has inspired a great deal of research analysing and observing this activity in various contexts and in different grades of schooling, going from elementary schools to the academic environment. The *writing across the curriculum* movement, named by Britton and colleagues in 1975, for example, has been involved, in the last few decades, with the analysis and research on the topic of writing. Schematically, two main lines of research could be identified within this movement (McLeod, 1992): a *cognitive* approach examining writing to learn activities, on the basis of the idea that writing represents a unique way to learn new information (Emig, 1977), and develop ideas, beliefs and knowledge, and a more *rhetorical* approach, which analyses the process of learning to write. This second approach analyses the way in which writing is learnt, to identify the developmental, cognitive and instructional aspect of this activity, and therefore analyse how it can be taught effectively (Rijlaarsdam, Bergh & Couzijn, 2005; for two interesting meta-reviews on this topic: Graham & Perin, 2007, analysing learning to write with adolescents; and Graham et al., 2012, focusing on elementary grades). Additionally, another focus of interest of this line of inquiry is associated with foreign language acquisition and the development of writing skills in this context (Ransdell & Barbier, 2002; Rijlaarsdam et al., 2013).

The first of these approaches, writing-to-learn, represents one of the foundations of the research we conducted in this thesis, and will be further analyzed in the next section of this introduction. It is interesting to point out, considering the context of this research, that the writing activities and its implications on the learning process have been the focus of numerous research across all educational levels. However, only few researchers have regarded the specific implications of writing in the professional context and as a tool for professional development. This becomes particularly interesting especially in consideration of the increasing use and practice of the writing activity in workplace environments. In reason of technological access and of the change in workplaces organization, writing has become a key activity for workers in any field, and with very different professional roles. In this sense, we believe that it is highly important, for researchers, to understand the use of writing in the professional context (Ortoleva, Bétrancourt, & Billett, 2014).

2.1.1 How writing promotes learning

Writing-to-learn is a research field that postulates beneficial effects of writing on the learning process. Studies belonging to this research paradigm particularly investigate the conditions under which these beneficial effects can be verified. Various authors have studied the impact of this activity on the cognitive processes and have concluded that writing implies organisation, manipulation and integration of knowledge (Olson, 1994). These processes encourage the creation of new concepts and the reorganisation of pre-existing ones (Tynjälä, Mason, & Lonka, 2001).

Different metaphors have been formulated to explain the effect that writing activities have on cognition: writing, for example, has been described as a *problem-solving process*. Hayes & Flower (1980), analysing the texts written by students engaged in drafting expository texts, considered writing as a *goal-oriented activity* that is carried out using specific procedures such as: *planning* (generating ideas, organising them and setting goals), *translating* (transforming plans into text) and *revising* (adjusting the text produced in order to improve quality). On the basis of this model of the writing activity, researchers formulated the hypothesis that two main strategies can be identified in writers: planning strategies, in which writers think thoroughly and decide what they want to say before writing, and the revising strategy, in which they write a rough draft which will be subsequently revised (Galbraith & Torrance, 2004). Research provided evidence of the existence and relevance of these strategies. In particular, Torrance, Thomas & Robinson (1994) could identify in postgraduate students the existence of three groups: planners, revisers and mixed strategy writers. In a successive study, Torrance and colleagues (1999) encountered similar evidence in undergraduate students and measured the impact of the use of these strategies on writing performance. They found out that there was no significant relationship between the strategy used and the final note at the writing task, therefore no strategy seem to be better than the other in terms of efficiency or final product. On the other hand, the writing strategies seem to be somehow stable, as in another research (Torrance et al. 2000) it was proved that 85% of undergraduate students show a predominant strategy.

On the basis of Hayes & Flower model, also Bereiter and Scardamalia (1987) proposed different writing strategies, distinguishing between *knowledge telling* and *knowledge transforming*. The former being the strategy of writing everything the writer knows about a given topic, without paying attention to the structure and organisation of the text. The latter constituting a method of transformation of ideas, where the writer takes into account the goal of the activity in order to modify the concepts, and create a hierarchy of information, keeping in mind clarity, plausibility and effectiveness of the text. In more recent years, Kellogg (2008) conceptualised the existence of another stage of writers' skills and development, named *knowledge crafting*. This strategy implies that writers adapt their texts to their audience, and on the basis of its characteristics, they select the information to present, as well as the way of presenting them (more information about the audience role in the writing process are given below, see section 2.1.3 Writing as a social activity). In Kellogg's conceptualisation, these three stages of writers' development: knowledge telling, knowledge transforming and knowledge crafting are not discrete, but rather placed on a continuum.

The *problem-solving, knowledge telling / transforming* model of writing was criticised by Galbraith (1999), who considered that this model represented writing as a controlled process, neglecting all the spontaneous aspects of the writing activity. He, therefore, suggested an additional dimension to it: the *knowledge constituting* strategy. This new model takes into account the creative process of writing and considers that the activity of writing implies the production of new concepts and ideas and their organisation, as well as the reorganisation of previous knowledge. More recently, Galbraith (2009) proposed a model showing a dual-process of discovery through writing (which refers to the formulation of new knowledge through the writing activity), which adds on and modifies Kellogg's (1988) conception of the role of outlining in the writing task. On the one hand, Kellogg's considered that outlining is associated with better text quality as it allows writers to separate the reflection phase, comprising text planning and organisation, from the actual drafting, formulating ideas in a comprehensible manner. Galbraith, on the other hand, saw the two phases of explicit planning and implicit text production as more interconnected. In his model, he asserts that the explicit planning process involves retrieval of information from the working memory, and its manipulation, in order to create a new knowledge object. The implicit text production process operates on the writer's disposition towards writing. This process is guided by the implicit organization of the semantic memory, which implies that the sequence in which the content will be produced is unpredictable. This process leads to the progressive formulation of new concepts that did not exist in the semantic memory before writing.

Discussing the same topic of writing strategies and modalities, Klein (1999) proposed four major hypotheses related to the effects of writing on cognitive development: 1) *Point of utterance* hypothesis: writers spontaneously generate knowledge when they write; 2) *Forward search* hypothesis: writers first externalise ideas by writing and successively revise them, generating

inferences; 3) *Genre* hypothesis: compares learning outcomes of different genres, as personal writing, argumentation, note taking, etc.; 4) *Backward search* hypothesis: writers construct knowledge by setting goals and solving content problems to achieve these goals. According to Klein, these hypotheses could correspond to different phases of the writing process, but only the *genre* hypothesis has been systematically tested and further research is needed. Klein's review has been criticised (Tynjälä *et al.*, 2001) as it only looks at the cognitive implications of the writing process on individuals, without considering the social and cultural practices, which widens the scope of writing to a form of social and collaborative knowledge building.

2.1.2 Design of writing activities

Regardless the attention that the topic of writing as a learning tool has generated, many contradictory and inconclusive results came out of the various attempts to collect evidence about its effectiveness (for critical reviews of various studies, see Ackerman, 1993 and Bangert-Drowns, Hurley & Wilkinson, 2004). Tynjälä (1998) explores the reasons underlying these contradictory outcomes, and points out one important element: typically, in these studies, the learning outcome has been measured through quantitative testing on recall tasks. This kind of exercise only measures quantitative outcome of learning, as the memorization, without paying attention to its quality. Tynjälä suggests that when memorisation is the sole aim of a learning activity, then writing does not represent an effective learning method (Penrose, 1992). On the other hand, if the objective of a learning activity is to produce conceptual knowledge change and the development of critical thinking, writing represents a suitable alternative (Tierney *et al.* 1989) as it implies a reflection process, compositing knowledge organisation, manipulation and integration (Olson, 1994). In order to verify this idea, a research with university students in educational sciences was implemented. In this study participants were confronted with writing tasks and group discussions. This research proved that this type of activity could significantly enhance learners' comprehension of domain knowledge and development of critical thinking, measured on the basis of subjective evaluation of learners (Tynjälä, 1998).

Interestingly, in the perspective of our research, various studies have demonstrated the effectiveness of journal writing as a learning tool, as it develops metacognitive skills and reflection of students (e.g. McCrindle & Christensen, 1996). Additionally, two studies demonstrated the effectiveness of journal writing in nursing education. One study (Cowles, Strickland, & Rodgers, 2001) demonstrated that continuous use of learning journals had effective results, with nursing students using this tool being able to produce superior papers at the end of the course. Another research, by Gillis (2001) demonstrated that journal writing supported nurses in the process of articulating and connecting theoretical knowledge acquired in the classroom and clinical experiences encountered in the workplace.

Tynjälä and colleagues (2001) propose a series of conditions that, if met, make writing an effective learning tool: 1) Writing tasks should require conceptual change and knowledge transformation/construction. 2) Students' previous knowledge and beliefs should be taken into account, by using free-writing exercises before studying the topic. 3) The writing tasks should encourage students to reflect about their own experiences. 4) Students should be encouraged to solve practical problems by applying theoretical knowledge. 5) The tasks should be integrated within the class curriculum, by organising discussions and small group activities around them. This last condition refers to the idea that writing should be considered as a social activity and not only as an individual one. Additionally, Tynjälä points out that the most efficient way to exploit the writing activity for learning purposes is to combine it with oral discussion and reading (Tynjälä, 1998). The five conditions listed above perfectly apply to the context of vocational education, making it a potentially fertile field to implement writing activities. However, this type of research, which is extremely popular in the higher education and academic environment, has been so far less implemented in the professional education field.

In this context it is important to mention the fact that, together with the design of the writing activity, another very important aspect anticipating writers' performance is associated with their beliefs about writing, as well as their writing self-efficacy and writing apprehension (Sanders-Reio et al., 2014). Graham, Schwartz, and MacArthur (1993) go so far as saying that the attitudes and beliefs about writing play an important role in the constitution of the writing process, therefore impacting the written production resulting from it.

2.1.3 Writing as a social activity

According to Graham & Harris (2013), writing is to be considered as a social activity, as it implies an implicit or explicit dialogue between the writer(s) and the reader(s). Additionally, these authors pointed out that the writing activity takes place in a cultural context, which shapes the purposes and meaning associated with it. In accordance with this idea, writing-to-learn theory has regarded writing not only as an individual process, but also as a social activity, and has considered its potentiality as a collaborative activity: writing can be, for example, a group activity, where different people contribute to one single document, as usually is the case for collaborative essay writing. Alternatively, individually written text can also be shared and commented by others.

In this sense, in this type of collaborative writing activity, audience acquires a central role, as writers consider their future audience while producing their texts, adapting their style of writing (Bell, 1984). As seen above, Kellogg (2008) asserts that the consideration of the audience and the adaptation of the text to its main characteristics is a key step in writers' development, as this represents the fundamental ingredient to reach the *knowledge crafting* associated with expert writing. In Lavelle's research (1993), the sense of the audience represents one of the main differences between writers using a deep

or a surface approach to writing. The identification of the audience adds authenticity to the task, improving participants' performance and participation in the task (Magnifico, 2010). Considering the audience while writing also implies that writers will adjust to it, in order to adapt their presentation, content and tone to the reader (Beach & Friedrich, 2006; Miller & Charney, 2008). Additionally, according to Baudrit (2005) audience consideration has positive effects, as writers engage in clarifying their texts and this implies a series of cognitive processes that prompt reflection meta-cognition and knowledge re-organisation.

Discussing about writing as a social activity, it is important to mention that recent developments in technology and Internet connectivity has brought to the emergence of a number of tools supporting the collaborative writing process, thanks to the sharing, collaborative editing and discussion features (see section 2.3 Computer-supported collaborative writing for professional development). In the following section we will discuss about the characteristics of collaborative learning and writing activities, with a special focus on the research considering technology affordances for collaborative writing.

2.2 Collaborative learning

Collaborative learning as a concept is hard to define, as many different interpretations can be associated with it. Using Dillenbourg's definition (Dillenbourg et al, 1996) collaborative learning can be seen a social contract between peers (and sometimes the teacher), which specifies the conditions under which some interaction should occur.

According to Stahl, Koshmann, & Suthers (2006), for many years, collaboration has been treated as a way to observe how individuals function in groups. In terms of research, the goal was therefore, to establish whether and under which circumstances learning in group was more effective than learning alone. This approach neglected completely some of the aspects related to the collaboration and group dynamics, which are, for example, the negotiation and sharing of meanings and the construction of shared conceptions, which implies that collaboration cannot be reduced to individual dynamics. More recently, the group process and the properties of the interaction among the group members gained attention, becoming central to the analysis of collaborative learning. Empirical studies in this area are therefore focusing on understanding the parameters and conditions that mediate interaction among individuals, analysing the characteristics of productive and non-productive interactions (e.g. Scanlon 2011; Suthers & Medina, 2011).

The development of computers and the increased availability of Internet connection have offered the possibility to collaborate across space and time, to keep track of all phases of the collaboration and

revise the production over time. A remarkable portion of the research on collaborative learning has, therefore, moved to technology-enhanced learning environments, with the development of the Computer-Supported Collaborative Learning (CSCL) research paradigm.

2.2.1 Computer-Supported Collaborative Learning (CSCL)

CSCL focuses on the analysis of how collaboration between peers can be triggered and enhanced in computer-supported environments in order to favour deeper learning (Puntambekar, Erkens, & Hmelo-Silver, 2011; Spada, Stahl, Miyake, & Law, 2011). Gerry Stahl (2002), one of the founder of CSCL, identified four main research themes that he considered should become central to the field of CSCL: 1) Collaborative knowledge building; 2) Group and personal perspectives; 3) Mediation by artefacts; 4) Interaction analysis. More specifically, this author considers that the four mentioned themes should be brought together by CSCL, following four main argumentations, which would set the direction of future research in this field. In the first place, the term knowledge building should be used in the place of learning when the research analysis focuses on collaboration. Additionally, this knowledge building is the results of a combination of personal and group perspectives, which requires researchers to consider them both, and particularly the interaction between them, in order to understand this process. Moreover, the construction of knowledge requires the utilisation of a number of different types of artifacts, as well as the creation of new ones, which are necessary to create and communicate new knowledge. Finally, the examples and proofs of collaborative knowledge building derived from the observation of interactions, are to be analysed in a rigorous manner, in order to make visible the type of exchanges and interactions producing the co-construction of new knowledge.

A few years later, Dillenbourg & Fischer (2007) summarized the main ideas of the CSCL research and pointed out two interesting concepts: firstly, the collaboration between peers does not happen spontaneously. On the contrary, participants at all educational levels may reveal reticent in engaging in a truly collaborative effort (see Grant, 2009 for an example of a research conducted in secondary education, and Hadjerrouit, 2014 who analysed the collaborative behaviours of university students) and need therefore to be triggered and guided through the design of the activities. In particular, well designed activities should place students in situations where they need to interact, and should provide them with all the instructions needed to guide their interaction. The authors suggest that specific types of utterances can also be prompted through the use of semi-structured interfaces, and with the use of specific scripts. In this sense, the role of scaffolding in computer-supported collaborative learning environments is recognized as highly important to structure interactions and determine collaborative knowledge building (see section 2.2.2.2 Scaffolding peer-collaboration, for more details on the use of scaffolding in collaborative learning activities). Additionally, Dillenbourg & Fisher (2007) explain the fact that neither the concept of collaborative learning nor the one of computer-support should be treated in a narrow sense. Pedagogical scenarios should not only include collaborative learning

activities, but also individual ones. Moreover, these scenarios should foresee both computer-supported phases and phases without computers.

In recent years, CSCL focused on analysing the parameters that influence the interaction of individuals in collaborative situations and its effectiveness and productiveness. Recent research has therefore particularly focused on the interaction among peers, both in written and oral format (Spada *et al.*, 2011; Puntambekar *et al.*, 2011).

2.2.2 Computer-Supported Collaborative Writing

Writing activities are central to CSCL research, which analyses writing and collaboration, especially focusing on short production and written interaction in technology-enhanced environments. Two interesting types of activities are identified, when analysing studies conducted on computer-supported collaborative writing. On the one hand, researchers have been trying to analyse and capture the complex process of collaborative knowledge building and of the co-construction of knowledge. In this type of activity, learners are asked to collaborate from the beginning in the creation of the content required from them (see for example, Bereiter & Scardamalia, 1991, 2006; Hadjerrouit, 2014; Kim *et al.*, 2012). On the other hand, other studies focused their analysis on a different type of interaction aiming at providing learners with an environment in which to provide each other with comments and assessment of their work. This interaction type, in which learners consult each other on their practice and receive and provide comments and suggestions to others, can be considered one interesting process which brings to the construction of communities of practice and learners. These two approaches should not be considered as mutually exclusive. On the contrary, the task of giving and receiving comments and feedback from others, is a source of learning for the participants involved in these activities and allows them to create an environment in which common knowledge and understanding can be created and developed.

More details on the use of computer-supported collaborative environments for the creation of communities of practice, as well as for collaborative knowledge construction, and on the type of technologies that have been used to support these processes, will be further detailed in the next section of this chapter (see section 2.3 Computer-supported collaborative writing for professional development). Here, we will provide an overview of the literature analysing the use of peer-feedback in computer-supported collaborative environment.

2.2.2.1 Written peer-collaboration

Among the various types of collaboration that can be initiated in computer-supported collaborative writing environments, peer-feedback represents an interesting option, requiring learners to comment on each other's work. Even though the interaction between learners in this type of activity is sometimes limited, it still offers learners with the possibility of developing new knowledge and understanding in collaboration with others. In this sense, it is considered by the research community

as a collaborative learning activity (Shekary & Tahririan, 2006; van Gennip, Segers, & Tillema, 2010; Kollar & Fischer, 2010). Different forms of peer-feedback have been implemented and studied, on the basis of the idea that peer exchange can have some important beneficial effects on the learning process (Davies, 2002) and, according to Dochy & McDowell (1997), it can support the development of important skills related to communication, self-evaluation, observation and self-criticism.

Two main type of peer-feedback can be identified in literature: in peer-comment activities, learners are asked to provide more formative comments to the work of their colleagues, providing them with constructive criticism and suggestions (Gielen, Peeters, Doch y, Onghena, & Struyven, 2010; van der Pol, van den Berg, Admiraal, & Simons, 2008). On the other hand, in peer-assessment activities, participants are asked to evaluate and rate each other's performance, providing therefore a summative feedback (De Wever, Van Keer, Schellens, & Valcke, 2011; Gielen & De Wever, 2012; van Gennip, Segers, & Tillema, 2010). 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 the one provided by the teacher of the class (Gielen, et al. 2010). Additionally, this practice resembles to professional practice, in which providing and receiving comments to colleagues is a normal learning procedure (Billett, 2002; Eraut, 2004). The activity of peer-commenting is also interesting as it offers two contemporary learning opportunities to participants, as both providing and receiving comments can impact learning outcomes (Tseng & Tsai, 2007). The impact of producing peer-feedback on learning is more directly associated with the behaviour of each student, as it directly relates to the efforts students put in this type of activity. Additionally, while performing this task, students learn how to evaluate their own production (Dochy, Segers, & Sluijsmans, 1999; Topping, 2003). On the other hand, the results of the reception of feedback from others is more difficult to estimate. This is particularly due to the fact that colleagues are not experts on the topic (van der Pol et al. 2008), which means that the feedback they provide may not be correct, or may be misleading for the receiver (Gielen et al., 2010). However, it is important to mention that Tseng and Tsai (2007) observed a significant correlation between teachers' and peers' assessments and concluded that peer-assessment can be considered as a valid assessment method. Additionally, De Wever at al. (2011), in an experimental study conducted with Educational sciences students, observed that peer-assessment has a rather high reliability. In this sense, the assessment produced by different learners were highly consistent, and this reliability increased when it was explained to them, since the beginning, the presence of a peer-assessment task and the criteria they should consider to perform it. A similar result was identified by Xiao & Lucking (2008), who observed both the reliability of students' generated feedback, as well as the similarity of them and teacher's generated scores and both results revealed significantly high.

Regardless the high level of reliability of peer-feedback, it was observed that learners often have reservations about peer-assessment, as they do not appreciate their work being commented by a peer,

considering it unfair and questioning the peer's qualifications to take this role (Kaufmann & Schunn, 2010). In this sense, learners usually do not consider their colleagues as "knowledge authorities" (Hanrahan & Isaacs, 2001). Teacher feedback, on the other hand, is always accepted as such but it may produce misinterpretation and miscommunication in some cases. Interestingly, reservations regarding peer-feedback may encourage students in a process of *mindful reception* of feedback (Bangert-Drowns, Kulik, Kulik, Morgan, 1991), pushing them to engage in discussions and to look for confirmation of the comments received in textbooks or other media (Yang, Badger, & Yu, 2006). This mindful reception is crucial to determine the benefits of peer-feedback activities. According to van Gennip et al. (2010) learners' initial hostility towards peer-feedback can be caused by insufficient introduction to its process. Students' conceptions of the activity positively evolves as they gain more experience with this type of assessment (Dochy & McDowell, 1997).

Various researchers analysed which characteristics of peer-feedback had an impact on students' performance in a task. Gielen et al. (2010) observed that constructiveness of feedback reveals as a very important characteristic, impacting performance, but only in learners who had initially a low performance. Additionally, confirming previous research (i.e. Bangert-Drown et al, 1991; Narciss & Huth, 2006), the presence of justification for the comments and observations provided, as well as the accuracy, also appeared as an important characteristics of peer-feedback. Nelson & Schunn (2009), on the other hand, analysed which characteristics of peer-feedback determine its acceptance and implementation by the receiver (for example modification of the produced text), and concluded that a feedback was more probably implemented when the receiver could precisely understand the problem the colleague identified. Three feedback characteristics seemed to impact the understanding of a problem, and more precisely: the clear identification of a solution, the indication of the precise location of the problem, and the presence of a summary of the feedback. On the other hand, explicit explanations of the problem revealed, in this research, counterproductive, as they produced misunderstandings. These results confirm the need for a training, guidance and quality control on peer-feedback, in order to encourage students at providing in their interactions the fundamental elements of a peer-feedback, which would have a higher impact on colleagues' performance (Webb & Mastergeorge, 2003).

Van Gennip and colleagues (2010) conducted a research with the objective of understanding the nature of learning in peer-assessment tasks. In particular, they were interested in analysing the impact of interpersonal variables in this process. In order to perform this analysis, they modelled the interpersonal variables playing a role in this type of assessment, and identified four variables they anticipated could impact peer-assessment results: 1) *Psychological safety*, indicating the beliefs of participants that it is safe to take risks in the group of people they are collaborating with. 2) *Trust in the self and the peer as assessor*, indicating that learners feel confident in providing feedback and in receiving comments from other. 3) *Value diversity*, refers to the ideas individuals have on what is

important for the group. This variable should be low for an effective performance. 4) *Task interdependence*, refers to the interconnections between tasks, and implies that the results to one activity is dependent on the completion of another activity. The results of this research highlighted how all the identified interpersonal variables have a significant influence on the perceived learning of students.

Using online platforms and environments in order to conduct peer-feedback activities presents a number of advantages: in the first place, it allows an easier access to others' production, not requiring learners to be in the same physical environment and to conduct this activity at the same time. Additionally, van der Pol and colleagues (2008) identified also pedagogical reasons in favour of this practice: teachers can maintain a control over the feedback process and guide the students in its execution, when this is considered important (Trahasch, 2004). Furthermore, online peer-feedback is more often followed by a revision of learners' text, if compared to the face-to-face situation (Hewitt, 2000; Tuzi, 2004).

An interesting consideration that emerged from some the studies observed is associated to the idea that, for peer-feedback activities to work effectively, there is a need for an adequate structure and organisation of the task (Van der Berg, Admiral and Pilot, 2006a, Gielen et al., 2010). In the next paragraph we will consider the importance of scaffolding and structuring of activities in computer-supported collaborative learning contexts.

2.2.2.2 Scaffolding peer-collaboration

Various studies mentioned above (Kollar & Fisher, 2010; Gielen et al., 2010), as well as Dillenbourg and Fischer's (2007) summary of the main ideas of CSCL, mention the importance of an adequate scaffolding of the activities in which participants are asked to collaborate, either for building new knowledge together, or to comment and provide feedback to one another, as collaboration is generally not spontaneous and needs to be guided. In a computer supported environment, collaboration scripts can be provided either by the teacher or by the technological tools used for the activity, and can be characterized by single, directive, prompts, or by long explanations. Additionally, they can contain suggestions and flexible prompts, as well as more prescriptive instructions (Dillenbourg & Fischer, 2007).

Various researchers studying the impact of scaffolding on collaborative learning, were interested by the comparison of structured and unstructured peer feedback in CSCL environments. In order to observe the impact of structured peer-feedback over learning and compare it with unstructured peer-feedback, Gielen & De Wever (2012) conducted an experimental study with Educational Sciences students. They compared a condition in which no particular instruction was provided for the feedback process, with one in which learners were provided with a structured form in order 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, confirming Berg's results (1999) about the role of peer-feedback in stimulating critical thinking. Moreover, learners in the structured feedback condition had a better perception of the feedback received by others, considering them more profound and detailed. Noroozi et al. (2013) observed the impact of structured transactive discussion scripts on the argumentative knowledge construction of university students. The transactive scripts they analysed asked learners to paraphrase, criticize, ask questions propose counterarguments and syntheses of the work of the colleague of a multidisciplinary dyad, while performing the task of analysing and solving a problem related to both fields of the two participants. Coherently with the previously mentioned research results, they observed how transactive discussion scripts, compared with unstructured feedback, facilitated argumentative knowledge construction. Learners in this condition acquired more domain-specific and domain-general knowledge.

Kollar, Fischer, & Hesse (2006) compared the collaboration scripts associated with face-to-face learning situations, with the type of scaffolding usually applied in computer-supported collaborative environments. Among the various differences they identified in the two types of scripts, it is important to point out that face-to-face scripts are often directed towards the individual knowledge acquisition of learners participating in the collaborative activity. On the other hand, the scaffolding used for computer-mediated collaboration are typically directed towards a facilitation of the communicative process among the group members. These authors consider that these two types of scripts should be integrated so as to support both individual knowledge acquisition, and to facilitate participants' interaction in collaborative learning tasks. In a previous research, Weinberger et al. (2003) had analysed the impact of two types of collaboration scripts, *interaction-oriented structuring tools* and *content-oriented structuring tools*, in a computer-supported collaborative environment. The results of their analysis showed a positive impact of the interaction oriented scripts, which enhanced the process and the outcomes of the activity, and produced the intended collaborative knowledge construction, while no positive results could be observed as a consequence of the implementation of content-oriented structuring tools.

Wang et al. (2011) conducted an interesting research on the use on the use of adaptable scripting in a CSCL environment. Participants were divided in two conditions, one group was provided with a series of fixed prompts to guide their interaction, while the other group was provided with the same prompts, which were, on the other hand, adaptable. In this sense, learners could reduce or increase the scaffolding in the various phases of their collaboration. The results of this study showed that learners in the adaptable scripting condition had enhanced individual knowledge acquisition of both domain specific knowledge and domain general skills, when compared with their colleagues. This is in line with Dillenbourg and Tchounikine's (2007) notion of the need, for scripts in CSCL environments to

be flexible. Additionally, Wang et al. suggest that the benefits of this adaptability in the activity scripting can also be explained in the perspective of self-regulated learning, which produces a cognitive and motivational engagement of the learners in self-monitoring, in the establishment of learning goals, and in the utilisation of learning strategies (Zimmerman, 2008). On a similar perspective, Gavota, Schneider, & Bétrancourt (2010) conducted a study in which they observed the advantages of the fading in the scripting of a CSCL activity over time, if compared to a condition in which the scaffolding elements would remain fixed and not evolve throughout the implementation of the activity. In this sense, scripting revealed particularly useful at the beginning of an activity, but had, on the other hand, a negative impact if it continued throughout its successive implementations.

All of the above studies allowed us to trace a series of characteristics associated with effective scaffolding of written peer-collaboration. Among them, as mentioned, the necessity of providing structured prompts for collaboration, their focus on both interaction and communication among the participants of a collaborative work, and on the content and the process of individual knowledge acquisition during the activity. Additionally, the adaptability and progressive fading of these scripts represent also factors increasing the effectiveness of collaborative learning methods. The next section will be dedicated to analysing the impact that technology has on writing and collaborative writing activities, and the types of computer support that can be used for the implementation of the kind of collaborative activities analysed.

2.3 Computer-supported collaborative writing for professional development

The content of this chapter is based on:

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2.3.1 Introduction

Computers have become prevalent in most professional activities, whether it is for administrative management or to perform core professional operations, like troubleshooting in car mechanics or computer-assisted surgery. Professional writing, in particular, occurs mainly on computers and is no longer restricted to secretarial work. However, vocational programmes rarely offer dedicated computer-supported writing classes in the school or training place, as found in a large survey examining the development of vocational educational training in 31 European countries (Tessaring & Wannan, 2004). Yet, the trainees are asked to return printed project reports. The computer is thus considered as a mere production tool in which affordances for professional writing are largely ignored. In addition, computers and more generally digital technology, also known as ICT (information and communication technology), offer great potential for deep learning and innovation in teaching (Molenda, 2007), provided that they are used in an instructionally relevant way (i.e., in compliance with cognitive, instructional, and social constraints).

This chapter presents an overview of the way computer technology can be used to facilitate and support individual and collaborative writing, with the perspective of fostering learning and professional development. The first section identifies the functions and affordances offered by technology to support different aspects of the writing activity. A special attention will be given to tools oriented towards collaboration (e.g., wikis, blogs, eportfolios, computer-supported argumentation), which are considered particularly relevant to promoting the social and cognitive processes underlying professional development. In particular, this type of collaborative activities can contribute to the building of communities of practice, particularly influential in the professional development of learners (Wenger, 2000), as well as to collaborative knowledge building, where learners co-construct their knowledge (Scardamalia & Bereiter, 2006). The second section provides examples of studies involving two types of computer-supported collaborative writing activities, oriented respectively towards collaborative production and asynchronous discussions, in two different domains: teacher education and health.

2.3.2 Computer support for individual and collaborative writing

For more than 30 years, the roles and impacts of computer technology on learning have been extensively studied from multiple perspectives, eliciting lively debates (e.g., the media debate: Clark, 2001). The current approach considers that learning environments should be regarded as complex systems rather than a “collection of variables that can be studied one by one” (Salomon, 2006, p. 258). In this perspective, computer technology is considered as one component of learning environments that is necessarily linked with other components, like the type of instructional activities or interactions between peers and with the teacher, whether these are determined by the characteristics of the technology or by instructional decisions (Lowyck & Elen, 2003). As Rouet (2009) stated in the domain of document-based learning, learners tend to focus on the environmental affordances which

are most compatible with the learning objective, as they perceive it. Conversely, technology can provide affordances that prompt, facilitate, or even constrain learners' activity, so that it is important that learning objectives, the instructional method, and the chosen computer support are aligned (Reeves, 2006). In what follows, we describe technology affordances for individual and collaborative writing.

2.3.2.1 Functions of computer technology and writing processes

The reasons for which computer technology has become mandatory in almost all areas of modern life lie in four characteristics (Bétrancourt, 2007) that also apply to writing technology. The first is dynamic storage: computer technology provides a way of storing written productions to reuse them later. Text editors of all kinds enable writing and rewriting, as well as the reuse of previously written text, from one's computer or through the Internet. Second, computer technology offers automatic processing of large amounts of data quickly and reliably. That is the very purpose for which computers were invented in the first place. Presently, automatic processing allows for interactivity and immediate feedback, for example, in spelling functionalities in text editors. Such functionalities provide an extension of human capabilities through the possibility to allocate some tasks to the computer (Salomon, 1993). A third function is the possibility to integrate multimedia information, leading to a change in the expectations towards professional or academic documents (see Breuer, Newman, & Newman, this volume). Multimedia enrichment ranges from the presence of advanced graphics in printed reports (see Grant, this volume) to the insertion of video and sound, up to becoming the main source of information in online press, for example. Beyond esthetical functions, computers enable multimedia and dynamic representation of knowledge, possibly facilitating cognitive flexibility and conceptual change (Jonassen, 2006). Finally, the fourth function, associated with the development of the Internet and Web services, is the possibility for users to collaborate and communicate across space and time. In the last two decades, there has been an extraordinary development of Internet services involving writing for facilitating communication (email, forum, chat, instant messaging) or for collaborative productions at a distance (wikis, googledocs, content management systems). In this sense, it may be useful here to introduce the distinction between "traditional" Web (Web 1.0) and its more recent development, usually referred to as Web 2.0 or social media. The first one provides users with the opportunity of accessing a large amount of information. Of course, internet users can also create web pages of their own, but in a static fashion, which does not really provide opportunities for direct collaboration and communication between the reader and the information provider. On the other hand, web 2.0 is based on the idea of providing the opportunity to directly collaborate and share information online, transforming the static web in a more dynamic environment. In this sense, in this type of web environments the content is not given a priori, but co-constructed and negotiated between the participants. Particularly interesting, in the perspective of the use of writing for professional

development, are the affordances of web 2.0 in this context, promoting the development of communities of practice, as well as supporting collaborative knowledge building activities.

As writing tools changed considerably in the last two decades, it is legitimate to believe that this also had an impact on the cognitive processes involved in the different phases of writing. A substantial body of research conducted in the early times of text editors experimentally investigated the impact they have on writing processes (especially planning and revision) and text quality as compared to paper and pencil. Overall, the results were inconclusive (Piolat, 1991), largely depending on other parameters (type of task, participants' writing skills, functionalities provided). As Dessus (2001) observed, these studies were conducted in experimental conditions, over very short time, and could not capture the reality of authentic, long-lasting writing production. Recent studies (Leijten, van Waes, Schriver, & Hayes, 2014) found that professionals spend more time consulting multiple sources (from their own and from others' production) than in writing per se.

To sum up, if the affordances of computer technology did not change the basic cognitive processes underlying writing much, they modified the overall activity, especially in terms of information seeking and reuse of previous writing. In learning contexts, technology offers new ways of representing information, like dynamic modelling, multimedia and hypermedia representations, or collaborative edition that enable new types of writing activities, support cognitive flexibility, and promote conceptual change (Jonassen, 2006).

2.3.2.2 Collaborative writing and professional training

As mentioned above, one of the most important affordances of technology over the writing process comes from the possibility to share, to write collaboratively, and to discuss, as offered through Web services. These functionalities are widely used in workplaces involving distributed locations and task sharing. In education, computer technology supporting collaboration is considered by the tenants of the field of Computer-Supported Collaborative Learning (CSCL) as the most promising innovation of the last few decades to improve teaching and learning (Lehtinen, 2003). By collaborative technology, we refer to systems that are primarily designed to enable or support interactions between learners.

Several theories have emphasised the benefit of collaborative situations for learning. First, when working with others, learners have to express their thought clearly, and this process encourages them to structure their knowledge and deep thinking (self-explanation effect, Chi et al., 1989). Second, engaging learners in sharing and comparing their understanding of complex situations elicits socio-cognitive conflicts, arising when students diverge in their understanding (Doise & Mugny, 1984). Discussing and solving these conflicts improves the conception of the problem at hand. Dillenbourg (1999) went so far as to claim that learning in collaborative situations occurs as a side effect of having to construct a shared representation of the problem. Third, learners may use each other to distribute the cognitive processes and to provide additional knowledge (Hutchins, 1995) to make the problem more

manageable. Finally, in the socio-constructivist view initiated by Vygotskij and followers, learning is essentially social since we learn with and from others. Learning is not a purely cognitive matter; it involves entering a community of practice (Wenger, 2000), with its specific culture and identity, to promote professional development of individuals through social interactions and other situated mechanisms (Billett, 1998).

Computer technology provides functionalities that can support, and even make possible, collaborative activities and social learning. The storage and communication functions described above enable learners to work over time and space, but also provide a reification of the collaborative processes that are not necessarily visible in face-to-face communication. Setting up a collaborative problem-solving task using a simulation and chat interaction, Jermann and Dillenbourg (2008) investigated the effect of displaying the number of chat utterances and actions of each learner to help them regulate their interaction. The results showed that such graphic feedback helps learners only if some regulatory advices are provided alongside. Very popular in the 1990s, argumentation tools provided a graphic visualisation of the claims and arguments discussed by learners, supporting epistemic elaboration on the topic at hand (Baker, de Vries, & Lund, 1999). In these cases, writing is used for two purposes: as a communication tool, in the chat, as a written version of discussions; and as an organisation tool, for putting down the main ideas that arise in the discussion.

The use of collaborative technologies to support the writing process revealed its potential in supporting particularly two type of collaborative activities: on the one hand, it may contribute to the construction of communities of practice, allowing vocational learners, as well as professionals, to build a community in which to share their experiences and create a network of professionals. On the other hand, collaborative writing activities can also represent a mean to support collaborative knowledge building, with the co-construction of knowledge and understanding shared by learners. In line with this last point, a specific type of computer applications offering visualisation, reification, and tracing over time, thus supporting comparison of perspectives and construction of a shared understanding, is dedicated to provide an environment for community knowledge to develop. The CSILE project initiated by Scardamalia and Bereiter (1994) is an early example of such a purpose. Using a specific type of forum, students construct progressively their own collaborative knowledge base by asking questions on a given topic and answering each other's questions. In 2006, these same authors described a new and revised version of the CSILE project, called Knowledge Forum®, providing an environment to support knowledge building practices for communities (intended in a wide sense, therefore encompassing more "formal" school settings, as well as workplace organisations). If other models of collaborative learning, based on threaded discussion, seem to be inspired by a one-to-many email approach, Knowledge Forums present different characteristics, as this multimedia approach aims at supporting a community of users in creating their content and their organisation. Knowledge Forum is not simply a tool, but a complete environment, in which all the

work and activities associated with knowledge building take place (Scardamalia, 2003). Knowledge Forums follow, therefore, a socio-constructivist approach, according to which each learner can contribute to the elaboration of the content, provided that effective scaffolding is made available. Other researchers described possible uses of writing and particularly, collaborative writing in a knowledge building perspective. Tynjälä, Häkkinen & Hämäläinen (2014) for example consider how the collaborative writing process can be used in association with the *Integrative Pedagogy model* (Heikkinen et al., 2011; 2012; Tynjälä, 2008; Tynjälä & Gijbels, 2012), aiming at creating learning environments in which the four types of knowledge constituting professional expertise are integrated. These four types of knowledge are represented by theoretical, practical, self-regulative and sociocultural knowledge. In this sense, collaborative writing would represent a mean to integrate and connect theoretical knowledge and practical experience emerging from the workplace. In their article, Tynjälä and colleagues, show how the integrative pedagogy-model can be combined with social media tools in a professional development and knowledge building perspective. Different examples of the utilisation of social media (the focus of this research was particularly on blogs) with this purpose are shown, supporting the idea that the integrative pedagogy model can be used to design workplace activities aiming at introducing people in innovative and transformative learning activities, as well as in social rather than individual learning (Tynjälä, 2012). Wiki environments, Web-based collaborative text editors, have also been used in education with the same community building perspective (Donnelly & Boniface, 2013). The particularity of the wiki (from the Hawaiian, ‘wiki-wiki’, meaning quick, fast) was to be simple text editors that should encourage learners in writing their ideas on a topic and to make links with other related topics. Section 3.1 will present some studies investigating the use of wikis to support professional development in teacher education, providing an environment supporting both co-construction of knowledge and the creation of communities of practice.

Another category of tool having a great potential to support collaborative writing for professional development is represented by asynchronous online discussion tools. This environment can reveal particularly useful for community development, either organised in formal education or emerging in a community of practice. For example, Daele (2013) studied how socio-cognitive conflicts about teaching practices emerged and were solved in a discussion list created by in-service teachers in Belgium. He found that one critical condition for productive discussions (Suthers, 2006) was the feeling that the community can be supportive of professional development. Section 3.2 will present a set of studies investigating the use of asynchronous discussion tools for promoting professional development through the construction of communities of practice.

2.3.3 Applications of computer-supported collaborative writing for professional development

This section presents a review of studies investigating Computer-Supported Collaborative Writing (CSCW) for professional development. We focus here on two different practices of collaborative writing with corresponding computer support, in two professional domains: collaborative knowledge

construction in teachers' education and asynchronous discussions in the health care domain. The selection of these two professional fields is motivated by the fact that, in both domains, the concept of professional identity and its development is particularly valued, and collaborative writing practices are commonly in place.

2.3.3.1 Teachers' professional development and collaborative writing through wikis

Teachers' education is an interesting field for the analysis of professional development, as it is often organised around the articulation of internships in which learners gain professional practice, as well as regular school lessons, providing them with the theoretical basis and fundamentals of teaching and learning. Moreover, in-service teachers are also subject to a growing demand for them to be involved in continuing education in order to review and refine their everyday practice. Therefore, the articulation of a formal educational context and of a real-life working experience accompanies teachers throughout their careers (see Ortoleva, Bétrancourt & Billett, 2015, and in particular contributions from Vanhulle & Perréard Vité; Alvares Pereira, Cardoso, & Pereira; and Woodard, treating of teachers' professional development). In recent years, a series of studies have analysed the use of wiki platforms to support in-service and prospective teachers in developing their practice.

Wikis for professional development

A wiki is a Web-based environment allowing a group of people to collaborate asynchronously on the Web, building a corpus of knowledge organised in a series of interlinked pages, with an open and flexible structure (Franklin & Van Harmelen, 2007). Wikis are appropriate for community building purpose, since participants can create collective documents, discuss, and share information (Chao & Lo, 2011; Wichmann & Rummel, 2013).

Wikis offer three main characteristics that support collaborative writing: a) the multi-users edition, as various users can create and modify texts and decide the connections and paths between the pages; b) the history function, thanks to which all modifications of the pages are saved, along with the identification of the user, and can be retrieved, if necessary; and c) the discussion page, where participants can discuss asynchronously and provide comments to each other (Hadjerrout, 2014). In education, some studies showed that wiki-based activities, requiring collaborative writing and sharing, encouraged a higher level of cognitive engagement, as well as a deeper emotional commitment with others (Biasutti, 2011; Cole, 2009). Finally, wikis are relatively easy to operate and to sustain.

On the other hand, some characteristics of the wiki tool can be particularly challenging for its implementation in the educational context. More particularly, Donnelly and Boniface (2013) consider that one issue emerging from the use of wikis is associated with its design, which is completely open, while there is a need for a well-defined and functional structure for these environments to work efficiently. Individual characteristics of the participants can also represent an issue, as users need to feel confident enough to be able to overcome technical difficulties they may encounter and a lack of

interest or time to dedicate to this environment can also be detrimental for the activity. Finally, maintenance is to be addressed by ensuring someone, either a peer or an instructor, will take the role of the leader of the environment, encouraging participation.

The features of the wiki, namely multi-user edition, history functions, and its highly flexible and adaptable structure, make this tool particularly interesting for the development of professional communities (Cole 2009; Sigala, 2007). Wikis can be exploited as environments to create communities of practice, where users can discuss their everyday practice, share ideas, suggestions and documents, and ask questions to their colleagues. This type of use seeks to help novices to move from the periphery to the centre of a professional community (Wenger, 2000), contributing to their professional development. Communities of practice have been used as central constructs for teachers' professional development (Schlager & Fusco, 2003). Below we analyse three examples of the use of wikis to encourage prospective and in-service teachers' professional development (see Table 1).

Table 1. Examples of studies analysing wikis for teachers' professional development

Authors	Participants	Activity	Research Approach	Methodology	Main Results
Kim, H.J., Miller, H.R., Herbert, B., Pedersen, S., Loving, C. (2012)	Early-career teachers (n=47)	Wiki-based professional learning community-model for entry into teaching sciences	Reflective practice	Quasi-experimental design, with pre/post-test subjective scales	<ul style="list-style-type: none"> • Positive impact on teacher's perceptions of wiki and inquiry • Possible use of wiki to build communities
Donnelly, D.F., & Boniface, S. (2013)	In-service teachers, various levels (n=3)	Wiki-based e-portfolios to support teachers' professional development	e-portfolios & knowledge sharing	Case Studies with classroom observations and interviews, before after and follow-up	<ul style="list-style-type: none"> • Technological training and modification of teachers' social expectations highly important • Tendency to engage more in individual than collaborative activities
Hadjerrout, S. (2014)	Students in teacher education (n=16)	Collaborative writing on key educational topics in a wiki-based environment	Collaborative writing practice & wikis	Quantitative and qualitative analysis of participants' interaction. Subjective scales	<ul style="list-style-type: none"> • Perception of an authentic audience highly important • Technological training highly important • Tendency to engage more in individual than collaborative activities

Wikis for professional development, implementation examples

When implementing a wiki for teachers' professional development, after having defined the specific target audience within the population concerned (in-service or prospective teachers), it is important to specify the role attributed to writing individually and collaboratively in the activity.

The role of writing

One important component of the learning situation is associated with the role that writing has in the activity, and this comprises the specific tasks that are given to students, whether they have to be done individually or collaboratively, and how the collaboration is orchestrated (when and for what purpose).

Kim et al. (2012), working with early-career science teachers, set up a wiki environment in which participants were encouraged to share and discuss their ideas on the use of inquiry in their lessons by creating new pages in the shared environment. Participants were therefore involved in community collaboration to build a shared knowledge repository on the use of inquiry in education. The authors were interested in observing professional development communities and the impact they have on participants' conception of teaching science through inquiry, as well as the educational use of wiki technology.

Hadjerrouit (2014) conceived a wiki environment targeting students in a formal curriculum of pre-service teachers. Learners were asked to collaboratively investigate one specific topic related to their pedagogical practice. The task proposed to the learners consisted of collaborating in small groups (two to four participants) in the production of a wiki of several pages. The objective of this research was to evaluate the collaborative writing practice of prospective teachers and produce suggestions on how to encourage them in engaging in this sort of activity.

Donnelly and Boniface (2013) used a wiki to support the conception of collaborative e-portfolios by in-service science teachers with different levels of experience. The aim of this project was to reduce teachers' isolation by providing them with an environment to share personal experiences lived in the classroom and to receive or provide suggestions and comments. The e-portfolio was organised around Content Representations (CoRes), pages dedicated to one specific science topic and created in collaboration by a group of teachers. The CoRe is composed of the answers to pedagogical questions (for example, limitations/difficulties connected to teaching this topic). Each CoRe is associated with a series of Pedagogical and Professional-experience Repertoires (PaP-eRs), written individually by the group's participants in the form of narratives reflecting on particular aspects of the CoRe. In this sense, these e-portfolios are composed by both collaboratively (CoRes) and individually (PaP-eRs) written texts.

Results

The three studies varied in their instructional design regarding the role of writing and collaboration, while pursuing the same global objective of professional development through the community. What is the impact of this variety on outcomes?

Kim and colleagues (2012) observed a positive effect of the use of wikis to create a community repository discussing the topic of inquiry learning, both on teachers' ideas of teaching through inquiry (the topic treated in the community repository), and on their conceptions of the use of wikis in the classroom (the environment used for the activity). The authors conclude that wikis represent a good option to support teachers' communities, as in this research teachers attributed significance and value to the community they participated in, and they perceived that the use of a wiki-based environment enhanced their interaction and collaboration experience.

On the other hand, Handjerrouit (2014) and Donnelly and Boniface (2013) observed a reluctance of students in truly collaborating. As Grant (2009) explained, the lack of collaboration is less a technological problem, since wikis offer the functionalities to support it, than it is an issue related to culture and pedagogy. Additionally, participants may consider writing as a non-authentic task, perceiving the lack of a real audience for their collaborative effort (Grant, 2009). This, together with the fact that writing collaboratively requires an additional cognitive effort, may explain the fact that participants of this type of activity show a tendency to work individually rather than collaboratively.

Building on the results mentioned above, Donnelly and Boniface (2013) analysed a series of cases to understand the factors affecting in-service teachers' perceptions of wiki-supported e-portfolios and to identify ways to support them in engaging in knowledge-sharing activities. In the limited number of cases analysed (three), they observed that the issue of competence in technology was revealed as particularly important. Competence, in this sense, not only refers to the need for training in the use of technology, but also to the need for modifying teachers' mind-sets about the use of technology in their practice and the effort associated with it (Glassman & Kang, 2011; Daele, 2013). In relation to this last point, it is interesting to notice how teachers, who thought wikis could represent a support to overcome the isolation in their practice, were, on the other hand, reluctant to the idea of collaborating with colleagues of other schools. This phenomenon is repeatedly observed in collaborative contexts, since exposing their knowledge could be face-threatening for individuals (Buchs & Butera, 2009).

2.3.3.2 Health education and collaborative writing: Asynchronous online discussions

Similarly to education, the health care domain is usually organised around a dual mode in which students and professionals are exposed to formal education in schools, universities, or continuing education settings, while simultaneously acquiring professional experience in internships. In order to support learners in exploiting the competences acquired in these different environments, the use of asynchronous online discussions seems to represent an interesting option explored in various health education programmes (from health and social care students to doctors).

Asynchronous online discussions for professional development

Asynchronous online discussions (AODs) can be defined as conferences occurring on the Web, asynchronously and in written mode, in which learners are required to participate in various discussion threads by reading and contributing to them (Benfield, 2002). These can be conducted through forums, mailing lists, or other systems (like wikis). The fact that the discussion is conducted asynchronously allows participants to work at their pace and from different places (Fitzsimmons, 2007), which is particularly suitable for health professionals. In addition, the written mode of the discussion allows for a cumulative construction of the argument which facilitates deep thinking and reflexive processes (Baker, de Vries, Lund, & Quignard, 2001). Following a socio-constructivist view of learning, online discussions seem to be particularly suited to encouraging learners to analyse real incidents or events encountered in practice. This activity is considered as a way to promote critical thinking and clinical reasoning, and it has a long tradition in the health domain (Higg & Jones, 2000; Mann, Gordon, & Macleod, 2009).

Asynchronous online discussions are also associated with the development of communities of practice (Wenger, 2000; Dillenbourg, Poirier, & Carles, 2003). Through the discussion tools, the members of these communities, who share one interest and/or one professional role, can discuss about their practice to acquire new competencies and to modify their professional behaviour. These types of communities are especially useful for health professionals working in clinical settings where they need to operate in critical situations, as they allow them to discuss their decision-making process without being professionally exposed.

Although various studies indicate how to make an effective use of online discussions (Rovai, 2007; Salmon, 2011), little is known about the real impact of this tool on learning in terms of academic outcomes, professional practice, or personal improvement (Thomas, 2013). In the next section, we will present three examples of studies using asynchronous online discussions for the professional development of health care practitioners (see table 2).

Table 2. Examples of studies analysing asynchronous online discussion in health care education

Authors	Participants	Activity	Research Approach	Methodology	Main Results
Koops. W., van der Vleuten, C., de Leng, B., Snoeckx, L. (2012)	Medical students (n=47)	Peer-feedback on critical appraisal of a topic	Reflective practice & clinical problem solving	Quasi-experimental design, group identification a posteriori	<ul style="list-style-type: none"> • Number of postings has an impact on papers' revision • Task focused activities have an impact on paper's revision
Ortoleva, G.,	Students in health and	Peer-feedback on critical	Integrative Pedagogy	Quasi-experimental	<ul style="list-style-type: none"> • No impact of scenario on self-

Schneider, D., Bétrancourt, M. (2013b)	social care (n=31)	incident (wiki-based)	model	design	efficacy beliefs <ul style="list-style-type: none"> • Discussing significant episode lived by fellow apprentices has positive effects on learning
Thomas, J. (2013)	Studies using asynchronous online discussion in health education (n=14)	Various activities implemented in different studies	Literature review of various approaches	Literature review participants' interaction. Subjective scales	<ul style="list-style-type: none"> • Positive impact of AOD on learning • E-moderation positive impact on learning • Scaffolding has to leave time to familiarize with environment • An impact on reflection and reflecting only after long implementations

Asynchronous online discussion in health education: Implementation examples

As we previously discussed, important components of this type of activity are the role attributed to writing and the way collaboration between participants is orchestrated.

Role of writing

The use of writing to encourage reflection and comparison with others is central in the implementation of this type of activity. Koops et al. (2012) conducted a research on medical students during their clerkship, analysing the use of asynchronous discussions to debate clinical problem-solving papers written individually by the students. In this Clinical Appraisal of a Topic (CAT) task, students were asked to formulate a clinical question about a problem encountered in the workplace, followed by a critical investigation of the literature (Parkes, Hyde, Deeks, & Milne, 2009). The authors estimated that students would profit from a discussion with their peers on their papers (Bennet et al., 1987) and wanted to observe whether the participation in this discussion would influence their decision to revise the CAT paper.

Online discussions can also be used to share real-life experiences. Ortoleva, Schneider, and Bétrancourt (2013b), working with health and social care apprentices, used the critical incident technique (Flanagan, 1954; Schulter et al. 2008) to collect significant episodes experienced by students during their internships. After this individual writing phase, learners were asked to provide

written comments to their peers by asking questions, suggesting other possible behaviours in similar situations, and providing general comments. Peer collaboration was used here as a way to step back from personal experiences, embracing the perspectives of others and stimulating collective knowledge construction (Scardamalia & Bereiter, 1994; 2006; Davies, 2002). Collaboration not only served to encourage learners to engage in socio-cognitive conflicts, but it also provided an overview of various workplace practices that single learners cannot experience during their training.

Results

To judge the effectiveness of AOD for learning and professional development, different aspects of the collaboration and the interaction among the participants can be measured and observed. Koops et al. (2012) explored whether the discussion had an impact in participants' revisions of their individually written papers of critical situations encountered in the workplace. After the discussion phase, 51% of the 47 medical students participating in the research revised their papers. Analysis of the interaction on the forum highlighted that students' paper revisions seemed to be associated with an intense activity during the discussion with peers, as well as with higher task-focussed discussions. These results seem to confirm that the use of a forum to conduct written discussions in medical education could support students in reflecting on their practice and in learning collaboratively during their clerkships.

From a different perspective, Ortoleva et al. (2013b) measured the effect of writing and discussions on knowledge acquisition and self-efficacy belief adjustment compared to individual writing only. The results did not show significant improvement in any of these dimensions. However, two effects were observed: in the first place, the more that learners engaged in a significant episode lived by a fellow apprentice by providing suggestions and comments, the more they learned, improving their performances at the knowledge-acquisition test. Moreover, apprentices reacted positively to the writing activity in general and to the peer-commenting phase in particular, leading to a high level of engagement in the task. This result confirms the literature of the domain, which sustains that the quality of the interaction between apprentices is a fundamental aspect in collaborative learning contexts (Suthers, 2006).

Thomas (2013) performed a literature review based on 14 studies analysing the use of asynchronous online discussions in the health sector. Despite the heterogeneity in the methodologies of these studies, some interesting overarching conclusions could be derived. All the studies analysed showed some effect of AODs on learning. In this result, the mode of e-moderation and structuring of the activity seemed to play a significant role (Johnson, 2006). In particular, structured discussions (e-moderated) induce higher order thinking than unstructured discussions (without moderation). Moreover, Johnson observed that the impact on learning is enhanced when it is mandatory for learners to participate in the activity, rather than when it is voluntary. Finally, Thomas concludes that in order to encourage learners towards reflective and critical thinking, they have to be exposed to an asynchronous online

discussion tool for an extensive period of time, while limited and punctual utilisation may be less effective.

2.3.3.3 Discussion

The research examples presented in this chapter, with the different approaches observed and their range of target populations, account for the potentialities and limitations of the use of wikis and asynchronous online discussions for professional development. Various roles can be attributed to the writing task in this type of activity, and collaboration and individual writing can be mixed and combined in different ways. Overall, the interesting and contrasting results of these studies highlight the potential of these tools to support communities of practice and to provide participants with environments to overcome the isolation experienced in their working practice. Additionally, as mentioned above, this type of writing activities also have great potentialities for knowledge building and co-construction. In this sense, they can serve as ways to provide learners with environments were to share resources and discuss knowledge, in order to create new shared understandings. Collaborative writing activities have therefore a great potential in supporting the integration of theoretical, practical, self-regulative and socio-cultural knowledge, which represent the foundation of the integrative pedagogy model (Tynjälä, Häkkinen & Hämäläinen, 2014). On the other hand, these studies also show how collaborative writing, and particularly knowledge building, are effortful activities which seldom happens spontaneously. The recommendations driven by the results of these studies represent one way to encourage collaborative writing and to support the successful implementation of computer-based activities.

As far as the use of wikis is concerned, different authors agree in pointing out the need to provide technological support for wiki participants (Kim et al., 2012) to ensure the basic skills needed to use the tool, while also modifying teachers' mind-sets associated with the use of technology in their practice (Hadjerrouit, 2014). Additionally, even for teachers who are competent in using technology, it is important to consider that this type of activity represents an investment of time and effort, and adequate resources should be allocated to it (Donnelly & Boniface, 2013).

Moreover, for both wikis and asynchronous online discussions, an important aspect for the effective implementation of these tools is associated with the design of the activity which learners will have to perform. Various studies demonstrated a reluctance of learners in collaborating, showing that this type of sharing practice does not happen spontaneously, even when computer support is provided with this aim (Dillenbourg, 1999; Kreijns, Kirschner, & Jochems, 2003), also in regard to the cognitive load that collaboration implies (Dillenbourg & Bétrancourt, 2006). To overcome this issue, Hadjerrouit (2014) suggests that participants should be prepared for the collaborative activity and powerful discussion tools should be provided to them. Moreover, he points out that collaborative writing should be integrated into a well-constructed scenario in which collaboration is explicitly valued and evaluated

(Mindel & Verma, 2006), or even mandatory for learners (Johnson, 2006). Donnelly and Boniface (2013) further suggest that regular face-to-face sessions combined with the use of the collaborative environment would represent an interesting solution, allowing the conversation to continue beyond the organised meetings. Thomas (2013) additionally points out the importance of the mode of e-moderation (Johnson, 2006) and of the amount of time spent working on the environment.

2.3.4 Conclusion

In this chapter we discussed the potential of computer-supported collaborative writing activities to sustain professional development. After introducing the concept of collaborative writing and the technological tools that can support this activity, we analysed empirical research using two types of collaborative writing tools: wikis and asynchronous online discussions.

Overall, this review and exploration of the use of different technologies for professional development allowed us to conclude that even if the potentials of the two tools analysed are distinct, they can both support the building and maintenance of communities of practice, and are sometimes implemented for similar purposes, as encouraging sharing and discussions among peers is fundamental for professional development.

Even if in wikis, participants are enabled and supposed to collaborate in the construction of a common content, it is not infrequent for users to conduct in them the same type of activities supported by asynchronous online discussion environments. The reason for this practice may be associated with the fact that the use of wikis to create common content requires a higher level of collaboration, which, as mentioned above, has to be supported with well-designed activities providing a specific value and an explicit evaluation to the interaction among peers. Moreover, the use of a tool to support collaborative knowledge construction represents a change of paradigm if compared to more classically performed activities, which is harder to accomplish than the adaptation of an existing paradigm, as in the use of asynchronous online discussions (Albion, 2008). This aspect should always be considered when deciding to use any type of technological support for a collaborative writing activity.

In this sense, we consider that, while online discussions are easier and more directly implemented, the use of wikis for professional development will require longer training, both on the use of technology and on the mentality of the users. In our opinion, the potential of the utilisation of technological tools for this purpose should be further explored, in consideration of the recommendations that emerged in the research analysed.

3. Presentation of the research

The review of the literature on vocational education, writing as a learning activity, and collaborative learning and writing, allowed us to set the framework of the research presented in this manuscript, identifying its main components, and justifying them on the basis of previous studies conducted on the topic. On the basis of this review, the present part introduces the research conducted in the framework of this project, explaining the specificities of the methodological approach followed, describing the specific context in which this research was conducted, and detailing the characteristics of the research project, by setting out the main research questions and organisation in the different studies.

3.1 Introduction to the Design-Based Research approach

In consideration of the aim of this research, oriented both towards the implementation of a rigorous academic study and the identification of interesting and effective practice for the professionals involved in vocational learning, a methodological approach based on Design-Based Research (DBR collective, 2003; Sandoval & Bell, 2004; Herrington, 2012) was implemented. Design-Based Research (DBR) is an approach inspired by software engineering principles, based on an iterative design, including a series of successive design cycles. This approach allows working on a concrete problem encountered in the field and producing a set of design principles, but also conducting formal research, e.g., testing hypotheses based on the literature of the domain. When developing a scenario, following this approach, the first version is developed on the basis of the literature and of field observations. The resulting scenario is implemented and tested, and on the basis of the results of this test, some modifications are made. The design cycle continues with successive phases of testing, and redesign. The outcome of this process is the development of a highly adapted scenario, which is created thanks to progressive adaptation, redesign and troubleshooting of the original one.

Reeves (2006) proposed a graphical representation of this process, in which he represented it in a loop with four main phases. Figure 5 reproduces this representation.

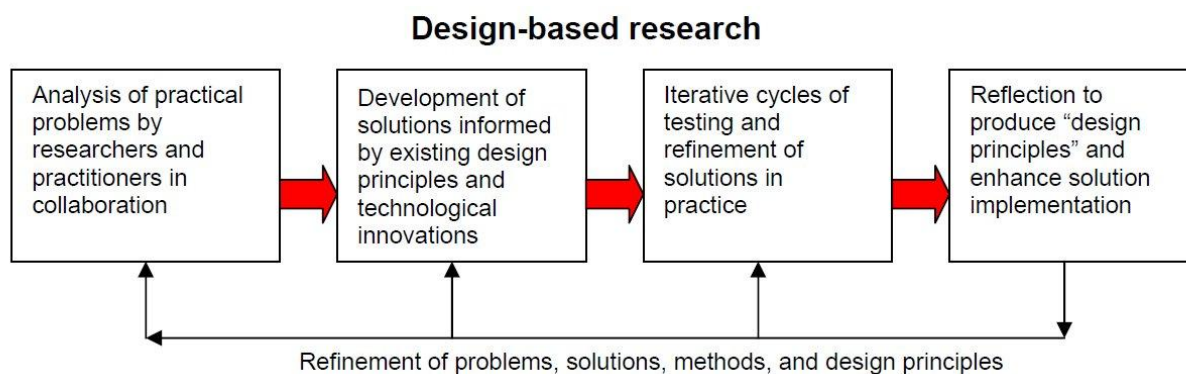


Figure 5. Phases of the DBR approach (Reeves, 2006, p.59)

In the description Herrington (2012) provided of Reeves' four phases, the first phase, *Analysis and exploration of a problem*, was presented as dedicated to the understanding and exploration of the educational problem. This exploration is performed through the collaboration of the researchers and the practitioners involved in the process. The exploration of the problem is therefore based on the description of the issue encountered by the practitioners, combined with a literature review performed by the researchers. In order to perform an effective analysis of the problem, the context in which the research takes place needs to be taken in careful consideration, by understanding its main characteristics and challenges. In the next phase, called *development of solutions using existing design principles and technological innovations*, the consideration of possible solutions to the problem identified begins. This solution is designed and developed, so that it will be ready for implementation in the next phase. The third phase, *Implementation and evaluation in iterative cycles*, is dedicated to the application of the solution previously identified. The results of this implementation are evaluated and provide elements that will be used to modify this solution, in iterative cycles. Finally, the last phase of the DBR, *Reflection to produce design principles*, is characterised by the refinement of the solution and the design principles considered. The solution is afterwards shared, both in the practitioners' and in the researchers' communities, so that feedback will be received, while, at the same time, providing visibility to the outcome of the process. In this sense, design-based research is particularly relevant for this research project as its outcome can be both theoretical, in terms of hypotheses testing and contribution to the literature, but also practical, allowing to formalise recommendations and guidelines for practitioners willing to implement similar pedagogical scenarios in their contexts.

The next sections will detail the characteristics of the context in which this research took place and of the research project implemented, taking into account the details of the methodology followed and its organisation in the different studies.

3.2 Context of the research

As described in the previous paragraph, a thorough analysis of the context in which a research takes place, represent a fundamental step for the design and implementation of coherent and effective learning solutions. The following paragraph will detail the main characteristics of the educational track in which our research was conducted.

3.2.1 The educational track of Assistant en Soins et Santé Communautaire (ASSC)

3.2.1.1 *Introduction to the profession of ASSC*

The profession of Assistant en Soins et Santé Communautaire (ASSC), that we have translated in Social and Health Care Assistant, is a relatively new professional role in Switzerland. This educational track was established some years ago (2002 for the school-based training, with the first graduation in 2005, and 2009 for the Dual system, with the first graduation in 2012) to recruit more healthcare professionals, in consideration of the severe shortage of professionals working in this domain currently experienced in Switzerland (Schweri & Trede, 2010).

Social and Health Care Assistants are supposed to assist and take care of people of all age in case of sickness or on a regular basis, in their everyday life. They are supposed to organise the physical and social environment of their patients/clients, while at the same time providing physical assistance to them, on the basis of their needs. More precisely, they are asked to work on a number of professional axes, going from 1) assistance and care; to 2) conception of the physical environment and organisation of everyday activities; 3) administration and logistics; and finally 4) medico-technical procedures. In particular, in relation to this last point, ASSC are prepared to perform medico-technical procedures under the direct responsibility of nurses and medical staff of the institution in which they operate. In this sense, ASSCs need to work on a regular basis in multi-disciplinary teams.

Health Care Assistants can work in a number of different institutions, as virtually any setting in which health professionals are needed may profit from the presence of this professional role. For this reason, the profession can assume very different characteristics, adjusting to the target audience, the constraints, and challenges of the various settings. A non-exhaustive list of the professional setting in which ASSC can be hired would include retirement homes for elderly people, the hospital setting, in a number of different wards as psychiatric or emergency, and to the home care service for which they need to go to their patients' habitations. As one can easily imagine, the tasks, responsibilities and situations faced by assistants working in their patients' home are not the same as the ones encountered in emergency wards of the hospital. In the first case the maintenance and care of the physical environment of the patient, including for example the basic cleaning service, may be particularly frequent, while in the hospital setting assistants will be asked to perform more medico-technical procedures. The variety of the tasks associated with this profession represents an important characteristic and sometimes a challenge for the

professionals in this role, and can be even more critical for learners in this educational path. In this sense, it is very important for them, to have the opportunity of discussing and learning from one another about this great variety of working conditions, associated with the possibility of experiencing various workplaces through internships.

On the basis of the characteristics of the professional roles of ASSC, some personal characteristics are required to the ones interested in this education path, going from their desire and willingness to help and assist others, to the understanding of others. Additionally, a certain psychological and emotional equilibrium is also required. Assistants also have to be able to work in teams, to act with discretion, and to be flexible in adjusting to irregular schedules and night shifts.

3.2.1.2 A profession in between, specificities of ASSC and their professional role

When presenting the profession of Social and Health Care Assistants, it is very important to describe also its relationship and positioning with respect to the other healthcare professions sharing similar, or sometimes the same, tasks. In this sense, it is important to mention the fact that ASSC profession is often described, by its very professionals and even the teachers, as a profession in between other two: health aid (aide soignant) and nurse. More precisely, as the health aids, ASSC have to perform a series of tasks aiming at the well-being of the patients, as washing them, taking care of their environment and also accompanying and supporting them in critical moments. On the other hand, in comparison to health aids, ASSC are prepared to execute more technical procedures, allowing them for a more complete care of the patients. The task of washing them can be complemented by, for example, the replacement of their caterer. Additionally, they are allowed to administer the pills and some medications to their patients, under the surveillance and responsibility of nurses or medical staff. In this sense, the profession of ASSC is also similar to the one of nurse, even if more limited in terms of the tasks and procedures that can be executed.

This positioning of the profession in between other two, associated with the fact that it is a relatively new role, have an important impact on how this is perceived by the colleagues and on the actual tasks and responsibilities imparted to these assistants in the different institutions. More precisely, two main effects of this situation may be observed: in the first place, an often confronting and difficult relationship with health aids and nurses have been reported. According to many sources of information as professional association, learners (see for example the interviews discussed later in this chapter), the teachers of the professional school, and the same episodes reported by apprentices, both nurses and health aids sometimes manifest an opposing attitude towards ASSC as they consider that their own role may be less valued or risks to be modified in reason of the presence of these new professionals. This creates a sometimes difficult working environment in which ASSC struggle to be fully integrated and accepted by the colleagues with whom they are required to collaborate. Many learners reported encountering confrontational behaviour of others and struggling in making them accepted by the others.

Additionally, a second effect of this situation is associated with a certain fuzziness surrounding the specific tasks and responsibilities that ASSC are prepared to face. In this sense, in some institutions assistants may be asked to perform procedures they are not prepared and allowed to perform. On the other hand and probably more often, in other institutions, in order to avoid any risk, ASSC are not working to their full potential, being relegated to less responsibilities that they could actually undertake. Both these situations may be particularly critical for apprentices in their internships, as they risk to be asked to perform tasks above their competence and legal possibilities, or, on the other hand, not be allowed to learn and exercise some of the procedures required to them in order to complete their education and that will be requested in their future working environments.

In this sense, in order to better prepare learners to the various working situations they may face, and provide them with an environment where to share and discuss the situations encountered in the workplace, we believe that it is important to give learners the opportunity of sharing and discussing their experiences in terms of the relationship with the other professionals in their working environment, and of discussing about the tasks and responsibilities attributed to them. Having a better overview of what their colleagues are asked to do in different working environments and discussing this with the teachers, will provide them with the possibility of negotiating their workplace situation and making sure they are invested of all the opportunities and requirements associated with their role.

3.2.1.3 Professional identity in the health domain

In reason of the fuzziness associated with the specific characteristics of the ASSC profession, the construction and development of a professional identity may reveal particularly complex for apprentices in this vocational education path. As seen in the literature review of this manuscript, one of the most important steps implied in the development of apprentices' professional identity is associated with their integration of a professional community, characterised by the progressive acquisition of the practices and the customs of the profession (Lave & Wenger, 1991). This movement from a more peripheral to a more central participation in this community may reveal particularly difficult when learners do not have a well-defined professional group to which they can refer, as is the case for ASSC. Moreover, another issue comporting an additional complexity to this process, is that as ASSC are required to perform different tasks in different working environments, the community of practice resulting from these profession is very heterogeneous and new comers can sometimes struggle in recognizing themselves in this group.

On the other hand, the health sector represents one of the fields in which the development of professional identity has been particularly investigated and researched. A number of studies have observed how this identity develops overtime in all professional groups of this domain, going from doctors to nurses, from radiologist and physiotherapist to health aids. Professional identity has been defined as the series of knowledge, values, attitudes and skills shared by members of one professional group (Worthington, Salamonson, Weaver, & Cleary, 2013). This definition confirms the importance, key for the design of our

study, of the two vocational learning settings (school and the workplace) and the knowledge they impart, as knowledge, skills and attitude all concur in the construction of this identity. The professional identity can have an impact on the way people interact and create professional groups differentiating themselves from others (Adams, Hean, Sturgis & Macleod Clark, 2006; Crossley and Vivekananda-Schmidt, 2009). Confirming our idea about the major importance of both theory and practice, Cook, Gilmer, & Bess (2003) assert that theoretical as well as clinical components contribute to the development of this identity, impacting on the success of the transition from the student to the professional status of nurses. In this sense, a low professional identity can result in the decision of nursing students of leaving the program or, subsequently, the profession (Worthington et al., 2013; Deppoliti, 2008). Skorikov & Vondracek (2011) added that occupational identity, defined as the awareness of oneself as a worker, represents an important factor determining “occupational success, social adaptation and psychological well-being” (p.693). Adams et al. (2006) explored the factors influencing the development of professional identity in health and social care professions and identified a number of different aspects: as for example the gender; the specific profession people are members of (professional identity of nurses is different from the one of doctors); previous experience in the health sector; attitude towards team work; knowledge of the profession; and cognitive flexibility.

Coster and colleagues (2008) conducted a study aiming at observing the development of professional identity in students enrolling in different health careers (dentistry, dietetics, medicine, midwifery, nursing, occupational therapy, pharmacy, and physiotherapy) in the UK. The professional identity was measured using Brown et al.'s (1986) scale, based on three main factors: the awareness of group membership, the emotional significance of this membership, and the values attached to belonging to the group. The results of this research highlighted how professional identity for all professional roles was high on entry in the healthcare education (as asserted by Mandy, Milton, & Mandy, 2004), but slowly declined overtime (similarly to what was shown above for self-efficacy beliefs). The authors suggest that this may be explained by the fact that learners acquire awareness about their professional status, and become less enthusiastic about it after the clinical practice.

Globally, these studies are extremely relevant for the context of our research, as they confirm the need for a support in the construction of learners' identity, so that apprentices can positively integrate the profession, lower their risk of withdrawing the professional course and prepare to interact more effectively with other professionals. The aim of our research is therefore to support learners in this process.

3.2.1.4 Reflective practice in the health domain

Health and social care field presents another interesting characteristic, making it a particularly suitable environment to conduct a research on apprentices' professional development, which is associated with the use of reflective practice and of writing activities. Even though we do not aim at presenting here an

exhaustive review of all types of reflective activities conducted in this educational domain, it is important to mention the fact that the health profession, as nursing education to mention one example, have a well documented tradition associated with the use of reflective tasks. Just to cite a few, critical incidents techniques, as well as portfolios and learning journals have been largely implemented in this field, producing interesting results. Additionally, as seen in our literature review various asynchronous discussion environments facilitating the creation of communities of practice in the health care domain have been successfully implemented.

The critical incident technique (Flanagan, 1954) is a technique aiming at the collection of a series of important facts concerning the behaviour adopted in certain situations. This technique is not characterized by a set of precise rules, but rather is an adaptable method that can be modelled and shaped in order to meet the demands and constraints associated with one specific situation. The concept of *critical* incidents should not be interpreted in a narrow sense, as significant situation, selected on a number of parameters, can be considered as critical incidents. In this sense, not only negative circumstances should be included when using this technique but all meaningful episodes. As mentioned above, this technique has been thoroughly implemented in the field of health care and particularly nursing education (see Byrne, 2001; Redfern & Norman, 1999; Minghella & Benson, 1995, only to cite a few examples), to the point that Schluter et al. (2008) provided a guide dedicated to the implementation of this technique in this specific context. They mention in particular three key elements for the success of this technique: 1) participants should complete a detailed description of one situation; 2) the actions of the people involved in the situations should be reported in details; and 3) the outcome of the event should be also discussed in details. Thanks to these three steps, this technique can reveal particularly useful to discuss about the possible reactions to a difficult situation lived in a sensitive environment as the one of health and social care.

Portfolios and learning journals have also been particularly exploited in the field of nursing education and health care in general. As mentioned in the literature review of this thesis, learning journals were implemented in various studies showing a positive effect on the metacognitive skills of learners (e.g. McCrindle & Christensen, 1996). Gillis (2001) discussing about the usefulness of journal writing in nursing education cites Bunkers (2000), who defined these journals as tools that provide an opportunity for apprentices to describe, interpret and analyze their learning experience and consider their future perspectives. This activity would therefore support the development of higher level conceptual skills, through the use of three skills: introspection, reflection and dialogue. In this sense, the authors considers that the use of learning journals represent a unique opportunity to externalise and elaborate what happens in practice, which is otherwise very difficult to integrate, explore and connect with knowledge and ideas. This activity could, therefore, provide an opportunity to challenge and question what happens in the working practice. The outcomes of this activity would be extremely positive, as it could develop skills in critical thinking, reflection, self-awareness and self-efficacy beliefs; improve care provided to patients

through the development of new practical and theoretical knowledge; enhance professional development; uncover pre-existing knowledge used without awareness; monitor knowledge and skills developed overtime; and finally it would provide the means to understand a theory, to assess its relevance and to understand the potential of practical implementation associated to it (Gillis, 2001; p. 57).

As mentioned, this overview provides only some examples of the type of activities that have been conducted in nursing education in order to stimulate the reflective practice of perspective and in-service professionals. This overview shows that the type of activity we are aiming at conducting in this context presents some elements of continuity with already existent practices in this field, while it brings new elements, as the use of collaborative writing and the possibility of sharing and discussing the experiences in a constructive and productive manner.

3.2.2 Getting to know the profession: Interviews

In order to better understand the Community Health Care Assistants (ASSC) profession and the challenges encountered both by apprentices and professional workers, a series of interviews were conducted with apprentices and members of the professional association. Apprentices were asked information about their motivation in choosing this particular professional learning path and their ideas and feelings about their education. Additionally, they were asked about their access to and use of technology. The members of the professional association were interviewed to understand the positioning of this professional role within the other health care professions. Additionally, an ongoing discussion and collaboration has been initiated with two teachers of the school, and school courses were observed.

3.2.2.1 Interviews with apprentices

Five apprentices (4 III year and 1 II year) were interviewed using a semi-structured interview. In this exploratory discussion, apprentices were asked about their motivation towards the profession, their impressions about workplace, school and the articulation between the two settings, and their ease with technologies. Five interesting themes emerged from these interviews and are reported below.

Motivation for the choice of the profession

In the first place, as far as the motivation associated with the professional choice is concerned, in one case an apprentice mentioned the fact that he wanted to work in the health care domain, ever since he was a child. Other family members are working in this field and the fact of having assisted his sick father represents an additional motivation. In the other cases, the fact of having experienced this type of professional role through an internship period of a few months represented the strongest motivation to choose the health care. To be in direct relationship with the patients is also considered as a very important motivation.

Future directions in their educational path – One of the learners interviewed mentioned explicitly that her motivation in the choice of the profession was linked with her willingness to continue her educational

path in order to become a nurse (rejoining tertiary education). On the other hand, the other apprentices interviewed mentioned their willingness to work in quality of ASSC at least for a few years. In two cases, they explicitly mention their willingness of picking up a new educational path eventually.

“ In the near future, I would like to work as a ASSC, while afterwards I would like to pick-up a new professional education path... I don't know yet... maybe nurse or ambulance man, I have to decide”.

Relationship with other professional roles

Apprentices mention the fact that it was not always easy for them to define their role and find their space between the other health care professionals. This is probably a consequence of the fact that, as mentioned above, this professional role is a quite new educational path, forming to a profession that will complement two already existing professions.

“The relationship with the colleagues depends a lot on the different workplace organisations. In some places I found myself to work better with the health aids, in others with the nurses. Because of the way our profession is conceived, we are always in the middle, always trying to find our place. I think it will be possible in the future to define our professional role, but this will take time. It is hard because it is a new role and additionally it is in between to existing ones.”

Articulation of school and workplace learning

A more critical aspect emerged from these interviews when discussing about the articulation of school and workplace learning. In this case, apprentices mentioned how the information obtained in the two environments is not always consistent and sometimes this creates confusion:

“We have the theory here and the practical experience at the workplace and we can see that the two are not always in agreement, it is not always the same. (...) [In school] everything is perfect, but in the workplace everything will be faster and less structured than at school, I'd say. Teachers tell us that workplace practice is not the same we see in school, but cannot prepare us, as each workplace will differ from the others.”

Additionally apprentices mention the fact that workplaces can be quite different from each other and this may result in a different preparation of the apprentices. This represents an additional challenge for learners.

What could be done to support apprentices in their learning

Learners consider that it would be interesting to dedicate some time at school to discuss about workplace experience, in order to share the situations encountered and discuss them with both colleagues and the teachers. They consider that it would be useful to hear others' opinions on possible ways to handle a

difficult situation and discuss this with the teacher. This is an existing practice in school but scarcely implemented and one learner mentions that they need sometimes to insist so that this type of activity is conducted.

Access and use of technologies

All apprentices declared to be at ease with the use of technologies. They mentioned, for example, having access to internet basically everywhere (home, school, on portable devices), and they said that their use of technology is directed both towards leisure and hobbies, as well as towards their learning. In relation to this last point, they mentioned using internet and computer for their school activities, as well as for searching information and clarifications in relation to their workplace practice.

3.2.2.2 Interview with members of professional association

The interview with the members of the professionals association of ASSC focused on the challenges and difficulties encountered by apprentices in their work and on the relationship with the other professional roles ASSC collaborate with. Some interesting and critical points emerged throughout this discussion, which partially correspond to the ones cited by the apprentices in their interviews.

The emotional charge of the profession

The members of the professional association underlined how this role is often very charged emotionally, as apprentices are asked to work with sick people in all sorts of situations, from retirement houses to psychiatric hospitals. They consider this aspect as particularly critical in consideration of the fact that apprentices in this profession are often very young. They are often confronted with death as well as with the intimacy of their patients in their work and sometimes do not have the maturity to handle these types of situations. They need an adequate support system as well as the possibility to externalise and discuss the situation they are facing, as well as their feelings in this respect.

Definition of the role of ASSC

As previously mentioned by the apprentices, the role and position of ASSC in health institutions is yet to be completely defined. In this sense, the responsibilities and tasks that can and should be associated with this profession aren't widely recognised as yet.

“In some institutions ASSC can do various things among the things thought in school. In others there are more constraints. I think that an assistant working in a retirement home and one working in an hospital should be doing always the same job.”

“We do many things. We have various responsibilities and we are instructed and prepared to have them, even though we are not always recognized as responsible”.

Relationship with other professional roles

As a consequence of the previously mentioned issues regarding the definition of the role of ASSC, and in reason of the fact that two other previously established professions share with ASSCs some of the tasks and responsibilities, the relationships with the colleagues working in the health domain are sometimes difficult. According to the members of the professional association, both nurses and health aids reveal sometimes a confrontational behaviour with ASSC, worrying about the possible impact that this would have on their professional role in the future. In this sense, there could be a modification in this behavioural patterns in the future, once there will be a bigger recognition of the role ASSC have and how it relates to the other professions. However, the situation at this stage may sometimes be critical for apprentices joining a workplace and having to face this confrontational attitude.

3.2.2.3 Implication of these interviews on the research

For all the various issues mentioned above, we consider that, together with the need for an external higher recognition of the role of this profession in the health institutions, it would also be important to provide learners with the tools needed in order to face their workplace environments. These tools are not only associated with specific professional competences, but also with the definition of a clear professional identity, reflecting the confidence in one's competence of performing the professional tasks required and the feeling of belonging to a community of professionals. In this sense, all the aspects that emerged from these different interviews and observations conducted in the school confirmed our questioning associated with the challenges presented by the articulation of two different working environments, as well as the importance of the development of both the individual and the social and collective dimensions of learning.

In order to address these key aspects of the profession, we identified a series of aspects as particularly relevant for this professional track and key for the development of an effective pedagogical scenario:

- (1) In order to bridge the gap among theory as thought in school and practice lived in the workplace, apprentices are asked to capture real-life experiences encountered in their internships, through the writing activity, and discuss them at school among themselves and with the teachers.
- (2) In order to give to all apprentices a wider perspective on the type of working conditions, tasks, challenges and responsibilities their classmates face in their working context, apprentices exchange their real-life experiences, and discuss them together.
- 3) As the constitution of a clear professional role for ASSC represents a challenge not only for apprentices but even for professional workers, the self-efficacy beliefs of apprentices, and its evolution throughout the curriculum will be explored, analysed and possibly strengthen.

Moreover, the fact that the learners declared being at ease with the use of technology is an additional element confirming the feasibility of the planned scenario.

In accordance with the DBR approach described above, these aspects were taken into account for the development and implementation of the learning activity conducted throughout this study. The methodology followed to accommodate these various aspects in this research will be detailed in the following section of this chapter.

3.3 Research Project

This section of the manuscript will set out the main characteristics of the research project, describing its research questions, providing some specifications associated with the type of methodology implemented, the role attributed to technologies in this scenario, and the organisation of this project in three different studies composing the corpus of our analysis.

3.3.1 Research questions

The objective of the present research is to analyse the effects of pedagogical scenarios including individual writing and experience sharing on the professional development of apprentices in initial vocational education. In this research professional development will be regarded as a two-folded concept, which includes apprentices' competence acquisition, and their self-efficacy beliefs adjustment (Bandura, 2006), both participating in the construction of their professional identity (Billett, 2006, Lave & Wenger, 1991).

The second chapter of this thesis introduced the pedagogical model that constitutes the framework to design learning scenarios that support the integration of school and workplace learning in vocational education. On the basis of the literature of the domain, rather than researching pure collaborative writing, the main concept of this design is based on the alliance of individual writing activities and peer-feedback: Learners are asked to write individually about a critical situation and to collaborate through peer-commenting, exchanging ideas and suggestions with others. The combination of these two types of activities is believed to trigger both individual and collaborative knowledge building processes, together with the consideration of different perspectives, which have beneficial effects on learners' professional development. A collaborative platform (wiki) is used in order to conduct these computer-supported collaborative writing activities, as it provides all the tools needed for participants to write and interact among them.

The research presented here has a two-folded objective. First, from a research perspective, it aims at finding the answers to a series of fundamental research questions, namely: To which extent a blend of individual and collaborative writing activities affect learning processes, having an impact on apprentices' professional development? More precisely, two research questions can be derived from this one: 1) Do these pedagogical scenarios have an impact on apprentices' competence acquisition? 2) Do they prompt a

re-adjustment of apprentices' self-efficacy beliefs? In order to scientifically assess the impact of the scenario proposed on the mentioned aspects, the studies will be conducted following a quasi-experimental design using pre and post-test methodology.

The second objective of this research concerns the pedagogical design of these activities and is more directed towards the practitioners and policy makers involved in vocational education. In this sense, the main questions are: 1) How can learning activities articulate efficiently individual and collective dimensions of learning? 2) How can collaboration be prompted and enhanced through efficient activity design? 3) What features should a technology-enhanced environment have in order to facilitate and increase collaboration among peers?

In the course of this manuscript, a series of studies aiming at providing an answer to our questions will be presented. The interventions composing this project have been implemented progressively. Each study represents an evolution of the previous one.

In the discussion section, based on the results of these three studies, an answer to our research questions will be provided. Additionally, the implications of our results on the pedagogical design of the activities will be discussed, considering the design-oriented questions as well as the possibilities for the modification and adaptation of our scenario to various domains.

3.3.2 Methodological approach

The research presented in this thesis was conducted, as mentioned above, in collaboration with an initial vocational education school for *Social and Health Care Assistants (Assistants-es en Soins et Santé Communautaire - ASSC)* in Geneva in the framework of the Dual-T project. The agreement with the school management foresaw the implication of a group of teachers recruited on a voluntary basis, who continuously participated in the design, development and implementation of the activities. The design of the activity was, therefore, discussed and progressively adapted to the needs and expectations of the teachers, in accordance with the DBR approach.

This section illustrates the overall methodology of the research project, detailing the way in which the DBR approach was adapted to our research, describing how the methodology of our three studies evolved throughout their implementation. More particularly, the first study implemented a quasi-experimental design, involving two classes of the school, one being the control group, exposed to one part of the pedagogical scenario (writing a critical situation), and the other one participating to the full experimental scenario developed in collaboration with the teachers (writing a critical situation, with peer-feedback activity). Driven by both ethical reasons (the teachers collaborating in the project questioned the idea of exposing the two groups constituting a class two different activities) and methodological reasons (the school has a limited population, 20 to 40 apprentices per year), in the following studies, it was decided to avoid the presence of a control group, and to adopt a more longitudinal approach. In this new

implementation, therefore, the scenario was progressively more embedded in the regular curriculum of the classroom, and was evaluated following different directions: (1) On a longitudinal approach, we compared the performance of the learners on the target measures, before and after the implementation of the scenario; (2) additionally, a qualitative analysis of the discourse was conducted, considering the written and oral interactions among participants and with the teacher (Filliettaz, 2010b); (3) and finally groups of learners were created *a posteriori* on the basis of data gathered throughout the activity, as apprentices participation to the activity, etc.

More details about the specific methodology used in the pieces of research analysed in this thesis will be provided in the chapters dedicated to the individual studies, together with the description of the specific scenario implemented and the results of the implementation.

3.3.3 Research plan

As mentioned above, this research project is based on two interventions and three studies, as the second intervention is articulated around two studies: the first one is dedicated to the quantitative research of this implementation, while the second one to the qualitative analysis on the written text. As the scenarios implemented represent the adaptation of the first scenario, they present some common characteristics.

As mentioned in the explanation of the model developed throughout this project, the main idea of this research is to implement a scenario using computer-supported collaborative writing in the vocational education context. Aside from the use of writing and collaboration, which was already explored and justified on the basis of the literature of the domain in the previous chapter, other characteristics representing common features of our scenario can be identified. On the one hand, for example, one key feature of the scenario implemented was based on the utilisation of the critical incident techniques. As mentioned above, this technique, particularly used in the domain of health and social care, as nursing and medical education, represents an interesting mean to capture particular and significant situations lived in the workplace and exploit them in the classroom environment. Another important characteristic that represents an overarching characteristic of this project is associated with the role attributed to the technologies in our scenario.

3.3.3.1 The technology in our scenario

The design of this learning activity required, for its implementation, the support of a technological tool offering a series of assets, going from the possibility of multi-user edition and collaboration, to a relatively flexible structure, and including security settings limiting the access to the environment to the participants of this research. These various requirements were considered in a needs assessment that represented one of the fundamental steps of the design of the first version of this scenario and resulted in the choice of a wiki platform. A wiki is a Web-based environment allowing a group of people to collaborate asynchronously on the Web, building a corpus of knowledge organised in a series of interlinked pages, with an open and flexible structure (Franklin & Van Harmelen, 2007). In reason of

these characteristics, this tool represented an excellent option for this research, as it provides learners with both the flexibility and the interactivity required. Other tools were considered when selecting the most appropriate option to support this pedagogical scenario, as forums and blogs, but these options were discarded in reason of a less flexible structure, not fully supporting the collaborative editing of the texts written by the apprentices, which was required in this design.

Performing a thorough analysis of the various wikis available, we selected *Wikispaces* (www.wikispaces.com), a wiki Web service specifically created for the educational context. Wikispaces has been selected for a number of reasons, which include its ease of use, both in terms of set-up of the environment performed by researchers and teachers, and of its utilisation by the apprentices participating to the studies. Additionally, this service offers the possibility of limiting the access to a selected group of users, and the automatic storage of last modifications. Moreover, wikispaces is available online and does not need to be reinstalled on a server, which means that no particular technical competence or hardware is required. This is a fundamental aspect to keep in mind in view of the sustainability of the project, enabling the school to maintain the pedagogical activity in the future, with no need for continuous support.

This research project does not involve the development of a specific computer-support adapted to the implementation of the emerging pedagogical scenario, and is rather focused to the analysis of the pedagogical use of a pre-existing tool. This is in line with the objective of technology-enhanced learning. Considerably more attention was indeed dedicated to the design of the pedagogical scenario rather than to technological development. This choice is based on the idea that the technology used in a classroom activity should provide support for a well-designed pedagogical scenario. In this sense De Lièvre, Depover & Quintin (2000) assert that the use of a specific technological tool does not automatically add value to the effectiveness of an activity, if its utilisation is not carefully considered and adapted to the specific needs and objectives of a learning activity. In this sense, the choice of the technology is important but only if it is used in accordance with the specific objectives for which it was designed. The objective of any intervention conducted in a classroom setting should focus on the pedagogical quality of an activity. Technologies in this framework are supposed to represent a support to this quality and to the actual implementation of the activity (Depover, Giardina & Marton, 1998). For these reasons, the importance of a solid pedagogical design, in which the activities of the learners were organised and scaffolded in the most appropriate and effective manner, was especially valued. The same type of pedagogical scenario would not have been possible without the utilisation of this technological tool, and this represents the fundamental role played by technologies in our design.

3.3.3.2 Global organisation of the research

Throughout this research, two main interventions were conducted. In particular, the second intervention represented an evolution and adaptation of the previous one, and, as Figure 6 shows, additional design

elements, stimulating different processes, were included in this intervention. The writing activity became longer and extended to more sessions and the peer-commenting phase of the second scenario was organised around two cycles. Additionally, the individual and collaborative writing activities were combined with a class discussion. The first intervention is associated with the first study described in this thesis, *Collaborative vs. individual writing*, while the second intervention is organised around the second and third studies of this manuscript, namely, *The impact of collaborative writing and discussion on professional development* and *Patterns of vocational learners' interaction on written critical incidents in a computer-supported environment*.

It is important to mention in this context that a third intervention, based on an adapted version of this scenario, has been implemented in the last year of the project. Given that this intervention was to be conducted at least over one semester, becoming one of the teaching practices in the school, this PhD project could not include its results, in reason of the timeline foreseen for this thesis. More details will be provided in the Future Directions section.

In this section of the thesis, the characteristics of the interventions will be described. The rationale of the activity both associated with the research design and the learning scenario will be detailed. The full report of the research conducted and the result in each phase of the research will be provided in the following chapters.

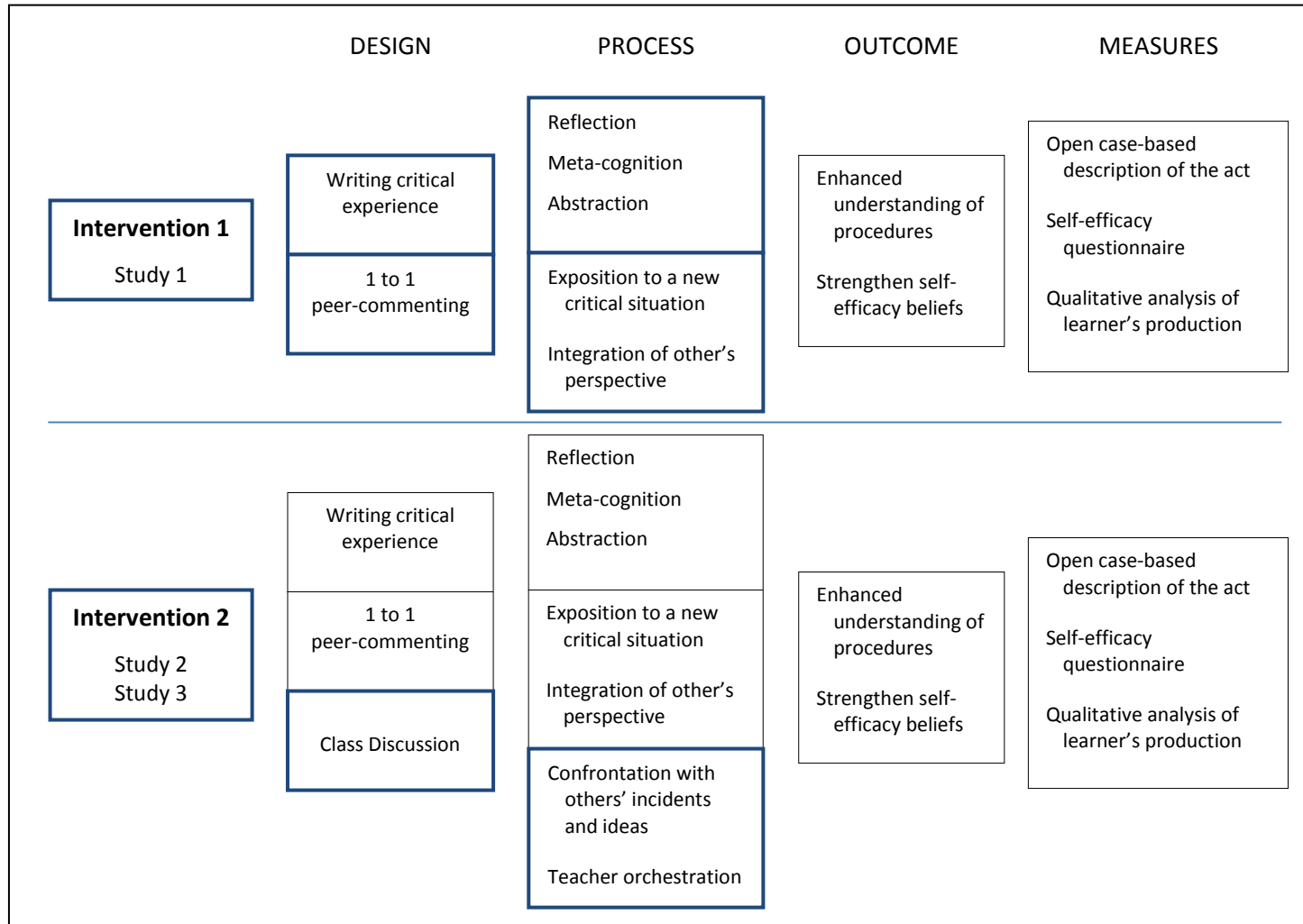


Figure 6. Map of the research plan. In thicker frames are the activities and processes added in each intervention

First intervention

Research purpose, questions and hypotheses

This intervention represents the first research conducted in the framework of this analysis of the use of computer-supported collaborative writing for professional development. This research, which was based on a shorter-term approach if compared to the following ones, had two main purposes. On the one hand, its objective was to answer to a set of research questions and verify the hypotheses about the impact of this scenario on learning and self-efficacy beliefs. Additionally, the aim was to conduct a first testing of the scenario, with learners in the authentic vocational school context, in order to observe their reactions and approach to this type of activity, collecting a series of information about the characteristics and specificities of this educational path (social and health care assistants) and the apprentices involved in it. A full account of this research will be provided in part three of this manuscript. This section focuses on the most important aspects of the methodology and scenario implemented, in order to describe its connections with the following one.

During this intervention, the impact of a peer-commenting activity on critical incidents (Flanagan, 1954; Schluter et al., 2008) described in written text by each apprentice was analysed. The fundamental question was whether peer interaction on these critical situations, reproducing the exchange of ideas and suggestions among professionals typical in professional practice (Billett, 2002; Eraut, 2004), fosters apprentices' understanding of a specific practice and increases their self-efficacy beliefs related to its execution.

The main hypotheses were: 1) Writing about critical experiences and comparing one's experience with others' promotes understanding of procedures, more than a task only foreseeing writing of critical incidents; 2) Writing about critical incidents and comparing one's experience with others' fosters self-efficacy beliefs, more than a task only foreseeing writing of critical incidents. 3) The more participants engage in the sharing phase, by commenting and reconsidering their experiences, the more they learn through this activity. In order to verify these hypotheses, an evaluation before and after the activity was conducted, observing apprentices' understanding of a procedure, through a test we designed for this purpose, and participants' self-efficacy beliefs. Additionally, the participation to the task was measured both quantitatively and qualitatively.

Methodology

As mentioned above, for this first implementation of our research, a quasi-experimental design was implemented, based on two different conditions. The two second year classes involved in the study (respectively 11 and 10 apprentices) were assigned to one of the following conditions: (1) Writing and Peer-commenting (WP, experimental); (2) Writing alone (W, control).

Scenario

The Writing and Peer-commenting group (experimental condition) followed the scenario below (represented in figure 7), while the writing group (control condition) skipped phase 2 (peer-commenting).



Figure 7. Scenario implemented in the first intervention

Session 1: Pre-Test - Apprentices answered to a test to evaluate their competence on the procedure (open case-based description of the act) and self-efficacy questionnaire.

Phase I: Using a wiki, each apprentice described a critical situation experienced in the workplace in relation to a given topic (*washing a patient*): what has happened, how they reacted, what were the consequences (critical incident).

Session 2: Phase IIa (1 week later - only WP group): Apprentices were required to comment in the wiki on the incident described by one classmate. The prompts provided to the learners, in order to perform this task were the following: 1) ask questions (King, 2007); 2) provide comments; 3) consider other possible reactions to a similar situation (Kuhn, Shaw, & Felton, 1997).

Phase IIb (same session): Everyone responded to the questions and comments received by the classmate to their text. Then they reconsidered the incident occurred to them in light of the consideration of the classmate by describing the way they will react next time a similar situation occurs.

Session 3: Post-Test (1 week later): The apprentices answer to the test and the self-efficacy questionnaire again.

As mentioned above, a full account of this study, comprising the detailed description of its implementation and the results emerging from it will be provided in chapter four of this manuscript, based on Ortoleva, Schneider, & Bétrancourt (2013a).

Second intervention

Modifications and development from first intervention

During this intervention, the same parameters of the previous one were analysed, as the research questions observing the effects of writing and sharing critical experiences on apprentices' understanding of a procedure and on their self-efficacy beliefs were applied to this research as well. However, three important modifications were made if compared to the previous research: on the one hand, the test to measure apprentices understanding of the procedures and the questionnaire evaluating their self-efficacy beliefs were redesigned, in order to overcome some problems that were encountered in the previous study. Additionally, in terms of design of the activity, in comparison with the previous scenario, the new one was longer, and included two complete writing and peer-commenting exercises, with the addition of an oral discussion phase. This discussion phase was handled by the teacher, who orchestrated and participated to the discussion about the difficult situations that can be encountered in the workplace, and talked about the experiences apprentices had written in their texts (Tynjälä, 1998). In this sense, the teacher assumed the central role of the *orchestrator* of the scenario (Dillenbourg & Jermann, 2010). She clustered and organised the situations encountered by the apprentices and lead the discussion in the class. Finally, given the length and development of this intervention, a thorough analysis of the exchanges between the apprentices was conducted, aiming at having an in-depth representation of the productive exchanges performed on the platform and the trigger associated to them.

The analysis of this second intervention is structured around two main studies. For the first one, our research questions are: 1) Does writing about critical experiences, peer-commenting and discussing them (with the orchestration of the teacher) promote competence acquisition? 2) Does writing, peer-commenting and discussing in the classroom about critical situations prompt a re-adjustment of apprentices' self-efficacy beliefs? 3) Is there a correlation among the level of engagement and participation of apprentices and their gain of understanding of procedures and modification in self-efficacy beliefs?

For the second study, on the other hand, more exploratory questions were also formulated: How do learners interact in this type of writing and peer-commenting activities? Can patterns of behaviour in the way they provide each other's comments and suggestions, as well as in the way they react to the comments received by others, be identified? Also in this case, a full account of this research is provided in the two chapters describing each one of the studies (chapters 5 and 6). These chapters will provide a

description of the scenario and methodology of the intervention, so that it will be possible to trace an overview of the whole research, presenting the evolution and transition from the previous research to the following one.

Methodology

As mentioned above, for this second intervention, for both ethical and methodological reasons, a more longitudinally based approach was implemented. In this sense, this activity was longer in time and more embedded in the regular curriculum of the school (as it was designed in full collaboration with the teachers of the school). The four classes involved in the intervention were two first and two second year classes (respectively 25 and 15 apprentices), both following the same instructional scenario.

Scenario

The scenario followed by the apprentices participating in this research is represented in figure 8, and described below.



Figure 8. Scenario implemented in the second intervention

Pre-Test - Apprentices answer a test to evaluate their competence on the procedure and self-efficacy questionnaire.

Session 1: Phase I - Using a wiki, apprentices describe a critical situation encountered in the workplace.

Phase II - Each apprentice comments on the experience of 2 colleagues (the prompts were the same as the ones provided in the previous study).

Phase III - The author responds to colleagues' questions and comments (the prompts were the same as the ones provided in the previous study).

Session 2: Phase IV - Group discussion organised around the thematic areas discussed in the episodes reported by the apprentices.

Session 3: Phase V, I year - Learners were provided with external resources (journal articles, book sections, video excerpts) that revealed interesting insights on the topics emerged in their episodes and during the discussion. After reading and watching the material, learners had to reconsider the topic discussed and draw new conclusions, following a series of guiding questions.

Phase V II year - The session was dedicated to the integration of the aspects emerged from the first two steps: the writing activity together with the oral discussion. Learners were asked to read and comment again on their pages and those of their colleagues, in light of what they had learned through the writing task and the oral discussion.

Post-Test: Apprentices answer to the test, the self-efficacy questionnaire and a questionnaire about their subjective evaluation of the activity.

As mentioned above, a full account of this intervention, comprising the detailed description of its implementation and the results emerging from the two studies conducted in this framework will be provided in chapters five and six of this manuscript. Chapter five, based on Ortoleva & Bétrancourt (2014b) will consider the whole scenario and provide the results of the more quantitative analysis performed on apprentices' competence and self-efficacy beliefs, together with their participation to the task and subjective evaluation of it. Chapter six, based on Ortoleva & Bétrancourt (2014c) will, on the other hand, consider the qualitative analysis on the patterns of written interactions of the apprentices in the first phase of this activity.

4. First study: Collaborative vs. individual writing

4.1 Introduction to the first study

4.1.1 Research objectives

In this study, which represented the first intervention in which we implemented the initial version of our pedagogical scenario, we investigated a peer-commenting design on critical incidents (Flanagan, 1954; Schluter et al., 2008) described in written text by each apprentice. The objective of this research was two-folded: on the one hand, this study aimed at answering our research questions and verifying the hypothesis we had in relation to the impact of such an instructional activity, and in particular of the peer-commenting phase of this scenario, on learning and self-efficacy beliefs. In order to pursue this objective, we followed a quasi-experimental design, **creating two different conditions, observing writing with and without peer interaction.**

The second objective of this implementation was associated with the observation of the apprentices' reactions to this pedagogical activity, which was a shorter version of the pedagogical activity implemented in the following studies, in the authentic classroom context. We were therefore interested in observing the attitude and behaviour apprentices would demonstrate both towards the task of writing personal critical experiences lived in the workplace, and of sharing these experiences with others, being proactive in providing constructive comments and ideas, and open to receiving suggestions and criticism of others. In this sense, we aimed here at collecting pieces of information related to the characteristics and specificities of this specific vocational education path, and its apprentices, in order to consider how to adjust our next interventions to this target audience.

4.1.2 Research questions and hypotheses

The fundamental question associated with the implementation of this research was whether peer-interaction on critical situations lived in the workplace fosters apprentices' understanding of a professional procedure, and produces an adjustment in their self-efficacy beliefs related to its execution.

Our hypotheses are: 1) Writing about critical experiences and comparing one's experience with others' promotes understanding of procedures, more than a task only foreseeing writing of critical incidents; 2) Writing about critical incidents and comparing one's experience with others' fosters self-efficacy beliefs, more than a task only foreseeing writing of critical incidents; 3) The more participants engage in the sharing phase, by commenting and reconsidering their experiences, the more they learn through this activity.

In order to verify these hypotheses, we performed an evaluation before and after the activity, observing apprentices' understanding of the specific procedure under analysis, through a competence

test we designed for this purpose. Additionally, we administered participants' a self-efficacy beliefs questionnaire before and after the implementation of the scenario, measuring various aspects associated with their feeling of confidence in performing a certain number of work related and non-work related tasks. Moreover, the participation to the task was measured both quantitatively and qualitatively.

The implementation of this research, together with its main results will be presented in the next section of this manuscript, on the basis of an article published in peer-reviewed conference proceedings (Ortoleva, Schneider, Bétrancourt, 2013a).

4.2 Use of a wiki for collaborative writing and experience sharing in initial vocational education

The content of this section is based on:

Ortoleva, G., Schneider, D., Bétrancourt, M. (2013a). Utilisation d'un wiki pour l'écriture collaborative et le partage d'expérience en formation professionnelle initiale [Use of a wiki for collaborative writing and experience sharing in initial vocational education]. In C. Choquet, P. Dessus, M. Lefevre, J. Broisin, O. Catteau, P. Vidal, *Environnement Informatique pour l'Apprentissage Humain. Actes de la conférence*. (pp. 17–28). Toulouse: IRIT Press 2013.

The article was translated for a better integration within the manuscript.

4.2.1 Introduction

The study presented here was conducted in the framework of a research project (Dual-T) aiming at developing technology-enhanced learning environments for initial vocational education, in particular to support the articulation of school and workplace learning. The field of implementations of this research is the health sector and more precisely the school for social and health care assistants in Geneva. The learning environment used in this context was developed taking into account the specificities of initial vocational education and of the profession involved in the study, as well as the fundamental research on technology-enhanced learning and vocational education, following a design-based research approach (Sandoval & Bell, 2004).

4.2.1.1 Initial vocational education

Initial vocational education represents a relevant portion of secondary schooling in Europe. In Switzerland, initial vocational education paths are chosen by nearly 70% of students finishing their compulsory schooling (lasting until 16 years of age). These educational paths are generally organised around a “dual format”, in which apprentices alternate in the same week, 3 to 4 days in a workplace environment with school, in reason of 1 to 2 days per week. Even if this type of articulation represents an ideal solution to impart a concrete and contextualised education, the literature identified a series of critical points associated with the integration of knowledge emerging from school and workplace learning, as well as different educational perspectives, which are not completely compatible (Billett, 2009; Filliettaz, 2010; Gurtner et al., 2012). In this sense, apprentices are confronted to different learning situations in school and in the workplace practice, running the risk that the emerging knowledge will be juxtaposed, rather than integrated. One of the challenges of initial vocational educations is therefore to support learners in articulating their practical experiences with the more conceptual knowledge emerging from the two environments.

This articulation of knowledge is not easy for the learners for various reasons. In the first place, schools follow a curriculum presenting the most important knowledge and skills associated to the profession, even though apprentices may not practice in their workplaces all of the procedures though to them (Ludvigsen et al., 2011; Stenström & Tynjälä, 2009). Additionally, school curriculum includes procedures that are beyond the basic knowledge of the profession, in order to provide apprentices with a better understanding of their work, as well as the opportunity of future career advancements. Finally, apprentices of a class are usually engaged in workplaces presenting different working conditions. This represents an interesting learning opportunity, while, at the same time, being a challenge in consideration of the diversity of individual learning paths that have to be integrated in the school context. For all of these reasons, the individual practical experience does not represent a stand-alone solution to develop the competences required for the profession.

On a cognitive perspective, apprentices need to acquire declarative knowledge, related to the theory of the domain of study, procedural knowledge for the execution of the professional gestures, and heuristic knowledge, allowing them to adapt to the different situations encountered in the workplace. The ability to react adequately to new situations is an essential dimension of expertise, which continues to develop even after formal education (Schön, 1983). Additionally, the apprentices acquire the professional attitude and behaviour, through the interaction with and observations of others. This contributes to the progressive development of their professional identity and their integration in the community of practice (Lave & Wenger, 1991).

The development of professional competences is accompanied by the evolution of the apprentices' subjective perception of their own performance. Bandura (2006) elaborated the concept of self-efficacy beliefs, which described the perception one person has of his/her own capacity of performing one action. Research in this field showed that self-efficacy beliefs are not only correlated but a determining factor of performance. The integration of these different aspects represents therefore a key characteristic of this type of educational path.

4.2.1.2 Writing to learn

According to the writing-to-learn research approach, the activity of writing could, in itself, produce beneficial effects on learning, thanks to the cognitive processes associated with it, comprising the organisation, manipulation and integration of knowledge (Olson, 1994). A pedagogical activity based on writing would allow, in this sense, not only to transform the knowledge (Hayes & Flower, 1980), but also to produce new one, thanks to the creation and organisation of concepts associated with this activity (Tynjälä, Mason, & Lonka, 2001). Galbraith (2009) created a model presenting a double process associated with the creation of new knowledge through writing (*discovery through writing*). A first process is associated with the explicit planning of the text, which allows to reorganise existing concepts and to create connections between these concepts. A second process, which is initiated when the writer has to explicitly formulate his/her thoughts in writing, is associated with the implicit organisation of knowledge in his/her semantic memory. This organisation influences the progressive formulation of new concepts, which were not present in the semantic knowledge at the beginning of the activity.

In the context of this research, apprentices do not only write individually about their practice, but they will also exchange and interact on their respective experiences. Few pieces of research have treated of collaborative writing, with or without the use of computer-support. The results show that the collaboration can have a positive effect on cognitive processes and learning (Hartley & Tynjälä, 2001; Orly-Louisa & Soidetb, 2008). Other research on the construction of a collaborative knowledge base (Scardamalia & Bereiter, 1994) guided us in the choice of the type of technology-enhanced environment to use in this context.

4.2.1.3 Choice of a technology-enhanced learning environment to support collaborative writing

Among the various technological tools that can support writing and collaboration activities, we selected a wiki environment, in reason of four main characteristics: 1) its accessibility, allowing to connect at different moments and different times; 2) the possibility of adding new pages; 3) the possibilities of organising the written productions, through the use of links and categories; and 4) the history function of the pages, through which it is possible to keep track of the modifications made by the various users and to go back to a previous version of the pages (Bétrancourt, 2007; Parker & Chao, 2007). The use of a wiki was chosen over a blog, as the aim of the activity was the one of producing a common repository of situations, in which the episodes could be classified and linked on the basis of the topics treated.

4.2.2 The study: Individual and collaborative writing activity

A quasi experimental study was implemented in order to evaluate the impact of a pedagogical scenario including both the description of a critical situation followed by peer-comments, compared to another scenario not including the peer-commenting phase of the activity, on apprentices' competence acquisition and their self-efficacy beliefs.

The proposed study is organised around the implementation of two pedagogical scenarios with two independent groups. The first scenario comprises two main phases: in the first session apprentices write individually a critical situation they encountered in relation to a specific professional gesture (washing a patient). Successively, a second session is dedicated to peer-comments and collaboration among participants. The second scenario only comprises the phase of individual writing, with no collaboration among the participants.

4.2.2.1 Research questions and hypothesis

In reason of the above mentioned literature review, we expect that, in comparison to a scenario comprising only an individual writing activity, writing about a critical situation and comparing this experience with others 1) increases the declarative knowledge about the professional gesture, and reinforces the ability to handle critical situations; and 2) it increases the perception of self-efficacy related to the execution of the specific gesture. 3) Additionally, we expect that the modifications in these values before and after the experience are associated with the level of engagement in the activity of writing and peer-commenting of the apprentices.

A second aim of this study was the one of observing the reaction of learners and teachers to the use of a platform for collaborative writing, and in particular a wiki. We wanted to test, in this context, the ease of participants in the writing with computers, and theirs subjective evaluation about the use of the platform.

4.2.2.2 Methodology

In consideration of the fact that this activity was conducted in the authentic context of a school, a quasi-experimental design was implemented, involving two classes, each assigned to one of the experimental conditions. The technology-enhanced environment, as well as the measures used, was conceived in collaboration with the teachers¹, who also participated to all stages of the design and implementation of the pedagogical scenario.

Participants and conditions

The participants of the study were the apprentices of two second-year classes of the school for health and social care apprentices (Assistants en Soins et Santé Communautaire – ASSC) in Geneva, composed by 27 women and 4 men. The two classes were assigned to one of the following conditions: Writing and Peer-feedback (WP – 18 apprentices) and the Writing alone (W – 13 apprentices).

Material

Instruments and measures – Each participant replied to a series of three questionnaires which, together with the analysis of the activity performed on the platform, represented the measures used of this activity. 1) The competence test about the professional gesture of washing a patient demanded apprentices to describe the different steps of the procedure of washing a patient (with some guiding elements), in the situation of a imaginary patient (see Appendix A). The score was obtained by calculating the number of elements reported by participants in relation to a grid of expected answers. The test was administered before and after the experience (the cases of two different patients were presented at the pre- and the post-test). 2) A questionnaire about apprentices' self-efficacy beliefs, developed on the basis of Banduras' (2006) recommendations, evaluated the perception of competence of participants in the execution of a number of tasks. The questionnaire included 18 items (response scale: 0 -100) on four dimensions: general, professional, school-related and specific to the procedure under analysis (see Appendix B). In consideration of the results obtained during the pre-test (various apprentices responding 100 in different items), we decided to modify the response scale for the post-test. In the new version of the questionnaire, participants were explicitly asked to state whether they perceived a difference in their ability to perform a task, in comparison to the pre-test. The response scale of the post-test was a continuum from “less able” to “more able”. 3) A questionnaire evaluating the subjective experience, required participants to express their interest and perception of utility of the activity, as well as their judgment in relation to the technological environment used.

Qualitative evaluation of the written productions was based on an evaluation grid developed on four dimensions: 1) *participation*: the number of words written at each phase; 2) *discourse analysis* (e.g.

¹ We would like to thank the teachers of the “Ecole d’assistant-e-s en Soins et Santé Communautaire” of Geneva, Ms. Martine Coquoz and Ms. Béatrice Jacquier, for their collaboration in the design and implementation of this research. We would like to thank also Ms. Anne Fisher, director of the school, and Ms Monique Gerdil, director of the Centre de Formation Professionnelle Santé et Social (CFPS) for their interest and support.

argumentation, statement, etc.) used in participants' texts; 3) *epistemic analysis*: themes discussed by the apprentices; 4) *Transactivity*: integration of colleagues' comments or suggestions in the conclusion (Weinberger & Fischer, 2006). As these analyses were conducted for exploratory purposes, in the context of this chapter, we will present two of these dimensions: the *participation* and the *epistemic analysis*.

The technology-enhanced learning environment – The activities were conducted on Wikispaces (www.wikispaces.com), a web service created specifically for the use of wikis for educational purposes. After a needs-analysis conducted on the basis of our objectives for this activity, Wikispaces was selected for a number of reasons: ease of use, possibility of restricting the access to the site to the participants of the experience, efficient system of automatic back-up, and functionalities specifically designed for educational purposes (e.g. project). At the beginning of the activity, apprentices received individual accounts on the platform, providing them with a personal space where to write their episodes and receive peer-comments.

Procedure and pedagogical scenario

The first session, identical for the two groups, began with the administration of the two questionnaires: the competence test about the professional procedure under analysis (*toilette* - washing a patient) and the self-efficacy questionnaire. Afterwards, participants were given access to the online platform. In this environment, each participant accessed a personal page, where he/she was asked to describe a critical situation experienced in the workplace in relation to the procedure of washing a patient. The instructions provided were based on the critical incidents technique (Flanagan, 1954; Schuler et al., 2008). The task's instructions, provided in the page of each apprentice and explained orally before the exercise, contained some guiding questions. In particular, participants were asked to describe the situation, specifying: (1) what have happened, (2) how they reacted to this incident, (3) what were the consequences that this incident had. The concept of "consequences" in this context was considered in a wide sense, including the "actual" consequences deriving from the situation, as well as the considerations made by the apprentices, and the changes in their practice and attitude deriving from this episode.

The second session, one week after the first one, was conducted exclusively with the writing and peer-commenting group (WP). During this session, participants were asked to work in couples, and were free to choose the person with whom they wanted to collaborate. All apprentices were asked to access the page of the chosen colleague and comment on the incident he/she described, by: 1) asking questions about the incident encountered (King, 2007), 2) providing comments and interpretation of the situation and of the behavior of their colleague, 3) describing what they had done in a similar occasion, or what they think should have been done (Kuhn et al. 1997). Following this phase, each participant had to go back to his/her own page, in order to (1) respond to questions and comments

received, (2) reflect on the key aspects of the incident they described, and (3) reflect on the way they will react next time to a similar situation. Figure 9 provides an example of the page of an apprentice, presenting a complete interaction.

The last session, two weeks after the previous one, was the same for the two groups. The apprentices were now asked to answer to three questionnaires: le competence test (presenting the same exercise of the pre-test, with the case of a different patient), the self-efficacy questionnaire (modified from the previous implementation, as described above), as well as the questionnaire about the subjective evaluation of the activity and the environment used.

Votre Texte

1. Qu'est ce qui s'est passé ?

Lorsque je faisais la toilette pour la première fois à XXX, dans l'établissement YYY où je suis en stage, j'étais un peu nerveuse. Je n'avais jamais fait une vraie toilette avant, vu que j'avais juste fait mes exercices à l'aide d'un mannequin, et je dois avouer que je ne savais pas trop comment m'y prendre. De plus, la personne à qui je faisais ce soin ne parlait pas français, mais seulement ça langue maternelle, le russe, langue que je ne connais pas. Je n'arrive donc pas à communiquer avec elle et je ne pouvais donc pas savoir si mes gestes étaient appropriés et ce qu'elle ressentait. J'avais particulièrement peur de pouvoir lui faire mal sans me rendre compte, et sans qu'elle puisse m'expliquer...

Chérie, je te comprends, car quand j'ai fait une toilette pour la première fois j'étais aussi stressée. Par rapport aux problèmes de communication avec la dame, par contre, je pense que tu ne dois pas oublier qu'il y a différents types de communication, notamment la communication non-verbale. Avec nos gestes, nos sourires et le ton de notre voix, on peut beaucoup communiquer, même si on ne parle pas la même langue. Tu peux donc mettre ta patiente à l'aise grâce à ce type de communication, et elle sera aussi capable de te communiquer si quelque chose ne va pas, ou si tu lui fais mal!

Ma Chérie, Merci pour t'as compréhension, Oui maintenant j'ai compris qu'on n'a pas forcément besoin de parler pour communiquer, grâce à la communication non verbale.

2. Comment avez-vous réagi ?

J'étais stressée parce que c'était la première fois mais surtout de ne pas comprendre la personne. J'ai essayé de ne pas trop paniquer et de garder la calme et mon sourire aussi. J'ai fait la toilette tranquillement et finalement je pense que ça c'est assez bien passé. La dame souriait aussi, donc je crois que je ne lui ai pas fait mal.

J'ai aussi stressée que toi quand on a commencé le stage car cela faisait longtemps que je n'avais plus pratiqué.
Comment as-tu géré ton stress?

Je me suis dit que si j'avais réussi en cours je devrais réussir aussi dans cette situation, et cela m'as un peu calmé. Mais surtout j'ai réussi à gérer mon stress parce que je lui faisais des gestes pendant la toilette et tout c'est bien passé. Elle me semblait être à l'aise, alors je me suis sentie rassuré.

3. Quelles ont été les conséquences ?

Finalement la toilette c'est bien passée, et ça fait maintenant déjà quelques mois que je fais la toilette à cette patiente. Je me sens toujours un peu mal à l'aise quand je dois faire une toilette à de personnes qui ne parlent pas ma langue, mais j'espère qu'un jour je vais me sentir plus confiante.

Et comment ça ce passe maintenant, arrive tu as la comprendre? peut-tu savoir ses besoins et ses demandes?

Vu que maintenant je travaille avec elle depuis quelque temps, je comprend un peu et quand je ne comprends pas on utilise les gestes. Finalement on a trouvé une manière de communiquer, mais il a fallu un peu de temps.

Moi aussi, j'ai du travailler avec de personnes que ne parlais pas français. Dans ces cas j'essayé d'apprendre à dire bonjour dans leur langue, pour créer un contact :D et après je parlais avec mes gestes. Quand je travaille régulièrement avec une personne qui ne parle pas français, je prends un dictionnaire de sa langue. Comme ça elle peut me montrer les mots qu'elle veut utiliser. ça peut être une bonne suggestion pour toi aussi.

Tu as raison par rapport au dictionnaire, c'est une bonne idée et je vais essayer de faire la même chose que toi!

Figure 9. Critical incident reported by one apprentices and peer-feedback (blue: questions and feedback, green: conclusions). The situation described was adapted to guarantee the anonymity of the apprentices

4.2.3 Results

4.2.3.1 Competence test performance

The apprentices' understanding of the procedure was measured by scoring their answers to the competence questionnaire on the basis of the canonical description provided by the teachers. The mean scores of the two groups did not reach 50% success, neither at pre-test nor at post-test (see Table 3

with the results of the pre- and the post-test). The participants of the writing only group had better performances than the participants of the Writing with Peer-feedback group, both at the pre and post-test, but the differences were not statistically significant (Test $t = -1.468$, $ddl = 19$, NS).

Table 3. Mean score (on 16 points) on competence test of the two groups, at the pre- and the post-test

Conditions	Competence		
	Pre	Post	Gain
Writing + Peer-feedback	5.9 (2.5)	6.8 (1.8)	0.90 (1.85)
Writing alone	7.2 (1.8)	7.6 (2.2)	0.27 (2.83)

An ANOVA was conducted, after verifying the conditions of sphericity and homogeneity of variance, in order to compare the gain of the two groups between pre and post-test. It is possible to notice that both groups have improved their performances (especially the WP group), **but the differences were not statistically significant (neither the intra-subject effect pre-post: $F(1, 19) = 1.232$, $MSE = 1.031$, NS; nor the inter-subject effect of the factor group: $F(1,19) = 2.070$, $MSE = 11.751$, NS; or the interaction effect: pre-post and group: $F(1, 19) = .353$, $MSE = 1.031$, NS).**

4.2.3.2 Self-efficacy beliefs

The analysis of the pre-test scores showed that students in the writing with peer-feedback group had a significantly higher perception of self-efficacy on the dimension related to the ability of washing a patient (toilette) than the writing alone group ($F(1, 19) = 5.399$, $p < .05$). Moreover, both groups rated remarkably high in their evaluation to all dimensions of the self-efficacy questionnaire, and particularly on the dimensions under analysis: self-efficacy related to ability of washing a patient (see Table 4 with the mean self-efficacy score at the pre-test).

Table 4. Mean score at the pre-test on self-efficacy beliefs of the two groups

Condition	Self-efficacy beliefs
	Pre
Writing + Peer-feedback	91.95 (4.669)
Writing alone	85.20 (8.028)

The post-test of the questionnaire was then modified (see above in Material). The new version explicitly asked for the modification of the apprentices' self-efficacy beliefs since the pre-test. The results of the modified post-test cannot be exploited in this context, as most apprentices chose the centre of the scale ("same as before", meaning no change) for all the items of the questionnaire.

4.2.3.3 *Quality of the written productions*

The qualitative analysis of the texts written by the apprentices was conducted with exploratory purposes. We will here report a selection of the most interesting results emerging from this analysis. Apprentices' *participation* in the task revealed satisfactory, as they were all able to describe a critical situation, as requested to them. In the description of the situation they encountered, they wrote in average more than 100 words ($M = 108$, $SD = 49$). Additionally, the participant of the writing with peer-feedback condition wrote overall, in the three phases of the experience, more than 280 words in average ($M = 286.2$, $SD = 119.98$). This result reveals a certain interest of the apprentices in the scenario proposed to them. The observation of the apprentices of the writing with peer-feedback condition throughout the activity showed a certain engagement in the collaborative activity, to which apprentices took part with much interest. This observation is also confirmed by the answers given in the subjective evaluation of the activity to the questions related to the peer-collaboration: 80% of the participants declared having appreciated the task of working in couples. Additionally, all the participants declared having appreciated the task of commenting the text of their colleague, as well as the fact of receiving comments. These results are particularly interesting in consideration of the fact that the majority of apprentices is not usually at ease with the task of writing, and particularly in the school context.

As far as the collaboration between participants is concerned, we observe in the writing with peer-feedback condition a significant positive correlation between the length of comments provided to the peers' texts and the score on the conceptual understanding of the procedure at the post-test (Pearson's $r = .731$, $p < .05$), while there was no correlation with the pre-test score (Pearson's $r = .285$, $p > .05$). This finding suggests that the more the apprentices engaged in understanding and commenting the peer's experience, the more they learned.

The epistemic analysis of the texts revealed that apprentices treated in their episodes mainly three thematic areas: the *professional gestures and procedures*, from a technical perspective, the *relationship* with their patients, and the *emotional* aspect associated with the situations. It could be noticed that apprentices usually treated the technical aspects associated with the professional procedure in the first part of the activity, while in the following steps of the scenario they open up to the other thematic areas, on a more personal perspective (treating about their relationship with the patients or their emotions). Additionally, this analysis allowed us to notice that the emotional aspect associated with the critical episodes rarely emerges when the apprentices describe a situation for the

first time. This aspect, on the other hand, is more frequently treated at the end of the exercise, when apprentices answer to the questions and write a conclusion to the situation they described (see figure 10). This observation suggests that this type of activity could indeed trigger a re-elaboration of the experiences encountered in the workplace.

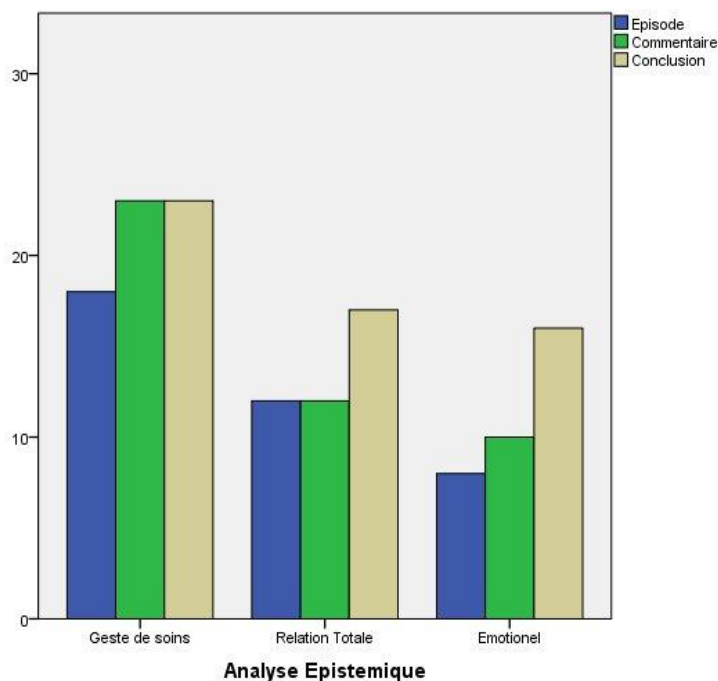


Figure 10. Epistemic analysis of the texts of the apprentices in the three phases of the activity: the presentation of the critical situation, the comments provided to the colleague and the conclusion

4.2.3.4 Evaluation of the technology-enhanced learning environment

As far as the wiki environment was concerned, apprentices' reactions to the use of Wikispaces suggest that this platform is a good environment for this type of activity. The class observation, together with the results of the subjective questionnaire, have highlighted the fact that apprentices were able to use the platform without encountering difficulties in writing their texts and commenting the one wrote by their colleague. No particular issue emerged in relation with the utilisation of the platform. In the questionnaire about the subjective evaluation of the activity, 100% of participants declared they found the platform easy to use, and 96% of them added that they appreciated conducting this activity on this kind of environment.

4.2.4 Discussion

This study allowed us to evaluate the effects of a computer-supported writing activity, with and without peer-feedback, in an authentic school environment. The results of this study did not show any significant effects of writing in both conditions (with or without peer feedbacks) on knowledge

acquisition and self-efficacy beliefs adjustment, as no significant difference was identified between the two conditions on these measures. However, a few encouraging elements emerged from the analysis of the results.

A first encouraging aspect emerging from this study is associated with the positive response apprentices had to this writing activity, and particularly to the phase of commenting the experiences of colleagues. Additionally, a favourable reaction to the wiki platform could be observed both in apprentices and teachers. A second interesting observation is associated to the statistically significant correlation existing between the participation in the commenting activity and the score at the post-test, which suggests that engaging in a significant episode lived by a fellow apprentice has a positive effect on learning. This result confirms the literature of the domain, which sustains that the quality of the interaction between apprentices is a fundamental aspect in collaborative learning contexts (Dillenbourg, 1999; Suthers, 2006).

This research presents, however, some limitations. In the first place, the activity, composed of three sessions, was quite short in the duration. A longer term activity comporting a longer time for reflection and maturation of ideas would allow to better evaluate the impact of this type of scenario on the dimensions under analysis. Secondly, the questionnaire of self-efficacy beliefs, as well as the competence test, should be modified in order to be more appropriate to measures these dimensions. The self-efficacy questionnaire, rather than a general evaluation on a scale from 1 to 100, should ask respondents to compare their level of expertise with the one of an experienced professional, which represents the maximum value of the scale. The competence test should present a problematic situation, offering to choose one possible reaction in a set of response options. In this sense, apprentices would have to choose one of the reactions and motivate their choice, answering to two open-ended questions.

On the basis of the results and observations emerging from this study, a longer pedagogical scenario was designed, foreseeing more sessions, as well as a two-by-two peer commenting phase, in line with the literature on peer-collaboration (Weinberger & Fischer, 2006). The new pedagogical scenario is also more integrated with the school curriculum and the regular class activities. This scenario was designed taking into account the appreciation of the apprentices for the task of collaboration and gives a more central role to the teacher, in terms of the orchestration of the activity and handling of the technology-enhanced learning environment.

To conclude, this study demonstrates the interest of a research approach based on the use of pedagogical scenarios to support the development of teaching and learning practices, in collaboration with the practitioners of the field, as well as to contribute to the research on technology-enhanced learning environments.

5. Second study: The impact of collaborative writing and discussion on professional development

5.1. Introduction to the second study

5.1.1 Research objectives

The second intervention conducted in the framework of this research was organised around two main studies. The first one was based on the actualisation of the research questions and hypothesis formulated in the previous study, applied to the new and updated pedagogical scenario, while the other one was dedicated to more exploratory research questions associated with the qualitative analysis of the exchanged and discussions of the apprentices. This chapter will be dedicated to the first one of these studies, while the following chapter will focus on the results of the other one.

Before this second intervention, the instructional scenario was importantly modified and adjusted on the basis of the results that emerged from the previous study. Even though the main research questions and parameters observed in the previous study apply to this research as well, as the questions observing the effects of writing and sharing critical experiences on apprentices' understanding of a procedure and on their self-efficacy beliefs remains valid, some important modifications to the instructional scenario were made. This study aimed, in this sense, at observing and analysing the effects of this modified scenario on understanding and self-efficacy beliefs.

The most important modifications made to the instructional scenario under analysis were the following: in the first place, the new activity, which was based on the same basic principles of the one tested in the previous study, was longer and organised around two writing and peer-commenting exercises (instead of the one present in the previous version). Additionally, a session dedicated to the oral discussion among the participants and the teachers about the critical situations encountered was included in the activity, in between the two writing sessions. The discussion was handled and organised by the teacher, who assumed the central role of the *orchestrator* of the scenario (Dillenbourg & Jermann, 2010). This modified role of the teachers in the implementation of the activity, as well as their early involvement in the design of this new version, produced an increased engagement of them in the research. This reflected in a modified perception of the apprentices of the task proposed to them, as they felt that the activity was more integrated in the school curriculum, and this increased their participation. Additionally, the tools used to measure both the competence test and the self-efficacy beliefs of the learners were redesigned, in order to overcome the critical issues that were encountered in the previous implementation.

5.1.2 Research questions and hypotheses

Our research questions for this study are: 1) Does writing about critical experiences, peer-commenting and discussing them (with the orchestration of the teacher) promote competence acquisition? 2) Does writing, peer-commenting and discussing in the classroom about critical situations prompt a re-adjustment of apprentices' self-efficacy beliefs? 3) Is there a correlation among the level of engagement and participation of apprentices and their gain of understanding of procedures and modification in self-efficacy beliefs? The answers to these research questions, based on the analysis of apprentices' answers to our tests and questionnaires and of their participation, will be presented in the next section of this manuscript, based on an article submitted to the *Journal of Writing Research* (Ortoleva & Bétrancourt, 2014b).

5.2 Computer-supported collaborative writing in vocational education: Effects of peer feedback on learning and self-efficacy

The content of this section is based on:

Ortoleva, G. & Bétrancourt, M. (2014b) Computer-supported collaborative writing in vocational education: Effects of peer feedback on learning and self-efficacy. In M. Braaskma, & G. Rijlaarsdam special issue: Intervention studies in writing to learn. *Journal of Writing Research* (in press).

5.2.1 Introduction

Most professional education tracks combine various learning methods and environments. In order to acquire professional experience, students are often asked to combine school learning with practical experience in a workplace, and this occurs at any educational level, from high school to university, from initial vocational education and training (VET) to adult education and life-long learning. While workplace experience is included in most cases, there are different possibilities for its concrete implementation (duration, articulation with school, conditions, supervision). The integration of the resulting different learning environments represents a great opportunity for learners to acquire the full range of knowledge they will need to act as professionals. However, the research has shown that this integration does not occur spontaneously and has to be formally organized during the training (Filliettaz, 2010a; Tynjälä, 2008).

The research presented in this article explores the potential of a learning scenario based on writing and collaboration to support vocational students in articulating conceptual and practical training. The next sections discuss the challenges that professional training encounters in helping students benefit from the combination of workplace and school training, illustrating how writing can be proposed as a cognitive tool to promote abstraction and conceptualization of practical experience, while collaboration is used to foster exchange and encourage learners to move beyond personal experience, establishing an authentic communication situation.

5.2.1.1. Articulating workplace and school learning

Professional competence requires not only the acquisition of a set of conceptual, declarative and procedural knowledge (simply put, what to do, how and why?), but also the capacity to adapt their behaviour to the context, like a novel situation never encountered or unexpected events (Billett, 2006; Mann, Gordon & Macleod, 2009). In the professional situation reported in Figure 2, occurring in the health context, Diana explained how she tried to handle the difficult patient using behavioural rules taught in the school, but nothing worked. It ended up with a potentially dangerous situation of which she is aware but could not avoid nor prevent in the future. In order to solve this type of critical situation, apprentices have to develop both “hard skills”, related to the theory of the domain and to the execution of practical procedures, and “soft skills”, associated with the behaviour, the communication standards and other interpersonal skills associated with the profession (Kumar & Hsiao, 2007). In participating in the community of practice (Lave & Wenger, 1991), apprentices progressively develop their professional identity, with associated knowledge, values and behaviour. In order to ensure the development of these multiple skills, vocational education offer the alliance of workplace and school training, to provide students with both practical situated experience and conventional conceptual knowledge, making them, in theory, effective practitioners when they terminate their studies.

However, as they are acquired in different contexts, through different mechanisms, these different types knowledge often remain disconnected, juxtaposed rather than integrated (Billett, 2001; Filliettaz, 2010a).. In addition, there is a large diversity in the workplaces offering internships, in particular in terms of learning affordances (Billett, 2006) so that practical training varies a lot across students. As a result. students will not necessarily practice the procedures or apply the knowledge taught in school (Ludvingsen, Lund, Rasmussen, & Säljö, 2011; Stenström & Tynjälä, 2009). Conversely, some students will perform professional acts before being taught the conceptual rationale in school. Therefore, taking practice, which is so diverse, into account in school teaching is challenging and requires specific instructional intervention. To this regard, Tynjälä and colleagues (2008; Tynjälä & Gijbels, 2012) proposed a conceptually-driven framework, called integrative pedagogy model, that describes the different types of knowledge professionals should develop and how to foster their articulation (Figure 11).

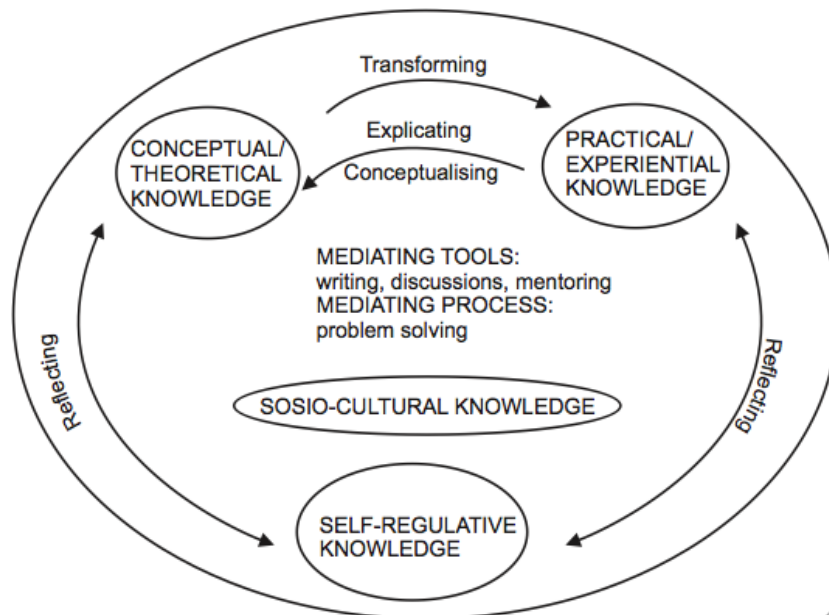


Figure 11. Integrative pedagogy model (Tynjälä & Gijbels, 2012)

According to this model, vocational education should not treat separately but address jointly four types of knowledge: practical, conceptual, self-regulative, and socio-cultural knowledge (knowledge that is embedded in the social practices of workplaces and is learned through participation in these practices). To this end, the instructional setting should provide mediating tools, like tutoring/mentoring, discussion, and writing activities, that supports the transformation and linking from practical to conceptual knowledge, also reinforcing self-regulative knowledge (by way of reflection) and socio-cultural knowledge (by way of discussions). The next two sections focus on two the components of this design that this contribution specifically addresses: writing and collaboration.

5.2.1.2. Writing and learning

Writing has a long tradition in academics as a means to foster students' memorization, reflection, and conceptualization, but the cognitive mechanisms underlying the effect of writing on learning were not formally addressed before the 1970s. Hayes and Flower (1980) first described how the core cognitive processes involved in writing (i.e., planning, editing and revising) involved a negotiation between the new ideas generated in the text and the knowledge in the writer's long term memory. Later on, Bereiter and Scardamalia (1989) distinguished two situations that differ in terms of consequence in writers' knowledge elaboration. In the knowledge-telling situation, the writers only tell everything they know about a given topic. Conversely, in the knowledge-transforming situation, writers take into account the goal of the activity and adapt to the situation, which leads to a reorganization and transformation of previous knowledge. Galbraith (1999) however criticized the vision that the explicit satisfaction of rhetorical goals was conducive to knowledge transformation and thus learning. In his latest model, Galbraith (2009) proposed a dual-process of discovery through writing, in which writing is the product of two complementary but somehow divergent processes: the explicit planning in order to satisfy rhetorical goals and the spontaneous, less controlled text production, that would lead to the development of understanding, through the implicit reorganization of semantic memory.

While cognitive literature converges on the idea that writing involves deep processing leading to conceptual reorganization of knowledge, abstraction (Olson, 1994) and creation of new knowledge, the attempts to collect evidence of its instructional effectiveness has been more challenging, with the literature reporting many contradictory and inconclusive results (for critical reviews, see Ackerman, 1993; Bangert-Drowns, Hurley, & Wilkinson, 2004). Tynjälä (1998), exploring the reasons underlying these contradictory outcomes, pointed out one important element: Typically, the learning outcomes of writing activities have been measured through quantitative testing on recall tasks without accounting for the quality of higher-order learning. According to the author, writing represents a suitable solution for learning when the objective of a learning activity is to produce conceptual and knowledge change, rather than memorization.

Tynjälä, Mason, and Lonka (2001) proposed a series of conditions that, if met, would make writing an effective learning tool: (1) writing tasks should require conceptual change and knowledge transformation/construction; (2) students' previous knowledge and beliefs should be taken into account, by using free-writing exercises before studying the topic; (3) the writing tasks should encourage students to reflect about their own experiences; (4) students should be encouraged to solve practical problems by applying theoretical knowledge; and (5) the tasks should be integrated with the class curriculum, by organizing discussions and small-group activities around them. This last condition refers to the idea that writing should be considered as a social activity and not only as an individual one. In a previous research, Tynjälä (1998) stated that the most efficient way to exploit the

writing activity for learning purposes is to combine it with oral discussion and reading. However, designing and implementing collaborative instruction is in itself challenging, since many variables have to be taken into account in order to make it effective, as the next section reviews.

5.2.1.3. Collaborative learning, computer support, and peer feedback

Collaborative learning represent a whole set of various situations, which basically consist in having students working together on a set of tasks along a usually quite precise scenario, specifying how the work should be organized and distribute and its planning over time (Dillenbourg, 1999). Collaborative scenarios prompt students to engage in discussion, making their own understanding explicit and gaining from others' perspective (Dillenbourg & Fisher, 2007). In some cases, conflicting points of view may arise, requiring the learners to reorganize their individual conceptions (Suthers, 2006). Though collaborative learning could be a powerful motor for deep learning, its actual effectiveness depends on many factors, but ultimately on the fact that students effectively engage in productive interactions (Stahl, Koschmann, and Suthers, 2006). In the last two decades, the research in collaborative learning has tried to identify the conditions that promote the emergence of these productive interactions among students (Scanlon, 2011; Suthers, 2006).

With the development of computers and the increased availability of Internet connections, a considerable part of the research on collaborative learning has been conducted on computers. In addition to enabling collaboration across space and time, computers allow learners to keep track of all phases of the collaboration and revise their production over time. A specific field dedicated to computer-supported collaborative learning (CSCL) focuses on how collaboration between peers can be triggered and enhanced in computer-supported environments to facilitate deep and sustainable learning (Puntambekar, Erkens, & Hmelo-Silver, 2011; Spada, Stahl, Miyake, & Law, 2011). Dillenbourg and Fischer (2007) summarized two key elements to consider when designing computer-supported collaborative activities: First, the collaboration between peers does not happen spontaneously, but has to be triggered and guided through the design of the activities. In particular, well-designed activities should place students in situations in which they need to interact and provide them with all the instruction needed to guide their interaction. Additionally, pedagogical scenarios should not only include collaborative group-learning activities but also individual and collective ones, some with computers and other without (Dillenbourg & Jermann, 2010).

Among the various types of collaborative writing activities that are facilitated by computer support, peer feedback represents an interesting option. Different forms of peer feedback have been implemented and studied: In peer-comment activities, learners are asked to comment on the work of their colleagues, providing constructive criticisms and suggestions (Gielen, Peeters, Dochy, Onghena, & Struyven, 2010; van der Pol, van den Berg, Admiraal, & Simons, 2008). In peer-assessment activities, participants are required to evaluate and rate each other's performance (De Wever, Van

Keer, Schellens, & Valcke, 2011; Gielen & De Wever, 2012; van Gennip, Segers, & Tillema, 2010). Learners may have reservations about peer assessment, as they may, for example, not appreciate having their work commented on by a peer and questioning the peer's qualifications to take this role (Kaufmann & Schunn, 2010). Interestingly, reservations regarding peer feedback may encourage students to engage in discussions and to look for confirmation of the comments received in textbooks or other media (Yang, Badger, & Yu, 2006). Teachers' feedback, on the other hand, is usually accepted as such, and learners rarely ask questions in an effort to better understand them or consult other sources. According to van Gennip et al. (2010), learners' initial hostility towards peer feedback can be caused by insufficient introduction to its process. Students' conceptions of the activity positively evolve as they gain more experience with this type of assessment (Dochy & McDowell, 1997). Regarding impact on learning, peer exchange can have some important beneficial effects on the learning process (Davies, 2002). According to Dochy and McDowell (1997), it can support the development of important skills related to communication, self-evaluation, observation, and self-criticism.

5.2.1.4. Self-efficacy beliefs

This research investigates how writing, peer-feedback and discussions could help students in developing a comprehensive understanding articulating conceptual, practical, socio-cultural and reflective knowledge. In this context, the knowledge gain is not only expected on conceptual understanding or practical performance, but also on the development of identity and self-beliefs, and particularly self-efficacy beliefs.. The concept of self-efficacy refers to the personal judgment people have on their capability in performing the courses of actions required to attain designated goals Bandura (1997; 2006). Self-efficacy is considered as the foundation of motivation and of personal accomplishment, as these beliefs provide people with the sense of agency motivating them through the use of self-monitoring and self-evaluation activities, as well as of self-regulation, supporting the setting of goals and the selection of strategies (Zimmerman, 2000).

According to Bandura (1997), self-efficacy beliefs have four main sources: 1) the first one is constituted by performance accomplishments. In this sense, self-efficacy derives directly from practice and personal experience. Success and failures would, therefore, respectively enhance and reduce the perception of one's capabilities in attaining a certain goal. It is important to underline that single successes or failures would not impact a well-developed sense of efficacy, which means that their impact is particularly relevant when they occur early in the learning process or if they happen repeatedly (van der Bijl & Shortridge-Baggett, 2001). 2) Another source of self-efficacy is associated with the vicarious experiences. Observing others performing a task in a successful manner also impacts learners' feelings of competence, as this can provide both examples and information on the difficulty of the task. 3) Additionally, verbal persuasion is a common source of self-efficacy. van der Bijl & Shortridge-Baggett (2001), referring to health care professionals, affirm that this verbal

persuasion is often used to convince professionals that they can succeed in difficult tasks, through the use of instructions, suggestions and advices. 4) Finally, also physiological information is an important source of self-efficacy. In order to judge one's own capacity in performing a task, a series of emotional and physiological factors, as tension, fatigue, pain, etc. will be examined and interpreted. When forming a judgement about competence in performing specific tasks, people have to integrate the information coming from all these different sources, associating different weights to each one of them (Bandura, 2006). Considering the integrative character of self-efficacy beliefs, it was regarded in the present research as an interesting indicator of the development of a comprehensive understanding of professional situations.

5.2.1.5. The present study and hypotheses

The present study integrates the literature reviewed above in order to propose an instructional intervention based on Tynjälä's and colleagues' integrative pedagogy model (Tynjälä, 2008; Tynjälä & Gijbel, 2012). The goal of this intervention is to help students develop a comprehensive understanding of professional situations, articulating conceptual, practical, self-regulative and socio-cultural knowledge. Following a design-based research approach (Design-Based Research collective, 2003; Herrington, 2012), the literature has been reviewed in order to formulate recommendations regarding the design of writing and collaborative learning activities, and particularly peer-feedbacks. Concurrently, thorough discussions have been conducted with the teachers in the partnering vocational school in order to raise the instructional issues occurring when trying to link theory and practice. Both lines of work lead to the development of an instructional intervention (see 2.2 for details) embedded in the school curriculum. Basically, the intervention involved individual writing about one's personal experience, written peer-feedback, oral class discussion and written individual wrap-up.

In line with Tynjälä's (2008) integrative pedagogy model, we assume that writing activities, together with collaborative activities, promote articulation among theoretical, practical, self-regulative, and socio-cultural knowledge. Writing is intended to foster explication and conceptualization of practical knowledge (Galbraith, 1999). Peer commenting should encourage participants to engage in discussion (Yang et al., 2006) to provide the students with others' perspective and experience, promoting the ability to reflect on their behaviour and develop new knowledge (Davies, 2012; Dochy & Mc Dowel, 1997). Finally, whole-class discussion offers the opportunity for the class to reframe the individual experience in a collective interpretation, with conceptual support from the teacher (Tynjälä et Gijbels, 2012). The function of writing is then to provide a way to collect and record for later use the collective interpretation of personal experiences (Scardamalia and Bereiter, 1994 ; 2006).

As a design study, the first question is whether the intervention as a whole meets the objective of developing a comprehensive understanding of a professional situation. To this aim, two learning outcomes have been explored: 1) performance to a declarative competence test that aims to capture

their capacity to understand a complex situation on a specific topic and act accordingly; 2) self-efficacy beliefs in general and in the specific topic. We expect that the intervention will increase students' scores to the competence test and their self-efficacy beliefs related to the topic and, by transfer, to estimated general professional expertise. As a design study involving a complete instructional intervention, it will not be possible to disentangle the effect of each component alone (writing, peer-feedback and discussion), but rather to investigate the impact of the intervention as a whole in an authentic setting. To this regard, the relation between the students' participation in the activity and their progress in terms of comprehensive understanding of the topic and self-efficacy beliefs will be explored, as previous research (Ortoleva, Schneider, & Bétrancourt, 2013a) found positive correlation between students participation in the peer-comment and their post-test performance.

5.2.2 Method

The research presented in this article was conducted in the school for Social and Health Care Assistants (Assistant-e-s en Soins et Santé Communautaire—ASSC) of Geneva canton. The students of this secondary vocational school are learners who finished their compulsory schooling (which in Switzerland is until 16 years of age). Some of the learners acquired some professional experience before accessing this educational path and part of them engaged in other types of education before starting this VET program. The Social and health care assistant training is a three-year program involving about half time in internships at the workplace. After finishing the school, students act as nurse assistants in different contexts (e.g., hospitals, retirement homes, home care).

5.2.2.1. Participants

Students of two classes were involved in the research: second-year students (20 women and 5 men, mean age = 22.48, SD = 3.18, min = 18, max = 31) and first-year students (12 women and 3 men, mean age = 23.3, SD = 6.02, min = 19, max = 40). Two teachers, both women, participated in the design and implementation of the scenario. They were nurse practitioners for more than ten years before becoming teachers.

5.2.2.2. Instructional scenario

The instructional intervention took place in a class precisely devoted to the articulation of theory and practice. This class usually entailed discussing about cases presented by the teachers, who tried to have the students make reference to their personal experience. The teachers complained about the difficulty of engaging the students in the discussion and to have full participation.

The implemented scenario entailed three phases, distributed over three learning sessions lasting one-and-a-half hour each. The sessions were two weeks apart, therefore the whole activity was conducted over a period of six weeks (not including the pre- and post-test who were administered in separate

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sessions). During this time, the students received only non-occupational courses (French, foreign languages, etc.). Contemporary, students were engaged in their workplace practice, for four days a week. Following a design-based research approach, the third phase of the scenario was slightly modified for first-year students after its first implementation with second-year students (see details below). These modifications were conducted in consideration of students' behaviour and observations of both the researchers and the teachers of the school.

The first phase of the scenario, writing and peer-feedback, was dedicated to the writing activity. Apprentices recounted experiences encountered in the workplace that were related to a specific professional competence: the relationship with their patients for second-year apprentices and the act of washing a patient for first-year apprentices. The teachers selected these topics as key competences participants are asked to acquire at their stage of the learning path. Participants were asked to write individually on their personal page on the wiki site (see 2.3) about one critical situation they encountered in the workplace. In accordance with the critical-incidents technique (Flanagan, 1954; Schluter, Seaton, & Chaboyer, 2008), students were provided with instructions on how to describe the critical situation they encountered. More particularly, three guiding questions were proposed to the students: (1) What happened? (2) How did you react? (3) What were the consequences of this situation?

Next, every student was asked to comment on two peers' written productions. In order to avoid the potential difficulties of peer-feedback for students not acquainted to it (Kaufmann & Schunn, 2010), precise instructions and prompts were provided, guiding them in the process of producing constructive criticism, as well as, later on, in the process of accepting and integrating the suggestions formulated by others. The instructions that were provided to them were the following: (1) Formulate questions (King, 2007); (2) Provide comments and suggestions; (3) In cases in which a similar experience had already occurred to them, they were asked to report their experience—otherwise they were asked to reflect on how they would react in a similar situation (Kuhn, Shaw, & Felton, 1997).

To conclude this session, apprentices were asked to go back to their own page. They were instructed to: (1) Reply to the questions formulated by their colleagues; (2) Consider the comments and suggestions proposed by others and explain their perspective on them; (3) Consider how they think they would react to a similar situation, in case they would encounter it again.

In order to be able to distinguish the text written in the different moments of the activity, apprentices had to use different colours (Figure 12).

Episode reported by Diana (D) and commented by Melinda (M) and Fabio (F)

D: "I am in charge of a schizophrenic patient living home. I have to give her the medication she needs, but once the patient refused and threw them on the floor and she started acting in a very aggressive manner. She tries to get what she wants by threatening of jumping off the window, as she has already done. I tried to be strict, to reframe the situation, to talk to her with a firm but calm voice... nothing worked. The situation was so tense that I left the apartment. I was scared that she would hurt herself and that I would feel responsible for it."

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

D: I tried to be strict, to reframe the situation, to talk to her with a firm but calm voice... I let her say what she wanted, shouting on me, hoping this would calm her, but it did not work.

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 for which she has a very expensive treatment, which she is not able to follow on her own and she needs assistance for her personal hygiene.

F: Have you ever been scared while you were taking care of this patient?

D: Yes, I did feel scared that she would hurt herself after my treatment and that I would feel responsible because of it.

F: Does this patient have a family?

D: No, she does not, she is alone.

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. I would explain the effect of the treatment and try to have a closer contact with her. I would also try to find possible accommodations with the patients (e.g. she takes her medicine and you do not bother her with her toilette).

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

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 will really need my help, she will ask me to go there.

Figure 12. Translation from French of the page of one student, including the critical incident (text in black), the two peers' comments (blue and red) and the conclusion, with answers to comments and questions (green)

Second study: The impact of collaborative writing and discussion on professional development

The second phase of the scenario, class discussion, took place in a second session two weeks later. It was an oral discussion involving all participants, orchestrated by the teacher. Before this session, the teacher, in collaboration with the researcher, organized the episodes of the apprentices in thematic clusters, which were discussed in class. The discussion was conducted with the objective of finding possible solutions to the critical situations reported by the apprentices. It was video-recorded.

The third phase of the scenario, final text elaboration, took place in a third session, and differed for first- and second-year apprentices. Second-year students were asked to write and comment again on their pages and those of their colleagues, in light of what they had learned through the writing task and the oral discussion. As the students considered this activity too repetitive of what was done during the first two sessions, this phase was modified for first-year students.

In the new version of this activity, first-year students were provided with external resources (journal articles, book sections, video excerpts) presenting interesting insights on the topics emerged in their episodes and during the discussion. After reading and watching the material, learners had to reconsider the topic discussed and draw new conclusions about how the situations described by them or their colleagues could be faced if encountered in their future practice.

5.2.2.3 Material

Pre- and post-test materials

Pre- and post-tests were administered to the learners before and after the implementation of the instructional activity. These evaluations included the following:

Competence test: A test to evaluate apprentices' declarative understanding related to the professional procedure under analysis (see Appendix C presenting the pre-test administered to second-year apprentices). The test included the description of one critical situation regarding the procedure under analysis: the relationship with the patients for second-year classes, and the act of washing a patient for first year ones. Apprentices had to select one of the seven possible reactions provided, and they were asked to answer to two open questions (*explain why you chose this option, and explain what else should be done in this situation*). The pre- and the post-test presented two different cases to avoid learning effect, while they were structurally equivalent. These tests were co-designed with the teachers of the school, who ensured that the level of difficulty of the two situations were equivalent for the students' educational level. For second-year classes, the pre-test presented the case of an elderly patient with instable mood complaining of a headache, while the post-test refers to the handling of the relationship with a patient and her family, after that the patient suffered of an unanticipated problem and felt neglected.

The results of the competence test are composed of two different scores. A first score is assigned to the reaction selected by the learner in the multiple choice question. The maximum score was 3

corresponding to the option describing a correct reaction and all subsequent actions to be undertaken; 2 for an option providing the correct reaction but missing one key element; 1 when the option was only partially correct and missed key elements, and 0 for incorrect reaction..

Additionally, open questions were evaluated on the basis of a grid provided by the teachers, identifying eight key elements relevant to understand the situation at hand and the actions to undertake. The researcher reviewed the texts written by apprentices and compared them to the grid, in order to count the number of key elements they identified in their answers (maximum score is 8). In order to verify the reliability of the analyses conducted on the open questions, two independent coders were asked to score the students' answers. Spearman inter-rater reliability was $r = .863$, (good agreement). The disagreements between the coders were resolved by consensus.

Self-efficacy beliefs questionnaire: This questionnaire, was composed of 14 items on a 100-point continuous scale, evaluating three dimensions of self-efficacy: professional self-efficacy (covering various aspects of professional tasks), efficacy specific to the competence under analysis (relationship with the patients for second-year and act of washing a patient for the first-year apprentices), and school related (covering various tasks associated with the school context). Appendix D presents the self-efficacy questionnaire administered to second-year apprentices, both at the pre- and at the post-test. As the items of this questionnaire are very much specific to the profession of Social and Health Care assistants, and to the specific procedure under analysis, the items were developed at this purpose following Bandura's guidelines (2006). The teachers co-designed these items, in order to make sure they were appropriate for the practical experience encountered by apprentices in their workplaces. The reliability of the questionnaire was measured calculating Cronbach's alpha, revealed very high, for all the dimensions analysed: Professional self-efficacy - 5 items, pre-test $\alpha = .93$, post-test $\alpha = .93$. Specific to professional procedure, - 5 items, pre-test $\alpha = .92$, post-test $\alpha = .94$. School-related - 4 items, pre test $\alpha = .87$, post-test $\alpha = .94$.

Subjective evaluation of the instructional scenario: Fourteen questions organized into 6 categories were designed to evaluate the students' subjective evaluation: the perception students had of learning through the activity (4 items), learning through the collaboration (3 items), appreciation of the activity (3 items), appreciation of the collaboration (4 items); appreciation of the wiki platform (3 items) and willingness to reuse it in the future (2 items). All these items were developed for the purpose of this research, as they asked very specific questions about the implementation of our activity in all its different aspects. Learners had to provide answers to the questionnaire using a 4-point Likert scale: (1) strongly disagree, (2) disagree, (3) strongly agree, and (4) strongly agree.

The computer-supported environment

The activity was conducted on Wikispaces (www.wikispaces.com), a wiki Web service targeted for educational purpose. Wikis are specifically designed to support collaborative writing: accessibility across space and time, possibility to create hyperlinks and new pages, and possibility to track all modifications done and their authors (Parker & Chao, 2007). During the first session, each apprentice received an individual account to access the platform. On the site, every learner had one individual page, named after them, representing their own space to write their critical incident and receive the comments and questions of their colleagues.

5.2.2.4 Procedure

Few weeks before the intervention started, the teachers who collaborated in the design and implementation of the activity, introduced to the three sessions of the scenario, explaining the activities foreseen in the context of each section and their implementation. They introduced the researcher implementing the study (the first author of this paper), explaining that this activity was part of a university research project. Students' consent in participating in this study was asked in this context.

During the session preceding the intervention, a forty-five-minute pre-test session was conducted. The students were asked to complete the competence test and the self-efficacy questionnaire. Subsequently, the three sessions of the scenario were conducted. The sessions were two weeks apart. Once the scenario had been fully implemented, one post-test session was conducted. Apprentices were asked to fill out the second version of the competence test and the self-efficacy questionnaire, and their questions and impressions on the activity were collected.

5.2.3 Results

As second- and first-year students followed a different instructional scenario, results are presented separately for each year classes.

5.2.3.1 Competence test performance

As the data did not meet the condition regarding homogeneity of variance or normality of distribution, a non-parametric test for related samples (Wilcoxon-Signed Rank test Z) was used to compare the score at pre- and post-test.

Performance of second-year apprentices

The performance of second-year students to the multiple-choice and open questions are reported in Table 5. The results showed no significant difference in the multiple choice question between the pre- and the post-test ($Z = .612, p > .05$).

As far as the open questions are concerned, there was a marginally significant difference between the post-test than in the pre-test ($Z = 1.854$, $p = .0684$), with higher scores in the post-test.

Table 5. Competence test's results of second-year apprentices

Second-year classes	Competence test			
	Pre-test (n=21)		Post-test (n=23)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Multiple-choice questions (max = 3)	2.14	1.28	2.47	0.77
Identification of key elements (max = 8)	3.05	1.20	3.55	1.317

Performance of first-year apprentices

The results of first-year apprentices are reported in Table 6. Regarding the multiple-choice question, there was a significant difference in the selection of the most appropriate reaction between the pre- and post-tests ($Z = 2.743$, $p < .05$).

On the other hand, no significant difference was observed in the open questions between the pre and the post-test ($Z = 1.581$, $p > .05$). In addition, there was no difference in text length between the pre-test and the post-test (Wilcoxon Signed-Rank Test $p > .05$).

Table 6. Competence test's results of first-year apprentices

First-year classes	Competence test			
	Pre-test (n = 14)		Post-test (n = 11)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Response option	0.43	1.09	1.50	0.67
Identification of key elements	3.69	1.11	4.42	1.17

5.2.3.2. Self-efficacy beliefs

The self-efficacy beliefs questionnaire evaluated three dimensions of apprentices' perception of their ability in performing a series of tasks: professional, specific to the procedure under analysis, and related to school. Results are displayed in Table 7 for second-year apprentices and Table 8 for first-year apprentices. As the data did not meet the condition regarding homogeneity of variance or normality of distribution, a non-parametric test for related samples (Wilcoxon-Signed Rank test) was used to compare the score at pre- and post-test.

Results of second-year apprentices

There was no significant difference between the pre- and post-tests for any of the dimensions observed ($Z = .450$, $p > .05$ across all dimensions).

Table 7. Self-efficacy beliefs of second-year apprentices

Second-year classes	Self-efficacy beliefs			
	Pre-test (n = 21)		Post-test (n = 23)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Professional	58.93	18.14	61.31	17.71
Specific to the procedure	70.57	22.97	71.34	20.30
School related	67.49	16.96	68.99	21.08
Mean of all dimensions	64.72	17.40	66.56	18.27

Results of first-year apprentices

As opposed to second-year apprentices, the statistical analysis conducted on first-year classes' responses raised a significant improvement in apprentices' self-efficacy beliefs on every dimension measured through the questionnaire, in line with our expectations (professional self-efficacy: $Z = 2.934$, $p < .01$; specific to the procedure: $Z = 1.961$, $p < .05$; school related: $Z = 2.668$, $p < .01$).

Table 8. Self-efficacy beliefs of first-year apprentices

Year-I classes	Self-efficacy beliefs			
	Pre-test (n = 14)		Post-test (n = 11)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Professional	67.64	17.64	84.62	9.51
Specific to the procedure	82.48	16.70	84.62	7.00
School related	76.82	20.11	92.11	9.15
Mean of all dimensions	76.19	17.28	90.21	7.64

5.2.3.3 Participation

Students' participation to the written tasks was evaluated through the mean number of words written by the students for each task in the first phase of the scenario (identical for second and first-year classes). Though the number of words does not take into account the meaning or the quality of the text, it can be used to estimate students' engagement in a task (Jermann & Dillenbourg, 2008). Student's participation to the oral discussion was estimated by counting the number of times each learner intervened in the discussion from the video captures of the class discussions. The data are presented in Table 9.

From an instructional point of view, the overall participation to the writing tasks ($M = 545.15$ for second-year apprentices; $M = 389.22$ for first-year apprentices), was considered highly satisfying by the researchers and the practitioners, considering the previous experiences of writing activities with students in this educational path. As there was substantial difference between second and first-year students, a between-subject ANOVA was conducted on participation to the three tasks. The ANOVA indicated that second-year students wrote significantly more to report their critical situation than first-year students, $F(1,32) = 11.123$, $p < .01$, partial eta-square = .258. In contrast, there was no difference for the peer-comments, $F(1,32) = 2.561$, $p > .05$, or for the conclusion, $F(1,32) = .438$, $p > .05$.

Table 9. Participation to the writing tasks of first-year and second-year apprentices (number of words produced)

	Participation			
	Second-year (n = 21)		First-year (n = 13)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Critical incident	247.10	97.52	147.15	58.12
Peer comments	185.43	73.41	146.15	62.55
Conclusion	112.62	78.47	95.92	58.00
Intervention in the class discussion	6.59	5.87	11.4	5.77

Correlation analyses (Pearson Correlation) were conducted between participation data for the whole sample and competence test scores (multiple-choice question) at pre-test and post-test. First, there was a significant correlation between the number of words written in the critical incidents and the pre- and post-test scores (with pre-test score, $r = .584$, $p < .001$; with post-test score, $r = .459$, $p < .05$). However, there was no significant relation between the participation in the comments and the competence test scores, neither at pre-test, $r = .255$; $p > .05$, or at post-test, $r = .124$, $p > .05$. Interestingly, there was a significant negative correlation between the length of the description of the critical incident in the first session and the participation to the oral discussion in the classroom, $r = -.435$; $p < .05$.

5.2.3.4 Subjective evaluation of the activity

Table 10 reports the scores of first- and second-year apprentices for the six dimensions evaluated (four-point Likert items). Even if the participants were moderately convinced that they had learned much through the activity (mean scores below 3), all the other scores were above 3, showing participants appreciated the activity, particularly its collaborative dimension, and the wiki platform.

Table 10. Subjective evaluation of the activity of first-year and second-year apprentices

	Subjective evaluation of the scenario			
	First-year (n = 23)		Second-Year (n = 11)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Learning through activity	2.77	0.70	2.7125	0.52
Learning though collaboration	3.31	0.50	3.20	0.36
Appreciation activity	3.43	0.52	3.00	0.54
Appreciation collaboration	3.79	0.32	3.45	0.38
Appreciation platform	3.53	0.46	3.17	0.58
Willingness to reuse platform	3.40	0.43	3.10	0.49

5.2.4 Discussion and future directions

Writing can be a powerful instructional method to foster knowledge construction from an individual point of view (Galbraith, 1999), but is more rarely used to foster discussion and collaborative knowledge construction (Scardamalia & Bereiter, 1994, 2006; Tynjälä, Häkkinen, & Hämäläinen, 2014). This study investigated the effect of an instructional intervention involving writing about a

critical workplace experience, peer commenting and class discussion in order to foster the articulation of conceptual and practical knowledge, following Tynjälä's (2008) integrative pedagogy model.

5.2.4.1. Did the students learn from this intervention?

The first hypothesis assumed that the intervention would foster students' comprehensive understanding of the topic at hand, which should be reflected in the capacity to solve a case-based competence test and the self-efficacy beliefs of students regarding this topic. The results of the competence test at pre and post-test only partially support the claim. While first-year apprentices improved their ability to select the correct response to the multiple-choice question, second-year classes had better results in their identification of the key elements of the situation (marginally significant). The differences between the two groups may be explained by the fact that first-year apprentices still need to learn how to react in difficult circumstances, while their more experienced colleagues are already more capable of selecting the appropriate reaction, but may still need to refine their capacity of detailing the reasons of their choices and anticipating future actions. The fact that second-year students wrote much more to describe their critical situation than first-year students may also be an indicator of higher expertise. In addition to the low sensitivity of the competence test score used in this study, the lack of substantial changes in performance could also be due to the relatively short intervention, particularly when conceptual understanding is involved (Bangert-Drowns et al., 2004).

Regarding self-efficacy beliefs, the results only partially confirmed our hypothesis. Self-efficacy beliefs improved over the sessions for first-year apprentices on all dimensions, while there was no observable change for second-year apprentices. As self-efficacy beliefs of students are normally developing as their expertise increases (Bandura, 2006; Renninger, Hidi & Krapp, 1992), it may be that second-year students had a more stable image of themselves, less subject to modifications and adjustments in similar settings. However, as there was a modification of the instructional scenario from its first implementation with second-year students to first-year student, the hypothesis that this modification had an impact on the results may not be ruled out. Moreover, the fact that all dimensions of self-efficacy were improved for first year may simply be due to their normal professional development during the course of the intervention distributed over 8 weeks.

5.2.4.2. Participation and subjective evaluation

While the outcomes measures were not fully conclusive, the participation in the written tasks were quite substantial, for all phases of the activity. Following Tynjälä's et al. (2001) recommendations for the design of writing activities resulted in an instructional scenario that was engaging for students, as the participation but also the subjective evaluation evidenced. In addition, in accordance with Tynjälä's integrative pedagogy model (Tynjälä, 2008; Tynjälä & Gijbels, 2012), the collaborative phase was particularly appreciated. This reinforces the assumption that getting the peers' perspectives

on a practical situation broadens the students' understanding and helps them to develop a more abstract view for further practice. Furthermore, there was a significant negative correlation between the participation in the oral discussion and in the written description of the critical incident. Though this correlation across the whole sample should be considered with caution, it suggests that apprentices who were at ease with the written format of communication were not always as willing to discuss their professional practice during an oral session in the classroom, and vice versa. This finding provides support for the claim that a blend of oral and written exchanges and discussions represents the best option for the implementation of writing activities, in which all learners get involved and participate in the learning scenario Tynjälä (1998). However, contrary to what was found in a previous study (Ortoleva et al, 2013), there was no correlation between the competence test score and the number of words produced in the peer commenting phase, while there was a significant correlation with the number of words written in the critical incident, both at pre- and post-test. One plausible interpretation is that the more able students wrote more detailed accounts of their critical situation. However, besides the fact that learning gains were minimal, another limitation is that simply counting the words learners wrote was too rough an estimation of their engagement. Taking into account the quality of the critical incident and the comments they wrote would provide a better picture of the students' engagement in the activity (Hämäläinen & De Wever, 2013).

5.2.4.3. Limitations

Conceived following a design-based research approach, this study presented some limitations. Firstly, though it involved all students in the first and second year of the school, the sample remained limited (40 students, 2 teachers) for quantitative data analysis and generalization. Furthermore, the absence of a reasonably valid control group for this design study does not allow to assert that the changes observed in learning gains and self-efficacy beliefs were due to the intervention itself and not the other concurrent elements of their training. Even if they had no professional classes during the intervention, they were engaged in workplace internships. The second major limitation is that taking the intervention as a whole, it is not possible to disentangle the effect of writing and peer commenting from the effect of class discussion and teachers' intervention with new material and explanation. Though the study was conceived primarily to evaluate the effectiveness of the whole intervention, it was not possible to identify the critical instructional elements. Further analyses are currently being carried out on the written productions in order to characterize students' written productions and identify the conditions under which productive interactions occurred (Dillenbourg & Fisher, 2007; Hämäläinen & De Wever, 2013; Scanlon, 2011). A third limitation is related to the instruments used, and particularly the competence test. This case-based test was conceived ad hoc, with teachers, which ensures its authenticity and its validity within the school context but not its validity as a scientific instrument. The lack of instrument to measure complex learning developed through meaningful writing activity, like the articulation between conceptual understanding and the capacity to

behaviourally adapt to a practical situation, has been pointed out as one of the major bottlenecks of writing intervention studies by Tynjälä et al. (2001). Further research should address this issue in developing a set of different assessment tools, with quantitative and qualitative indicators, which reliability could be evaluated before the intervention.

5.2.4.4. Instructional recommendations

This design study provides encouraging results to recommend the use of instructional intervention combining individual writing with peer-feedback, embedded in an authentic class situation, also involving discussions and teacher's feedback, when the objective is to help learners to connect workplace and school settings in initial vocational education, and probably in any education track involving articulating conceptual and situated knowledge. Three recommendations can be raised from this study. First, as already evidenced in the collaborative learning literature, having students first work individually before exchanging is very engaging for students and probably more effective too, since learners first organize their ideas through writing (Galbraith, 1999; 2009) before gaining from others' perspective (Scardamalia and Bereiter, 1994). Second, students engage in peer-feedback in the form of written comments if the interaction is scaffolded using prompts that promote productive interactions, like asking questions, making suggestions and relations to their own experience (King, 2007; Kuhn, Shaw, & Felton, 1997). Third, using simple web-based wiki environments allow for benefiting of computer affordances such as history tracking, revision and collaboration functionalities without overwhelming students and teachers with technical difficulties.

Future research will further investigate the type of interactions emerging when using a combination of individual and collective writing activities, in order to design instructional methods grounded in a solid understanding of the mechanisms underlying the observed learning effects.

6. Third study: Patterns of vocational learners' interaction on written critical incidents in a computer-supported environment

6.1 Introduction to the third study

6.1.1 Research objective

As mentioned above, this third study is based on the second intervention of our research, as the second study. A full description of the scenario implemented was provided in chapter five. In this framework, the focus of our analysis is associated with the type of interaction that could be observed among the participants and is based on a qualitative analysis of the discussion and exchanges observed. This analysis was conducted on the interaction apprentices performed in the first session of the activity, in which they were asked to provide questions and peer-comments on one critical incidents that was described by their colleagues, and to reply to the questions and comments received, discussing new solutions to handle the critical situations encountered. Our aim, with this analysis of the collaboration and interaction patterns among the participants, is to identify the best ways to encourage the participation and the engagement in this type of task, and to select prompts and instructions revealing more effective in this context.

6.1.2 Research questions

The research conducted in this study aims at answering exploratory questions associated with the interaction behaviours shown by apprentices in this activity. More precisely, our questions were: How do learners interact in this type of writing and peer-commenting activities? Can patterns of behaviour in the way they provide each other's comments and suggestions, as well as in the way they react to the comments received by others, be identified? The answer to these questions, based on a qualitative analysis of the exchanges and interactions of apprentices, will be presented in the next section of this chapter, based on an article submitted to the *Journal of Vocational Education and Training* (Ortoleva & Bétrancourt, 2014c).

6.3 Supporting productive collaboration in a computer-supported instructional activity: Peer-feedback on critical incidents

The content of this section is based on:

Ortoleva, G., & Bétrancourt, M. (2014c). Supporting productive collaboration in a computer-supported instructional activity: Peer-feedback on critical incidents in healthcare education. *Journal of Vocational Education and Training* (accepted with major revisions).

6.3.1 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 school and workplace, which aims at providing students with both theoretical knowledge and practical experiences. The first setting, school, presents students with the ideal way of performing a procedure, while the workplace allows them to observe how the real practice works in consideration of all the constraints associated with it. Different studies (e.g., Billett, 2001; Filliettaz, 2010a), however, have highlighted how the connection and integration of these different learning settings represents a challenge for the apprentices. Filliettaz (2010b) observed that students' paths in vocational education were affected by the delayed access to upper secondary education, and a high level of drop-outs, non-completions and changes in apprenticeship programs. He concludes that, 'transitions from school to work are to some extent far from smooth and unproblematic' (p. 487). A number of points exemplifying the differences of these learning settings can be identified and may explain why their integration can be difficult for students: In the first place, while workplaces are production-oriented, schools are learning-oriented. This means that in the workplace apprentices need to integrate into the workforce, be efficient and perform the required tasks that may vary considerably across contexts. In schools, on the other hand, students are presented with all the theoretical knowledge needed for the profession, without knowing whether they will experience the corresponding professional procedures (Ludvingsen et al., 2011). In addition, in their curriculums, schools include procedures and concepts that are not required for apprentices at the beginning of their working practice in order to offer them a more complete understanding of their future practice as well as the opportunity for further career advancement. In this sense, students will be taught procedures they will not or rarely experience in an authentic context. One additional 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 draws a personal education path, constituted by all experiences lived in the workplace, which is unique and specific to him/her (Billett, 2004). This diversity can represent a challenge for collective school teaching.

6.3.1.1 Learning in school, learning in the workplace

Though learning is fundamentally defined as a 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 organisation. 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 ones. 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 it their own (Lave & Wenger, 1991). However, learning at school does

not necessarily build on this culture, leading to a feeling of disconnection between concept taught at school and ‘real life’ (Tynjälä, 2008)

In order to benefit from the strength of the articulation between workplace and school, Tynjälä and colleagues (Tynjälä, 2008; Tynjälä and Gijbels, 2012), proposed an instructional model, the *Integrative Pedagogy Model*, which reconciles the different types of knowledge acquired in vocational education: practical, conceptual, self-regulative and socio-cultural knowledge. They propose to use mediating activities that can bridge across these different types of knowledge that include tutoring/mentoring, discussion, collaborative learning and writing activities.

6.3.1.2 Written peer-collaboration to bridge practical and conceptual knowledge

Learning through writing

Writing per se is considered as 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: 1) the need for the task to require a conceptual change and the construction of new knowledge, 2) the need to take into account students’ previous knowledge and beliefs, 3) the fact that the writing task should encourage students to reflect on their own experiences, 4) the idea that students should be encouraged to solve practical problems through theoretical knowledge and 5) the importance of integrating the writing task in the school curriculum, with the organisation of sessions around this activity, going from class discussions to small-group activities.

The five conditions listed above apply perfectly to the context of vocational education, making it a potentially fertile context to implement writing activities. However, while advanced writing activities are extremely popular in higher education, they have been so far less implemented in professional education. Accordingly, the research on writing in vocational education is scarce.

Fundamentally, writing is considered as an individual activity, and few are the studies in which writing is observed as a collaborative task. 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 the sharing, version tracking and collaborative editing (see Author, 2007). The potential of computer technology as a mean to support collaboration is even considered as one of the most promising innovation of the past few decades to improve teaching and learning (Lehtinen, 2003).

Written peer-collaboration

Collaborative writing is a wide concept that can refer to a range of different activities, 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 more individually driven, with space for reviews, editing and feedback from others. Following Witney and Smallbone (2011) who defined collaboration as the co-ordination of efforts to accomplish a common task, we consider the activity involving one or a group of people editing and/or revising 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 usual collaborative writing tasks starting from individually written texts and that can be easily conducted with computer technology is peer-feedback. Peer feedback can be declined in a number of different manners depending on the instructional role given to the peers. For example, peer-commenting activities require the participants to provide criticism and suggestions on their colleagues' productions (e.g., Gielen et al., 2010), while, in peer assessment tasks, the participants have to rate others' performances (e.g., Gielen and De Wever, 2012). If students are initially reticent to engage in peer-feedback, as they question the competence of peers in judging their work (Kaufmann and Schunn, 2010), their conceptions tend to positively evolve while they gain experience with this learning mode (Dochy and McDowell, 1997). Additionally, these reservations may have the positive effect of motivating students in seeking for confirmations about the reliability of the feedback received. This will therefore induce them into consulting other sources of information and verifying the inputs received. This type of behaviour is not reproduced when teachers provide comments, which are rarely or never questioned by the students, and this may cause miscomprehension of the criticism received (Yang, Badger, and Yu, 2006).

Collaborative learning offers opportunities for learners to engage in deep learning processes. According to Jermann (2004), in addition to sharing and benefitting from each other's knowledge, students 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). Gielen et al. (2010) identified three characteristics considered as 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 the justification for the comments and observations provided also appeared as an important characteristics of peer-feedback. Finally, accuracy was also revealed as being very important.

Another critical determinant of instructional effectiveness, and 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 Fisher, 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 in order 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 in order 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 in the structured feedback condition had a better perception of the feedback received by others and considered them 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 the variety of existing practice. Following the integrative pedagogy model (Tynjälä, 2008), we developed a learning scenario in which students would first write individually about a critical situation encountered in the workplace practice and subsequently share these texts with their colleagues in order to receive and provide comments and suggestions. In this sense, writing and discussion will be used jointly as mediating tools that link together practical, conceptual and self-regulative knowledge, thus allowing students to work collaboratively on individual experiences based on real-life practice. However, merely organising the peer-commenting will not guarantee that productive interactions (Stahl, Koschmann and Suthers, 2006) take place between students. This research aims to identify the different patterns of interactions emerging in such a collaborative writing activity in order to better scaffold the peer-commenting phase. 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 done in the 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.

6.3.2 The study: Supporting productive collaboration in a computer-supported instructional activity

6.3.2.1 Context²

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 as well as to 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 some basic tasks of primary health care, which were previously performed by nursing auxiliaries (e.g., washing patients, taking care of their environment), with some more technical and advanced procedures (e.g., collecting blood samples, replacing catheters). Professionals in this role can operate in different situation and conditions, as hospitals, retirement and handicap homes, as well as directly at the residence of the patients. This variety of working environment adds up to the difficult task of school in providing apprentices with a full overview of the various working conditions.

6.3.2.2 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 four men) between 18 and 31 years old (mean age = 22.24) participated in this activity.

6.3.2.3 Instructional activity and procedure

The writing activity analysed in this article represents the first session of a longer-term scenario implemented with the students of the school and described in full details in Ortoleva & Bétrancourt (2014b). This session was composed of three main phases.

Students were firstly asked to access a computer-supported environment that was created for this purpose using Wikispaces, a wiki web service allowing for collaborative edition, selected for its ease of use and for the possibility of limiting the access to the website.

In the first phase of the activity, students were asked to describe, on their personal page created at 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, as they considered it as a key competency that apprentices need to acquire during their second year of education and internship. It was specified that the concept of *critical incident* referred to situations revealing particularly difficult or important to the apprentices, making them reflect on their practice. In

² This study was conducted within the framework of the research consortium *Technologies for vocational training* (Dual-T), founded by the State Secretariat for Education, Research and Innovation (SERI).

accordance with the critical incidents technique (Flanagan, 1954; Schluter, Seaton, and Chaboyer, 2008), students were asked to individually write 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 in order to provide them with comments and suggestions on their situations. This way, students would read and comment two situations, as well as receive feedback on their situation from two colleagues. Other prompts were provided in order to guide the peer-feedback:

- (4) Ask questions (King, 2007).
- (5) Formulate comments and suggestions on other possible ways to handle the same situation.
- (6) 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 again their own page and to read the comments and questions they received. After answering them, they were asked to explain how they think they would react to a similar situation the next time this occurs. In order to be able 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.

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.

6.3.2.4 Developing the coding scheme

In order to evaluate participants' interaction, we tried 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 in it a few additional studies that considered variables appropriate to our research (Van der Berg, Admirall, & Pilot, 2006b; Hämaläinen 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 11). In order to organise the various aspects considered in our grid, we followed the categories created by Hämaläinen and De Wever (2013). Various aspects were taken into account, from more formal ones, 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 other aspects more related to the content,

as the questions they asked, and their ability to provide comments and ideas in order to suggest how to solve the situation.

Table 11. Analysis grid of peer-feedback

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

After the peer-commenting phase, the students had to write a conclusion to their episodes in order to answer to the comments and questions received and to indicate how they would react if facing a similar situation in the future (phase 3). A new grid was therefore elaborated that contained all the most important elements to evaluate this conclusion (see Table 12). As for Table 11, we used some of the categories identified by Hämäläinen and De Wever (2013) in order to structure our grid.

Table 12. Analysis grid of apprentices' conclusion on their own pages

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

6.3.2.5 Coding the data

All interactive productions by the apprentices were individually analysed by using the software Atlas.ti. The analysis was conducted following the grid exposed above, permitting us to explore the behaviour of each student in terms of a) the comments they provided to others and b) the conclusions they produced to the comments received. The analysis was organized in three separate stages, starting from the consideration of students' comments to the critical situation described by the colleagues using the grid presented in Table 11. A second stage of analysis was based on the evaluation of the conclusion that each participant wrote to the comments received by the colleagues on the basis of the grid presented in Table 12. 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 as one fundamental indicator of argumentative knowledge construction (Teasley, 1997; Weinberger and Fischer, 2006). By transactivity, we refer here to the capacity of students to consider and include in their texts the suggestions, ideas and comments provided by their colleagues.

6.3.2.6 *Checking reliability*

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 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 colleague working in the same department (coder 2) was then involved in the process. After describing the activity, presenting examples of students' interaction and explaining the four behavioural patterns that emerged from the analysis, he was asked to evaluate the peer-feedback, the conclusions and the students' interactions by assigning each one of them to the most appropriate of the four patterns. After conducting one evaluation jointly, coder 2 was asked to proceed independently and evaluate 50% of the productions. Once the evaluation concluded, 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.

6.3.3 Results: Four types of apprentices' interactions

The analysis conducted with the support of the grids presented above allowed for identifying four patterns according to the level of elaboration of the students' interactions. Each of the phases of the activity was organised in these four patterns. A detailed description of the evaluation of each phase of the activity, with the resulting categories is detailed below. In Appendix E, 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.

5.3.3.1 *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's³ critical incident (See Appendix E), Rebecca provides one example of peer-comment falling in this category.

³ All the names of the students were changed to protect their privacy.

‘Did you read all info about the patient before? It is normal to be scared, without showing it. Did you call before going there?’⁴

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 on personal experiences on similar situations or suggestions.

The comments in the *partial elaboration* category presented some more elements, including, for example, one interesting suggestion. However, these comments are not completely elaborated. In this sense, they do not offer the receiver with the possibility of really reusing the idea proposed in a constructive manner. One example of this type of comment is the one 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, even if not all 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 more justified and comprehensible points of view of others, 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 justified their comments. In Example 4 (Appendix E), Melissa provides such comment to her colleague Deborah by giving her a series of constructive elements to consider and integrate in this situation.

⁴ All excerpts of apprentices’ text were translated from French. Text translation and punctuation are as similar to the original text as possible.

From a quantitative point of view, each peer-comment provided by the apprentices 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: seven comments were attributed to the *minimal group*, nine to the *partial group*, 12 to the *sufficient group* and 14 to the *advanced group*. Globally, the results of this evaluation revealed a good level of interactions in this part of the activity, as 16 interactions corresponded to a quite low elaboration level (the first two categories), while 26 were considered more elaborated 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 level. More precisely, only four of the 21 one 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 also varied depending on the context.

6.3.3.2 Evaluation of apprentices' conclusions

Similarly to the peer-comments, the conclusions written by the apprentices in their personal pages (third phase of the activity) were also classified into four groups. The same categories as 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, as the lack of a response to part of the questions and comments received by the colleagues in the peer-comment phase and the fact that no new solution to the critical situation encountered was identified. The conclusion of Vanessa belongs to this category (see Appendix E).

The conclusions of students falling into the *partial elaboration* category included more elements, but again not all the aspects mentioned by the two colleagues were taken into account and reused in this context 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 was written by colleagues. 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 of 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 most important mentioned elements. The apprentices were able to consider new possibilities, or even confirm previously chosen strategies, taking into account the aspects emerging from 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 E), who replied thoroughly to the questions received and considered alternatives to her behaviour, suggested by her colleagues (in this case judging them as non-appropriate).

Two students did not participate in the conclusion phase of the activity, while the others distributed as follows in these four patterns: 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 to 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 remind that all these exchanges took place during the same school session. Therefore the activity may have revealed fatigue, resulting in this part of the exercise being less developed.

6.3.3.3 The complete interactions

Once the evaluation on the individual phases of the exercise was conducted, we evaluated the complete interactions composed of two peer-comments and the conclusions of the author. As mentioned, the criterion for this classification was based on interactions' *transactivity* level. 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 receiving interesting comments and suggestions, students may struggle in incorporating them in their own conclusions. In this sense, this analysis does not simply represent the summary of the previous ones, but considers the interaction as a whole, with the diversity it includes, and seeks for elements eliciting more productive interactions. This resulted in the identification of four groups, varying according to the level of transactivity.

Bare minimum category

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 bringing 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 group

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 3) 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 group

In this group, the exchanges are highly 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 handle the problems that do not build on the elements raised in the discussion.

The situation described by Albert initiated an interaction of this type. Both colleagues who participated in this interaction provided some interesting ideas to him ('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.

Maximum group

In this case, the transactivity level is at the higher level. The main difference with the previous category lies in the conclusion, where the authors of the incident formulate elaborated considerations on how they plan to react in the future, making explicit reference to the role that comments provided by others played in this new strategy envisaged. This is the case in the interaction about Deborah's situation (example 4).

The interactions generated by the apprentices during this activity distributed homogeneously in the four groups emerging 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 *Getting There* types, while five of them were associated to the *Maximum group*. Basically, the same number of interactions were attributed to the lowest transactivity categories (10 interactions belonging to the *Bare Minimum* and the *So-So groups*) as in the higher transactivity level categories (11 interactions in the *Getting there* and *Maximum 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 in producing 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 as belonging to different categories.

6.3.4 Conclusions and Implications

Vonthron, Lagabrielle and Pouchard (2007) assert that the engagement and retention of students in adult education pattern can be associated with three main dimensions: the cognitive, the motivational and the social. In this research, the cognitive dimension of the scenario was associated with the use of individual writing of a critical situation, followed by peer-feedback and conclusion from the author, considering both writing and collaboration as mediating tools to support students in creating bridges and connections between workplace experience and school learning (following Tynjälä's model [2008], as well as the literature on peer-feedback). The writing activity was designed according to Tynjälä, Mason and Lonka's (2001) recommendations for effective writing tasks. While writing fosters explicitation and abstraction of experiential knowledge, the peer-comment phase allows stepping back from individual experience and gaining knowledge from others' perspectives.

As far as the social dimension is concerned, the instructional activity was meant to allow for a collective professional knowledge to emerge and foster the construction of a sense of belonging. Apprentices share their experiences with others and provide each other with information about their working conditions and the way they can face difficult situations in the working environment. In this sense, this type of activity was conducted in such a way to support apprentices in integrating the individual and collective dimensions of learning, present in both school and workplace settings.

In terms of students' motivation in the task, we believe that the collaboration with others characterising the social dimension of this activity represents an important motivational factor. The motivation of the students in participating to this activity can be evaluated by considering their participation and appreciation of the task. They revealed a high level of participation, 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. 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 an element of satisfaction of 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 our course').

The engagement of students in this type of task was also confirmed by the fact that few of them, especially in the peer-commenting phase of the activity, were classified as having a minimal elaboration level. The majority of the texts were considered sufficient or advanced in terms of their elaboration. On the other hand, in the conclusion phase of the activity, implying the reception and

reaction to the comments of others, there was a more limited participation of students. In this case, various aspects converge in this observation, going from a reduced text length for the conclusion task, to the fact that students distributed much more homogeneously throughout the four categories of behaviour, and a similar pattern of behaviour emerged when considering the complete interactions. The distribution observed for the complete interactions is in line with Kaufmann and Schunn's (2010) consideration that students confronted with peer-feedback tasks may be initially reticent in fully engaging in the activity, particularly questioning the competence of their peers to provide comments to 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 the observations and suggestions made by others (Kaufmann and Schunn, 2010) and to integrate them in their own discourse, as they may question the competence of their colleagues in providing them with feedback on their behaviour.

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 getting into the activity in a progressive manner. On the other hand, it is when faced with concrete new solutions to an issue that the apprentices were able to come up with new concrete alternatives to their behaviour and the complete interactions revealed more productivity. The fact that the same student could produce two feedbacks that differed in their level of elaboration makes the assumption 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, Ertl, Fischer and Mandl (2005), epistemic and social scripts, reveal a great relevance. In particular, the epistemic scripts are of key importance to specifying and sequencing the 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 to facilitate 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.

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 distributed quite homogenously in the different categories of interaction in this first attempt with this task, we believe that, if they acquire more confidence with this practice, this will positively affect their ability of integrating each other's' perspectives and learning from colleagues' experiences. Further research should investigate the engagement of students in such peer-feedback tasks when implementing this scenario multiple times in order to explore the possible evolution in students' capacity to learn from each other over time.

7. Discussion

The research presented in this thesis aimed at identifying interesting ways to support learners in bridging the gap existing between school and workplace, the two educational settings involved in vocational education. In order to do so, our aim was the one of finding ways to connect the social and the individual dimensions of learning, both extremely relevant in this type of education, in order to successfully exploit school to discuss collectively the individual situations learners encountered in the workplace. In this sense, we aimed, with this research, at investigating the effects of pedagogical scenarios including both individual and collaborative activities, namely individual writing and experience sharing, on the professional development of apprentices in initial vocational education. This project had a two folded objective, aiming, on the one hand, at answering to a series of research questions, articulating around one main question: can the beneficial effects associated to writing and peer-collaboration, evidenced by the literature, be observed in the context of vocational education and training, producing an impact on professional students' professional development? More precisely, three research questions were derived from this one: 1) Do these pedagogical scenarios have an impact on apprentices' competence acquisition? 2) Do they prompt a re-adjustment of apprentices' self-efficacy beliefs? Moreover, we were interested in an explorative approach to understand apprentices' interaction and collaboration patterns, as well as their participation and subjective evaluation associated with this type of activity.

The second objective of our research plan was associated with the design of the instructional scenario used in this process, as, through the implementation of a design-based research approach, we aimed at developing one effective scenario, which could be modified, adapted and reused in numerous learning contexts facing the same or similar challenges to the one observed in initial vocational education. We therefore formulated a number of additional questions: 1) How can learning activities articulate efficiently the individual and the collective dimensions of learning? 2) How can collaboration be prompted and enhanced through efficient activity design? 3) What are the features that a technology-enhanced environment should have in order to facilitate and increase collaboration among peers?

In this discussion, we will consider the answer to both research and instructional questions, in order to sum up the main findings of this thesis, both to provide a contribution to the literature of vocational education, writing as a learning activity, and computer-supported collaborative learning, and to identify a series of recommendations, as well as the implications of the scenario we designed for the implementation of computer-supported collaborative activities of this type.

7.1 Discussion about research questions

In consideration of the literature on writing-to-learn and on the one on collaborative learning and on CSCL, we implemented a writing and collaborative learning scenario that could support learners in acquiring competence associated with specific professional procedures, while at the same time supporting the construction of conceptual understanding and professional identity, here considered through self-efficacy beliefs. Our research questions in this sense were organised around one main question: Do pedagogical scenarios involving reflexive writing, peer-commenting and discussing workplace experiences in class, have an impact on apprentices' professional development?

Vonthron, Lagabrielle & Pouchard (2007) assert that the engagement and retention of students in adult education pattern can be associated with three main dimensions: the cognitive, the motivational and the social one. Additionally, these same aspects can be associated with the research on professional development, which has been explained as characterised by the knowledge, skills, and attitudes associated with the professional field (Eraut, 1994; Kaslow et al., 2007). To this regard, we would like to discuss here the results of our studies in relation to our research questions and to these three dimensions characterizing adult education.

7.1.1 The cognitive dimension: Apprentices' competence acquisition

In consideration of the literature on the domain of writing-to-learn, in which writing is considered as an activity implying organisation, manipulation and integration of knowledge (Olson, 1994), encouraging the creation of new concepts and the re-organisation of pre-existing ones (Tynjälä, Mason, & Lonka, 2001), we expected that the task of writing would have an impact on apprentices' competence, measured before and after this learning activity. In this context, we use the term competence in order to refer to apprentices' conceptual understanding associated to a procedure, which includes the understanding on how to practically deal with it and with unexpected situations that may be encountered. To this regard, we refer to Vicente & Rasmussen's (1992) Ecological Interface Design, which considers the need to have an abstract conceptual understanding of key aspects of a procedure in order efficiently deal with an unanticipated event encountered while performing it. Additionally, the peer-commenting task, together with the elicitation of the social and motivational dimensions of learning, was also expected, in this circumstance, to encourage learners in embracing different perspectives, and therefore develop their competence by encouraging them to co-construct new knowledge (Scardamalia & Bereiter, 1994; 2006), represented here by strategies to face difficult situations encountered in the workplace practice. We were therefore expecting, in our studies, to observe a progress in terms of competence acquisition.

The results obtained partially comfort our hypothesis, even though some specifications reveal necessary. As far as our first study is concerned, the expected effect of the activity over competence

acquisition could not be observed, as no significant difference was identified either between the performance at the pre- and the post-test or between the two conditions: writing and writing with peer-commenting. It is important to mention, however, that the measures used to evaluate competence in this piece of research were not tested before and revealed unable to capture learning progress for two reasons: in the first place they resulted particularly difficult for apprentices (who in average did not reach the mean score in this test, neither at the pre- nor at the post-test). Additionally, they were different from the tests they are used to undertake. In this sense, no decisive conclusion can be drawn from the competence acquisition of learners in this study. In the second study, on the other hand, in which the test used to measure this variable was modified, results showed that the scenario proposed had an impact on both first- and second-year apprentices' competence related to the professional procedure under analysis. It is important to specify that in this study we observed a different impact of the scenario on first- and second-year apprentices. While first-year apprentices improved their ability to select the correct response to the multiple-choice question (asking to pick the appropriate reaction to a complex situation), second-year classes demonstrated that throughout the activity, they obtained tendentially better results in answering to open-questions in which their ability to identify the key aspects about a critical situation was analysed. We formulated different hypotheses to explain the differences between the two groups, as the fact that the topic under the scope (washing a patient for first-year apprentices and the relationship with the patients for second-year ones) may have an impact in the performance of apprentices and influence the type of measure affected by this scenario. However, we believe that another explanation may be provided, which refers to the fact that first-year apprentices may need to focus on how they should behave and react in various circumstances and therefore this competence may reveal more sensitive to this type of learning situations. Second-year students, on the other hand, who already developed some competence in selecting the good reaction to critical situations, may need now to refine their capacity in justifying and elaborating on their choices anticipating future actions.

Globally, we consider that the effect of this scenario on learners' competence seems to confirm our hypothesis that writing plays a role in the constitution of new knowledge and its organization (Galbraith, 1999) and in promoting knowledge abstraction and integration (Olson, 1994), while collaborative learning fosters exchange between peers and encourages learners to move beyond personal experience (Scardamalia & Bereiter, 1994). Additionally, it is interesting to point out that the results emerging from both interventions associated with the collaborative written productions, and more specifically, the correlation between the number of words written as a peer comment and the competence acquisition in the first study, and the analysis performed on the written productions in the second study, demonstrated that this type of collaborative writing activity can reveal highly productive for learners and trigger the constitution of new knowledge. In particular, in the qualitative analysis conducted in our third study, we could identify a number of highly transactive interactions, in which

learners were able to produce new knowledge and assume new perspectives on critical incidents, elaborating alternative solutions to a situation. Following Galbraith (2009) dual-process model of writing, the writing activity that apprentices undertake in this task allows them to create new knowledge, not only through the collaboration with others, but also through the explicitation of knowledge which was implicit in their semantic memory beforehand. Additionally, the fact of imparting specific writing instructions plays an important role in triggering the production of this new knowledge. This confirms the fundamental role played by the structuring and scaffolding of writing activity of this sort, aiming at the production of new knowledge and information.

For the reasons mentioned above, this type of activity would impact the cognitive dimension of learning in this type of educational context, and this is a highly interesting results, as finding a way to deal in school with professional competence and critical situations encountered in the workplace was one of the main issues we aimed at exploring in the context of this research. Additionally, this type of activity reveals in line with our idea of exploiting the collective environment of the classroom to discuss and work on the individual critical experiences issued from workplace practice. We believe, however, that further research may be interesting in order to analyse and elaborate about the differences encountered between first- and second- year apprentices. This could allow for the adaptation of the scenario to a more specific target population, focusing on its particular learning needs.

7.1.2 The motivational dimension: Engagement in the activity and self-efficacy beliefs

With regards to the impact of writing and peer-collaboration on apprentices' self-efficacy beliefs, we formulated the hypothesis that the scenario we designed may have an effect on participants' organisation of knowledge and creation of new ideas and concepts. The activity proposed, combining individual and collaborative writing, contains a motivational factor represented by the fact that it provides the possibility of taking into account one personal situation, sharing it and discussing on the solutions identified. A clear indicator of this motivational factor is the consideration of learners' participation rates to the activity proposed, which will be described below. This type of engaging activity is expected to impact apprentices' self-efficacy beliefs, as it should affect the personal judgment they have on their capability in performing the courses of actions required to deal with critical circumstances. Self-efficacy beliefs are considered as the foundation of motivation and of personal accomplishment (Zimmerman, 2000), and are constructed with regard to both individual and societal connotations (Billett, 2006). It is important to mention the fact that motivational and social dimensions of education are highly connected in this type of pedagogical activity, and it is not possible to consider the one as completely separated by the other.

Once again, contrasting, yet encouraging, results emerged from our implementation of this pedagogical scenario in the classroom context, in terms of its impact on apprentices self-efficacy

beliefs. If the first study's results were inconclusive, the results of the second study revealed an interesting trend that deserves to be further explored. In the first study, following Bandura's guidelines on self-efficacy beliefs scales (2006), we prepared a questionnaire in which apprentices were asked to auto-evaluate themselves on a series of competences issued from different domains, going from more general items, into professional and specific to the professional procedure under analysis. In addition, items specific to the school performance were included in the questionnaire. All items were self-evaluated on a scale from 0 to 100. In contrast with our expectations, students' first response to the questionnaire, in the pre-test of the activity revealed a very high level of self-efficacy beliefs with average response well above 80%. Unexpectedly, we observed a significant difference at the response to the pre-test between the two classes participating to the study. Because of the high response registered at the pre-test, the questionnaire was modified for the post-test implementation, requiring explicitly participants to consider the difference in their self-efficacy in comparison to the pre-test. Maybe in reason of this request, which may have been too explicit, apprentices filled in the questionnaire by crossing the response associated with no change for each one of the item of the questionnaire. For this reason, it was not possible to use the results of this analysis either to accept or reject our hypothesis foreseeing a re-adjustment of self-efficacy beliefs after the implementation of this scenario. This first study was however very useful to provide elements on how to redesign this questionnaire, in order for it to become more precise and usable at the pre- and post-test phase of the second study.

The questionnaire used in the second study was therefore adapted according to the results of the previous one. In this case apprentices were again asked to self-evaluate on a series of items (on professional, specific to the task under analysis, and school related domains), however, in this case they were asked to compare themselves with one expert they collaborate with in the workplace, while in the previous implementation a general evaluation was required. This had an impact on the response of apprentices, which decreased at the pre-test allowing for the same questionnaire to be used in the post-test phase of the activity. Thanks to this adaptation, it was possible to observe a significant increase of self-efficacy beliefs for first-year apprentices, while the same results could not be observed for second-year ones. Different explanations can be provided for this result, which include the idea that this difference could be associated with the modifications made to the scenario as a result of the observation of its first implementation. However, other reasons may be considered to explain these results. In particular, we think that the level of maturity of apprentices evolves throughout the years of their schooling, creating a more stable image of themselves, less subject to modifications and adjustments in similar settings. Additionally, the absence of a control group limits here the conclusions that can be derived from these data, as we cannot disentangle the evolution of self-efficacy associated with the intervention proposed in our study from the global effect of the curriculum.

These results seem to go in the direction of previous research, which observed a decline of self-efficacy beliefs in the initial phases of its development, usually followed by a new increase (Britner & Pajares, 2006; Harter, 1996; Caprara et al., 2008; Postareff et al., 2007). These results, observed in the higher education and the academic context, are reproduced in our research for vocational learning students. This result reveals highly interesting and should be taken into account by the practitioners of the domain, as it may be very important to prepare apprentices to this adjustment and adaptation of their self-efficacy beliefs overtime. In fact, students should be prepared to face a non-linear progress of their self-efficacy beliefs, starting often quite elevated, facing a decrease with the acquisition of initial experience, and a subsequent slow increase and regain of confidence in individuals' capabilities of performing the procedures and tasks demanded. To this respect, strategies to support this development and the feeling of confidence in one's capability should be implemented. The scenario we designed may reveal interesting, in consideration of the results obtained with first-year students. However, a more longitudinal approach, observing the development of this students' sense of efficacy over time should be implemented, in order to observe the longer-term effect of this implementation on their development.

As far as the participation to the activity is concerned, apprentices revealed a very satisfying participation rate, both in the first and in the second study. Participation was measured in terms of length of the texts written, engagement in the oral discussion, and through the qualitative analysis performed in the third study. In both interventions apprentices wrote interesting text and participated to the peer-exchange in a productive manner. On the other hand, the second study revealed remarkably higher participation rates, and this could be associated with the fact that the scenario was more integrated in the school curriculum, with a higher implication of the teachers from the design to the implementation of the activity. Additionally, even if this aspect cannot be objectively measure, it is important to mention that in both cases teachers were positively surprised by the way apprentices engaged in the activity, especially considering the resistance observed by the teachers towards the task of writing by apprentices throughout their curriculum. In both studies, it was interesting to notice that the peer-commenting activity proposed to the apprentices was the one in which they engaged the most, with very high participation rates. Additionally, a very interesting effect associated with the participation of apprentices in the peer-collaboration task was observed in the first study. More precisely, a significant correlation between the number of words written as a comment to the situation reported by a colleague and the result at the competence post-test emerged. The same correlation was not found for pre-test results, showing that it was not simply the level of competence of the students that explained the higher number of comments. This opens the hypothesis that the more apprentices engaged in the learning activity, the more they learnt. This very interesting effect was, however, not observed in the second study, at least by adopting a merely numerical approach. As the use of word count as a measure of engagement in an instructional activity is certainly quite limited and does not

consider fundamental elements associated with the content of the interactions among participants, a qualitative analysis of these verbal interactions was considered necessary for our research. Its results will be detailed in the next section, dedicated to the social dimensions of our pedagogical scenario.

Finally, we consider that apprentices' evaluation of the activity represented a very important aspect associated with the motivational dimensions of learning throughout our research. In both our studies, participants evaluated positively the activities that were proposed to them, surprisingly more than it was expected again by the teachers collaborating with the implementation and design of this activity. Particularly, apprentices revealed to appreciate the task of collaborating with others, with the possibility it offers to discuss and exchange with colleagues, getting to know their working conditions and critical experiences. In particular, they positively evaluated the opportunity to provide and receive comments from others, in order to reflect on their own practice and to prepare for difficult situations they may encounter in the future. Additionally, learners were asked to provide an evaluation of the environment that was proposed to them, based on wikispaces. Their evaluation revealed extremely positive, with the great majority of participants of both studies declaring to have found the environment easy to use and having appreciated to use this platform to conduct this activity.

7.1.3 The social dimension: Apprentices' participation and interactions

It is important to consider that in the computer-supported collaborative writing scenario the social, motivational and cognitive dimensions associated to learning are intertwined. The social aspect associated to the collaboration with others represents also a highly motivational characteristic of the pedagogical scenario proposed to learners, as well as a cognitive one, as it triggers distributed cognition, in terms of abstraction from one's experience and careful consideration of other's perspective. Considering the importance we recognize to both the individual and the social dimensions of learning for the professional development of apprentices, we were expecting that this activity would allow for a collective professional knowledge to emerge and to foster the construction of a sense of belonging. Apprentices share their experiences with others and provide each other with information about their working conditions and the way they face difficult situations in their working environment. This would support learners in their sense of participation in a community, encouraging them in moving towards a less peripheral participation to the professional group, reinforcing their sense of competence and efficacy in their work (Lave & Wenger, 1991). We adopted an exploratory approach to this social dimension, aiming at observing the way apprentices interacted with each other.

The analysis of the patterns of students' interaction throughout the writing and peer-commenting activity, conducted in the third study, allowed us to investigate more deeply participants' engagement in the scenario proposed, as well as to trace their way of collaborating and understanding how to support and reinforce the positive and constructive behaviours in this type of context. In order to have a complete overview of apprentices' interaction patterns, we analysed their exchanges at different

levels, from the comments they provided to their peers, to the conclusions they wrote to their own episodes after receiving the suggestions and ideas of others. Finally, the complete interactions of the learners in this activity were evaluated. For all these phases, four interaction patterns could be identified, going from minimal to high level of elaboration. Globally, it was observed that, as far as the peer-commenting phase of the activity is concerned, few learners classified as having a minimal elaboration level. The conclusion phase of the activity, on the other hand, comported a more heterogeneous distribution of the students throughout the collaboration patterns, with half of them revealing a lower transactivity and elaboration, while another half having more satisfactory results. The complete interactions revealed a similar distribution throughout the pattern of collaboration as the one observed for the conclusions. The distributions observed in the various phases of this activity are consistent with Kaufmann and Schunn's (2010) consideration that students confronted with peer-feedback, may reveal initially reticent in fully engaging in the activity, questioning the competence of their peers to provide comments to them. For this reason, it may be easier for them to provide comments to their colleagues (Dochy, Segers, & Sluijsmans, 1999; Topping, 2003), than to accept the observations and suggestions made by others (Kaufmann & Schunn, 2010), integrating these aspects in their conclusion. It may be interesting, in order to confirm this consideration, to observe the collaboration patterns of the same apprentices after various implementation of this task. This would allow observing whether the conception of students of this peer-feedback activity positively evolves over time, as suggested by Dochy & McDowell (1997).

In consideration of all the elements mentioned above, we consider that the social dimension of this activity revealed highly satisfactory for learners, having an impact on their motivation towards the task. Learners were able to provide and receive information on the workplace experiences encountered and reflect on their own practice to obtain ideas on how to face difficult situations. This practice of peer-commenting in relation to work-related situations reproduces a common workplace practice in which providing and receiving comments to colleagues is a normal learning procedure (Billett, 2002; Eraut, 2004).

To sum up the above mentioned findings, the research results could partially confirm the hypothesis formulated in terms of competence acquisition and self-efficacy beliefs of apprentices. In accordance with the literature considering writing as a learning activity, which implies knowledge re-organisation (Olson, 1994), as well as the creation of new concepts and the re-organisation of pre-existing ones (Tynjälä, Mason, & Lonka, 2001), and with the studies analysing the role played by peer collaboration in the acquisition of different perspectives on workplace practice, encouraging the co-construction of new knowledge (Scardamalia & Bereiter, 1994; 2006), an impact of this activity on learners competence acquisition could be observed, even though additional implementations should be conducted in order to confirm this results with learners in different years of education. Similarly, an impact on the development of first-year apprentices' self-efficacy beliefs could be observed in this

research, partially confirming the hypothesis that this learning scenario may have an effect on apprentices' professional development, and in particular on their self-efficacy beliefs (Lave & Wenger, 1991). Finally, the exploratory analysis conducted in the course of these studies provided interesting elements allowing to define interesting future directions for this research, as well as instructional recommendations for the implementation of similar scenarios.

7.2 Discussion about instructional implications

In addition to investigating learning impact of writing and peer-collaboration, with this project, we aimed at conceptualising a pedagogical scenario which would demonstrate effective in encouraging students to engage in writing and peer-commenting activities. In reason of the application of a Design-Based Research approach (Reeves, 2006), we had the opportunity to progressively modify and refine the scenario designed in the early stages of this research, in order to maintain all successful elements of the first implementation, and modify all critical aspects, in order to obtain a fully functional instructional scenario, which would reveal satisfying both in terms of the research opportunities, and even more particularly in terms of its potentialities for the practitioners of the domain. We consider, therefore, that the scenario designed throughout the different implementations of this activity represents now a functional model, which can be reused in a number of different contexts in which the coexistence of school learning and workplace experience represents a challenge for the students.

7.2.1 The resulting instructional scenario

The scenario we designed throughout this research project is organised around three main phases, of a duration of about 1h30' each. The scenario is characterised by the presence of two writing sessions, with, in between them, one oral discussion about the texts written in the first session. Each phase of the scenario was designed with the direct involvement of the teachers of the school, who played a particularly important role in refining the instructional activity from the first implementation in study one to the progressively modified versions of the following implementations. The teachers contributed in ensuring that the tasks and activities presented would be well integrated in the curriculum and aligned with apprentices' development and competence level. Figure 13 presents the main characteristics and features of the scenario implemented and its organisation in the three sessions.

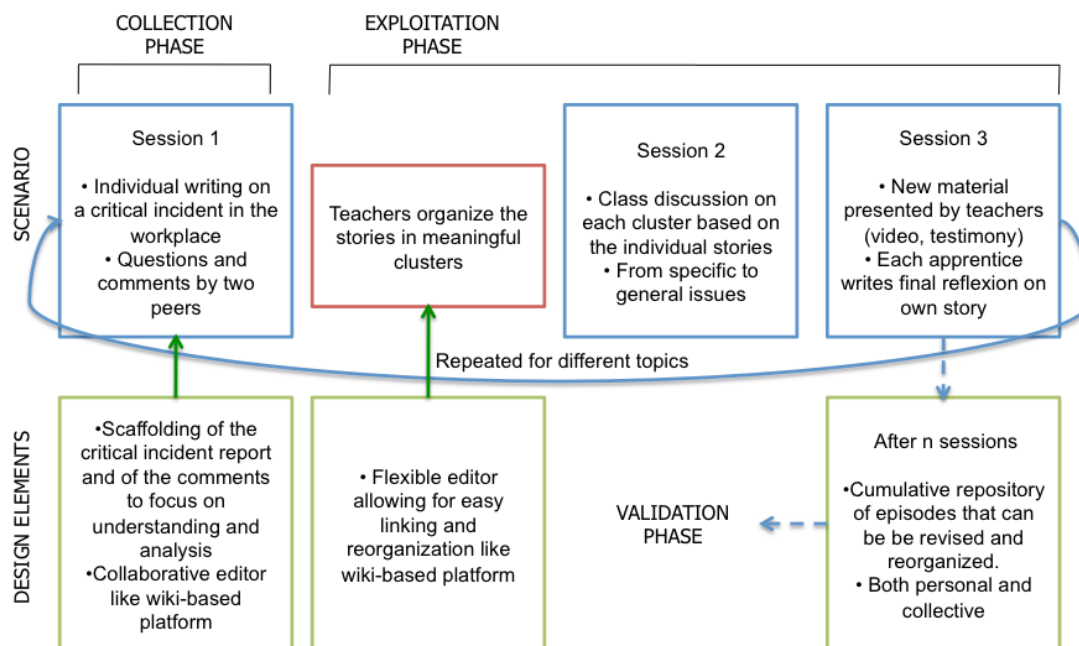


Figure 13. Complete scenario of the activity implemented (Unpublished research report, Dual-T Consortium)

The first session of this learning activity is dedicated to the individual writing of critical situations, followed by a peer-feedback activity, and by the redaction of a conclusion by the author of the episode. This activity represents in this scenario the collection phase, in which the episodes lived in the workplace by apprentices are reported in the classroom environment, in order to be shared and exploited in the collective environment of the classroom. In this same activity, the exploitation phase of the scenario begins, as the peer-feedback activity conducted on the episodes represents a first exploitation of the situations collected.

This activity is followed by two other sessions: the second session is a class discussion, requiring apprentices to discuss collectively the situations described. Very importantly, before this discussion session, the teacher involved in the implementation of the activity organises the episodes reported by the apprentices in meaningful clusters of situations treating, for example, of similar topics, or situation arising the same type of challenges, or emotional reactions (this clustering activity could be conducted by the students in collaboration with the teacher, in order to support their abstraction from their personal experience). Once the episodes clustered by themes, they are discussed in a classroom debate which touches upon all the topics described by the apprentices. This way, all situations can be treated in one single session, allowing all participants to intervene, by specifying aspects of the incidents they described themselves and debating on the situations lived by their fellow apprentices. This discussion session would allow to identify common trends and issues encountered by apprentices and treat them in an open debate.

Finally, in the last writing session, participants are asked to go back to their episodes. In this phase, the common issues emerged in the oral discussion session become key elements of the activity. Additional material, as videos or text, associated to the topic treated in the discussion, is presented to the apprentices by the teachers. On the basis of the debate and of the material proposed to them, participants are asked to write again on their pages and on the ones of their colleagues to resume the most important aspect of the reflection conducted throughout the activity and describe how they think they would handle the critical situations described now, after that they were treated in the collective environment of the classroom.

This scenario represents one complete activity, which would ideally be reproduced various times throughout a school year, in order to result in the creation of a cumulative repository of episodes that can be reorganised and revised. This repository is characterised by both an individual dimension, represented by the text written by each apprentice to describe the difficult situation they lived in their work practice, and a collective one, as it contains the comments and feedback provided by others (figure 14), and is structured around the main clusters emerging as key and common challenge of the apprentices (figure 15).

The screenshot shows a digital interface for a repository. On the left, there is a vertical spiral binding graphic. The main content area is titled 'Exemple' and contains a 'Consigne' (instruction) and a 'Votre Texte' (your text) section. The 'Consigne' asks participants to write about a significant episode from their practice during a toilet session, focusing on three aspects: what happened, how they reacted, and the consequences. The 'Votre Texte' section contains a student's narrative and several peer comments. The student's text describes a stressful experience in a classroom setting where they had to use a mannequin for a toilet session. Peer comments provide feedback, such as suggesting the use of a dictionary or non-verbal communication. The interface also includes a search bar, a 'Modifier' button, and a sidebar with navigation links like 'All Pages', 'home', 'Exemple', and 'Instructions'.

Exemple

Consigne

Racontez un épisode particulièrement significatif que vous avez vécu dans votre pratique lors de l'exécution d'une toilette. Concentrez-vous sur les aspects suivants :

1. Qu'est ce qui s'est passé ?
2. Comment avez-vous réagi ?
3. Quelles ont été les conséquences ?

Votre Texte

1. Qu'est ce qui s'est passé ?

Lorsque je faisais la toilette pour la première fois à XXX, dans l'établissement YYY où je suis en stage, j'étais un peu nerveuse. Je n'avais jamais fait une vraie toilette avant, vu que j'avais juste fait mes exercices à l'aide d'un mannequin, et je dois avouer que je ne savais pas trop comment m'y prendre. De plus, la personne à qui je faisais ce soin ne parlait pas français, mais seulement ça langue maternelle, le russe, langue que je ne connais pas. Je n'arrive donc pas à communiquer avec elle et je ne pouvais donc pas savoir si mes gestes étaient appropriés et ce qu'elle ressentait. J'avais particulièrement peur de pouvoir lui faire mal sans me rendre compte, et sans qu'elle puisse m'expliquer...

Chérie, je te comprends, car quand j'ai fait une toilette pour la première fois j'étais aussi stressée. Par rapport aux problèmes de communication avec la dame, par contre, je pense que tu ne dois pas oublier qu'il y a différents types de communication, notamment la communication non-verbale. Avec nos gestes, nos sourires et le ton de notre voix, on peut beaucoup communiquer, même si on ne parle pas la même langue. Tu peux donc mettre ta patiente à l'aise grâce à ce type de communication, et elle sera aussi capable de te communiquer si quelque chose ne va pas, ou si tu lui fais mal!

Étais-tu sous effet de stress le jour où tu a vue ça pour la première fois de ta vie? Pourquoi? Tu pourrais faire des gestes pour illustrer tes mots si tu ne sais pas parler allemand, ou bien tu peux prendre un dico de poche allemand-français pour traduire et faire des phrases

Ma Chérie, Merci pour t'as compréhension, Oui maintenant j'ai compris qu'on n'a pas forcément besoin de parler pour communiquer, grâce à la communication non verbale.

Commentateur 2: j'étais en état de stress parce que je savais pas vraiment comment m'y prendre vu que le mannequin en classe ne dit pas s'il a mal ou pas donc, oui j'étais en stress. C'est ce que je fais j'utilise la communication non-verbale et ça marche très bien. Pour le dico ça va être un peu dur vu que cette dame n'a pas toujours des dialogues cohérents, donc cela serait un peu difficile mais merci pour tes préposition.

2. Comment avez-vous réagi ?

J'étais stressée parce que c'était la première fois mais surtout de ne pas comprendre la personne. J'ai essayé de ne pas trop paniquer et de garder la calme et mon sourire aussi. J'ai fait la toilette tranquillement et finalement je pense que ça c'est assez bien passé. La dame souriait aussi, donc je crois que je ne lui ai pas fait mal.

J'ai aussi stressée que toi quand on a commencé le stage car cela faisait longtemps que je n'avais plus pratiqué.
Comment as-tu gérer ton stress?
Je peux comprendre mais savais-tu que la propre personne ressens que tu es stressée aussi et ça peut ne pas arranger les choses!!!!

Je me suis dit que si j'avais réussi en cours je devrais réussir aussi dans cette situation, et cela m'as un peu calmé. Mais surtout j'ai réussi à gérer mon stress parce que je lui faisais des gestes pendant la toilette et tout c'est bien passé. Elle me semblait être à l'aise, alors je me suis sentie rassuré.

Figure 14. Individual and collective dimensions of the repository, represented by the individual writing of a difficult situation and the peer-comments and suggestions of the colleagues

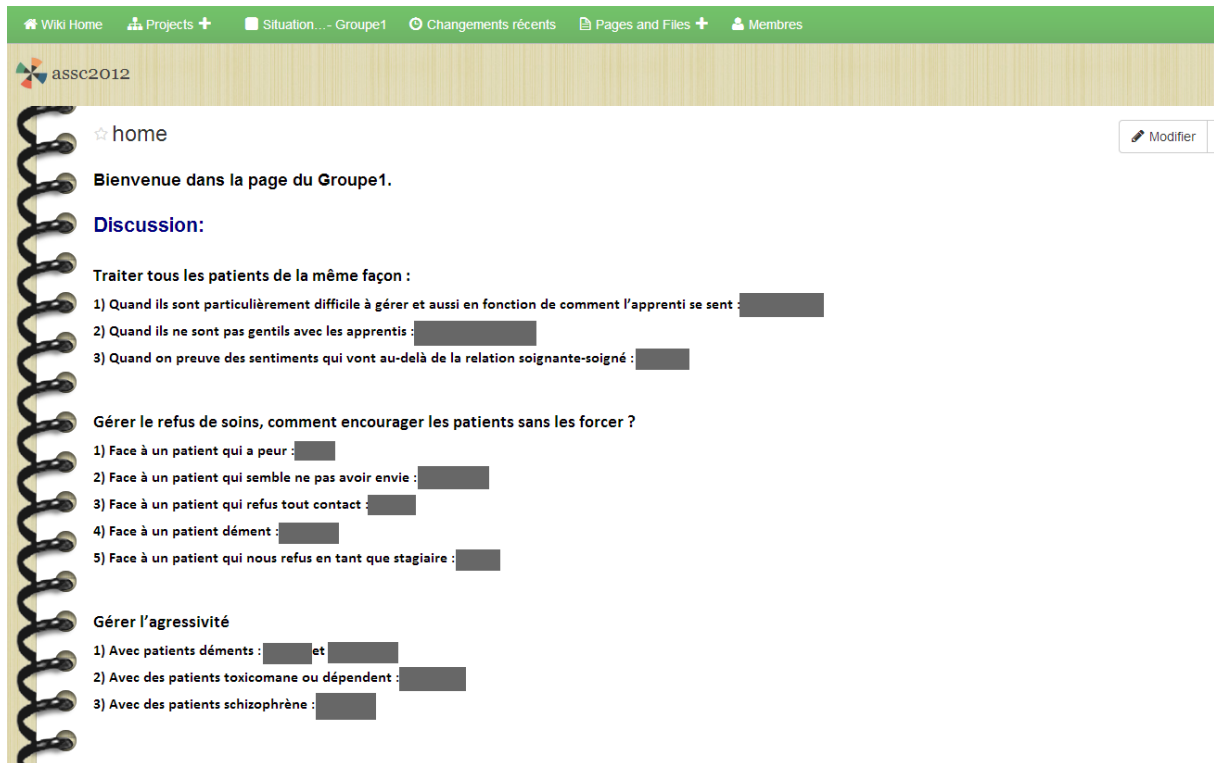


Figure 15. Collective dimension of the repository, structured around the main clusters emerging as key and common challenge for the apprentices

In the literature review introducing this research, we presented different models on which we based the design of the scenario. We will now consider the way in which our activity reflects the most important aspects treated in each one of these models.

7.2.1.1 Computer-supported collaborative writing scenario and the *Erfahrungsraum* model

As it appears in the schema presented above (figure 13), this scenario contains the three most important steps characterising the *Erfahrungsraum* model (Schwendimann et al., submitted): *Collection*, *Exploitation*, and *Validation*. All these phases were adapted to the particular characteristics of the professional education involved in this research. This is particularly important for the collection and the validation phases that were designed taking into account the constraints given by the privacy of the patients. This adaptation of the *Erfahrungsraum* model makes this scenario particularly flexible and adaptable to virtually all working conditions.

The collection phase of this scenario is conducted in the first part of the initial session, in which apprentices are asked to describe a difficult situation encountered in the workplace, in relation to a given topic. This represents a way of collecting critical situations without violating the intimacy and the privacy of the patients, as no information allowing to trace any personal data is required and additionally, the platform is not accessible to anyone but the class concerned, and the teacher and researcher collaborating on this activity.

The exploitation phase is the key aspect of this activity and various sessions are dedicated to it. More particularly, the second part of the first session, in which learners are required to provide and receive peer-feedbacks, comments, and suggestions represents a first exploitation of the episodes, as well as the conclusion written by each apprentice to his /her situation. Additionally, the second session of the scenario, with its oral discussion represents a key aspect of the exploitation of the situation described, as the final session, with its new material and conclusions on the situations.

The validation phase in the computer-supported collaborative writing scenario is associated with the successive implementation of the pedagogical activity over time. The repository of situations emerging from these multiple implementations, representing individual and collective knowledge, remains accessible for the learners to be consulted and revised at each time of their educational path. Additionally, it is possible to go back to the previously written situations and detail, as apprentices advance in their curriculum, whether they happened to live similar incidents again, how they reacted or how they think now they would handle similar issues. The validation phase in this activity is therefore very interesting, even if it requires conducting the scenario in multiple occasions. The other two phases, and more particularly, the exploitation phase can, on the other hand, be implemented from the very first run of the scenario with satisfactory results.

7.2.1.2 Computer-supported collaborative writing scenario and the Integrative Pedagogy model

A great source of inspiration for the design of the computer-supported collaborative writing scenario was provided by the Integrative Pedagogy model (Tynjälä et al, 2006; Tynjälä, 2008; Heikkinen et al., 2011; Tynjälä and Gijbels, 2012), in which writing and discussion are conceptualized as key mediating tools to support learners in performing the connections between theoretical knowledge acquired in school and practical experience encountered in the workplace. The activity created in this context follows this main concept, as it allows learners to bring situations encountered in their practice to school, where they are discussed according to the theoretical aspects thought in this environment. The use of the suggested mediating tools activates metacognitive and reflective skills representing the self-regulative knowledge, fundamental to perform the connections between theory and practice. Additionally, the integrative pedagogy model considers that a powerful mediating process is represented by problem solving activities. As in the computer-supported collaborative writing scenario learners are asked to describe a critical situation, and then to collaborate in identifying possible solutions to solve the issue encountered, we consider that this activity represents a form of problem solving, particularly relevant in this case, as issued from real workplace practice, instead of being an artificial activity designed for this purpose.

In this context, we consider that the fact of discussing about the working situations and conditions encountered by each apprentice in his /her working practice represents a way to increase the socio-cultural knowledge of the participants. This type of knowledge represents all the knowledge that is

embedded in the social practices of workplaces and is learned through participation in these practices. The fact of acquiring information of the social practice encountered by others allows apprentices to have a more complete overview of the working conditions associated with their profession.

The scenario presented in this activity represents an interesting way to integrate the four types of knowledge mentioned in the integrative pedagogy model. To this respect, we believe that the scenario emerging from our research represents a successful implementation of this pedagogical concept.

7.2.1.3 Computer-supported collaborative writing model and its evolution

In the early stage of the conceptualisation of the computer-supported collaborative writing scenario, we designed a new model resulting from the consideration of both the Erfahrungsraum and the Integrative Pedagogy model, adapted to the particular context of implementation. The idea underlying this new design was the one of exploiting the key aspects associated with these pedagogies, in order to create an environment in which to connect the individual and the collective dimensions associated with vocational learning. The use of individual writing of critical situations encountered in the workplace and sharing these situations with others, both in written and oral formats, allows for apprentices to bring their individual experiences lived in the workplace to a collective environment in which they are allowed to receive from others and to provide to them ideas and options on how to deal with the situations that may be encountered.

This scenario allows vocational education students to bring together the individual learning they encounter in their workplace practice, with the collective dimension of learning encountered by students in the classroom situation (Ortoleva, Bétrancourt & Morand, 2012). The scenario proposed presents therefore students with individual as well as collective activities (Dillenbourg & Jermann, 2010). This allows learners to all work, first individually and afterwards collaboratively, on finding new solutions to the challenging situations they encountered in their workplace practice. This, in parallel, provides them with a global overview of the working conditions encountered by others in their workplace practice. In accordance with the socio-constructivist view of learning and particularly with Vygotsky's concept of *zone of proximal development* (1978), this type of interaction with peers, based on the identification of possible solutions to critical situations, could augment learners' potential capacity of performing a task. Vygotsky's definition of zone of proximal development is the following: "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance, or in collaboration with more capable peers" (p. 78). In the case of our scenario, there is no explicit hierarchy of learners' levels of capability, as these depend on the specific situation under analysis, but anyone who had encountered similar critical experiences can contribute with the needed insights to elaborate possible alternative solutions. Additionally, collaboration can have other

important beneficial effects on the learning process (Davies, 2002), by, for example, provoking and mediating a socio-cognitive conflict between learners (Scardamalia & Bereiter, 2006).

To sum up, therefore, we consider that this scenario represent a successful implementation of the computer-supported collaborative writing pedagogical model, based on the idea of using this type of pedagogical activities in the context of vocational education. In order to obtain this result, the two models of integrative pedagogy and the erfahrungsraum were exploited, adapted to the specific characteristics of the learning context. This would allow students to perform the connections between theory and practice, and school and the workplace. We consider that the scenario we proposed represents the answer to the first of our three design questions associated with this research, considering how learning activities can efficiently articulate individual and collective dimensions of learning.

7.2.2 Recommendations for implementation

Some important aspects associated with a successful implementation of a computer-supported collaborative writing scenario in a vocational education context can be derived from the experience emerging from this research. These considerations represent the key aspect allowing us to reply to the second question associated with the design of the learning activity: How can collaboration be prompted and enhanced through efficient activity design?

In the first place, it is important for learners to truly engage in the scenario, as both the individually written productions and the interactions among them, both in written and oral format, will depend on the way learners will take part to the activity, writing interesting text in which they share meaningful episodes, and providing each other with interesting suggestions and ideas. The experience derived from our implementations of the scenario highlighted that a high level of engagement of the participants in the activity proposed reveals crucial for it to be fully integrated in the class curriculum. In the first study implemented, the teachers participated in the finalisation of the materials and the design, but were less involved in the conceptualisation of the activity, and this reflected in the students perceiving the activity as an external intervention. This resulted in a different attitude towards the scenario, less engaged in the completion of the task, if compared to the second study, in which the involvement of the teachers in all the phases of the design of the activity comported a clearer integration of the task in the curriculum, and reflected in a higher engagement of the learners in the task. This engagement could be observed in their attitude towards the activity, and in their participation to it, measured in terms of number of words written for the various phases of the task. The oral discussion was also very lively. Both the participation to the oral and the written phases of the task surprised the teachers who expected for the students to be more resistant to the task.

The writing activity is considered as a task hardly accepted by the apprentices, who are not really eager in producing written texts. Even though the working environments in which they operate require

them to write in various circumstances to produce reports and inform the colleagues about particular situations encountered, students tend to avoid the writing task required to them in the school environment. This is often associated with the fact that the learners choosing the vocational path are generally issued from a difficult educational path and associate writing to this type of pattern. Additionally, various apprentices having migration background, the formal quality of their writing varies substantially, and this makes them feel insecure about their written productions. Finding the right ways to motivate learners in engaging in such an activity is, therefore, particularly important. As said above, the fact of integrating the writing activity in the curriculum represents a good practice we observed throughout this research. Additionally, the fact of writing on a computer was considered as a great added value by the learners, who declared feeling much more at ease with typing than with handwriting.

As discussed in the literature review of this thesis, the writing activity, considered by many as beneficial to learning (Hayes & Flower, 1980; Scardamalia & Bereiter, 1994; Galbraith, 1999; 2009), produced contrasting results when tested empirically. The recommendations provided by Tynjälä and colleagues (2001) to create effective writing activities revealed useful in this research and represented an effective guide in the design of the tasks proposed to students, even though some aspects were adapted to the specific context of our research. In the first place, the authors mentioned that the writing task should require conceptual change and knowledge transformation/construction. To this regard, our activity meets this requirement, as learners are supposed, through this scenario, to acquire new concepts and understanding of the procedures discussed. The second recommendation is associated with the idea that students' previous knowledge and beliefs should be taken into account. In particular free-writing exercises should be used before studying the topic. In the case of our vocational school, this is not possible, as apprentices have the right to perform in practice only professional acts that were already studied in school. We asked, however, participants to write difficult situations encountered in school and proceed to peer-comments before the class discussion in which the teacher would also intervene by providing theoretical elements. Additionally, according to the third recommendation the writing tasks should encourage students to reflect about their own experiences. To this respect, this activity is a perfect example of the type of task imagined by Tynjälä and colleagues as it is completely based on a reflection on learner experiences. Moreover, the authors suggested that students should be encouraged to solve practical problems by applying theoretical knowledge, and in this case again, the learning scenario prepared aims at performing exactly this type of activity, asking students to describe issues encountered in practice and consider new solution between them and with the teacher. In this context, the theory associated with the practical problem will be discussed and integrated in the situation. The fact that the practical problem treated is directly issued from the personal experience of each student is particularly relevant, in our opinion, as highly motivating for the participants. Finally, the fifth recommendation considered that the tasks should be integrated within the class curriculum, by

organising discussions and small group activities around them. As mentioned above, this is a conclusion that was derived empirically from the implementation of our studies. Both discussion (oral with all the class) and small group activities (written peer-commenting) were conducted in our scenario. For all of the above reasons, we consider that this scenario represent an example of how to integrate all the recommendations provided by Tynjälä and colleagues. We believe, after our research implementation, that the points listed above represent indeed very central issue for the design of an effective writing activity.

As far as the peer-collaboration is concerned in this case again we identified a series of aspects that would play a role in the effectiveness of the implementation of this type of activity. More particularly, we identified various studies suggesting how the use of prompts represents a key feature of successful peer-collaboration task, as collaboration does not or seldom happens spontaneously (Dillenbourg & Fischer, 2007). 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 interactions among students. In the first place, for example, we observed that effective interactions were issued from situations in which students in their peer-feedback provided concrete suggestions or reported personal experiences in similar situations (Kuhn, Shaw, & Felton, 1997). Questions (King, 2007) and generic comments were also interesting elements of discussion and, in particular, questions were an excellent ways of getting into the activity in a progressive manner. On the other hand, it is when faced with concrete new solutions to an issue that the apprentices were able to come up with new concrete alternatives to their behaviour and the complete interactions revealed more productive. According to the results of our research, both types of scripts identified by Weinberger, Ertl, Fischer and Mandl (2005), epistemic and social scripts, reveal of great relevance. In particular, the epistemic scripts are of key importance to specifying and sequencing the 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 to facilitate knowledge construction, while social scripts facilitate the interaction among students. On the basis of the literature review, we believe that adaptable (Wang et al., 2011) and flexible (Dillenbourg and Tchounikine, 2007) scripting would also represent a very interesting option in this type of situation as this would allow learners to act on the prompts provided, stimulating their self-regulated learning. To this respect, the idea of, in successive implementation of this scenario, fading the prompts provided to learners (Gavota, Schneider, & Bétrancourt, 2010) represents a very interesting perspective, and would deserve to be further explored.

We consider that all aspects mentioned above should be taken into account when designing a scenario based on writing and peer-collaboration activities as a mean to bridge the gap between school and the workplace and even beyond this scope. These elements should be kept in mind when adapting and

modifying the pedagogical scenario developed in the framework of this thesis to different target audience or different pedagogical scopes.

7.2.3 The technological support

In response to our third design question, in which we considered the features that a technology-enhanced environment should have to facilitate the collaboration among peers, we describe here the main features associated with the computer-supported collaborative writing scenario. This activity requires for its implementation the use of a specific technological tool, a wiki environment. This type of technology is devoted to writing and peer-collaboration activities in reason of a series of features that facilitate this type of activity and provide all the freedom to the users to access the site across space and time (Franklin & Van Harmelen, 2007), to collaboratively edit a text, as well as to consult and go back to previous versions of a page. On the other hand, the technological support received in this thesis less attention if compared to the instructional scenario we developed in order to conduct our activity. As mentioned in the presentation of this research (see section 1.3.1 The technology in the computer-supported collaborative writing scenario), we consider that the technology used in a classroom should represent a support to a well-designed pedagogical scenario, and do not comport, in itself, an added value to the effectiveness of the activity (De Lièvre, Depover & Quintin, 2000). Technologies represent, therefore, a support to the quality of an activity (Depover, Giardina & Marton, 1998), and are key to its actual implementation, as without the utilisation of the technological tool, the same activity would not be possible. They, on the other hand, do not represent the objective of our research, and this may comport the impression that the role of technology in this thesis is only marginal. We believe that this is not the case, as this represents a fundamental tool, which is essential for the successful implementation of this scenario. It acts as a fundamental support, which makes the scenario possible, without, on the other hand, occupying the centre of the scene.

Additionally, it should be mentioned that the use of technologies, which made possible the scenario presented, produced other very interesting effects, which were not regarded in details, as did not represent the central scope of this research, but were fundamental for the implementation of the activity. Among these aspects, the flexibility provided by the pedagogical tool allowed for the teachers to reorganise the episodes described by the apprentices in thematic clusters which remain available for the classroom at any moment until the finalisation of the curriculum. The episodes can therefore be accessed and discussed in other circumstances after that the implementation of the activity is finalised or in between different sessions. These possibilities of reorganisation of the situations and of restructuring the texts inserted in the platform at any moment represent fundamental features which are offered by the utilisation of a specific technological tool in the implementation of the activity. It would be interesting, in future research, to consider these aspects and focus on the impact and importance of the use of technology for the conduction of a similar scenario.

7.3 Limitations of the research

This research presents some limitations that should be taken into account when considering its results. These limitations are mainly associated with the context and conditions in which these studies were implemented, as the authentic context of a classroom, which is extremely interesting in the perspective of educational sciences, presents a series of characteristics that make it a sometimes challenging environment to conduct formal research. More particularly, as it is often the case for intervention studies in the school context, it can be difficult to control a series of variables that can parasite the generalizability of the results obtained.

In the first place, a relatively small number of apprentices was involved in the studies. In the case of the first study the quasi experimental design, according to which the participants were split into different conditions, comported an even smaller number of apprentices for each group. The second study was extended to the students of two different years (first- and second-year apprentices) which permitted to work on a bigger sample. However, as the participants belonged to different classes, it was not possible to consider them as one single population. The issue associated with the number of apprentices is caused, on the one hand, by objective reasons associated with the fact that the school for Assistant en Soins et Santé Communautaire (ASSC) in Geneva is a relatively small school, therefore it was not possible for us to work in this context with a bigger population, as all apprentice in the concerned years of study participated to this scenario. On the other hand, on a more practical perspective, the scenario proposed to the learners was quite intense in its implementation, and required a high level of participation from both the teachers and the researchers involved in its design, therefore, even when working with vaster populations, an implementation with a bigger number of apprentices could reveal challenging.

Secondly, always in relation to the sampling of the research, the choice of working without a control group for the second implementation of the scenario, motivated both by methodological and ethical reasons, represents nonetheless a methodological limitation. It is not possible to conclude what are the results that are specific to the intervention as compared to the ones associated with the global curriculum effect, as these results are obtained comparing pre- and post test measures.

Thirdly, in the second intervention, the inclusion of a class discussion, which is important to ensure the authenticity of the task and strengthen the participation of the learners, limits the possibility to disentangle the effect associated to writing and peer-commenting from the one derived from this oral discussion. On the other hand, the qualitative analysis conducted in the third study permits to only consider the first phase of the activity, and therefore to concentrate on individual and collaborative writing exercises. It should also be mentioned here that there is a considerable *corpus* of data which could not be analysed in the framework of this project, and in particular all the data associated with the

class discussion. This is due to the time constraints, and also to the specific objective set out for this research.

Fourthly, it should be mentioned that, at this stage, it is not possible to rule out a beneficial novelty effect (Clark & Sugrue, 1991) associated to the fact that we present here the initial implementations of the scenario. It is difficult to anticipate what would be the reaction to a recurrent activity of this sort, as there may be a risk that participation levels of teachers and apprentices could decrease over time. On the other hand, on the basis of the literature on peer-feedback, we could also expect that apprentices' conceptions of the collaborative task would progressively evolve in a positive way with practice (Dochy & McDowell, 1997). We consider that further implementations of this scenario should be conducted in order to observe the patterns of behaviour over time, and verify which type of effect can be expected.

Fifthly, the scenarios proposed in the two studies presented in this manuscript are very different in terms of their duration. However, it should be mentioned that in both cases the implementation did not last over three sessions (five if counting the pre- and the post-test) and this could be considered as too short, if the objective of the activity is to measure a conceptual change. Literature (Bangert-Drowns et al., 2004; Lombard & Schneider, 2013) suggests that substantial changes could only occur in a scenario that extends over a long time span (i.e., several lessons over several weeks), covering a full semester and becoming one regular activity in the school curriculum. To this regard, a longer term implementation of this scenario, fully integrated in the school curriculum, should be conducted, in order to overcome this limitation.

Sixthly, one additional critical point emerging from this study is associated with the peculiar and specific characteristics proper to each class environment. Each group of students tends to have different social behaviour, and this produces an effect on the atmosphere of the class, as well as on the level of participation of the apprentices to the activity proposed. Both these aspects are extremely important for the implementation of this activity as the inter-class differences of attitude and behaviour towards the task may have a significant impact in the results obtained both in terms of the research hypotheses and in relation to the development of the scenario proposed to the apprentices.

Finally, it should be mentioned that all the measures used in this research project were composed *ad hoc* and could be improved. Even though both the instruments to measure self-efficacy beliefs and competence were modified after the first intervention, in light of the issues that emerged from their utilisation, there is still some room for improvement in the design of these tests.

7.4. Future directions

This section describing the future directions emerging from this research will consider two different types of perspective related to this project. For a start, we will describe the type of fundamental research that could be conducted in the field of writing and peer-commenting, in order to complement and expand the results emerging from this study. Subsequently, we will consider the ways to overcome the limitations encountered in the implementation of this project and the possible applications of this scenario in different contexts.

As far as the fundamental research about collaborative writing is concerned, we consider that various aspects could be further explored. Firstly, it would be interesting to further research the different impact of our studies on first- and second-year apprentices. Both in terms of competence acquisition and of self-efficacy beliefs, in our second intervention, we could observe different developments issued from the participation to our scenario. In the case of competence acquisition, both first- and second-year apprentices improved their performance, even though the measure impacted was different for each class, while in the case of self-efficacy beliefs only first-year students revealed a modification of this measure after their participation in this activity. We believe, therefore, that it would be interesting to further explore the evolution of these factors, in order to create activities correctly focussed on the specific target population, to maximise their effect.

Secondly, additional research should further analyse the scaffolding elements provided to learners, in order to consider whether additional guiding questions or hints could maximise the effectiveness of the writing and, particularly, of the peer-collaboration task. If a longer-term implementation will be envisaged, research should also focus on the evolution of these prompts, in order to confirm that these reveal more effective when they progressively fade out. This type of research could reveal particularly interesting in reason of the knowledge constituting process associated to the writing task, which could be impacted by the level of freedom provided to apprentices during the execution of the task.

Thirdly, an interesting aspect that should be further explored is associated to the collaborative knowledge construction. The scenario proposed in this study, if implemented on a longer term perspective and on a more regular basis, could encourage learners to engage in the process of creation of shared knowledge and the organisation of a common repository of critical situations encountered in the working environment by all apprentices. This could have interesting effects on apprentices' professional identity and competence acquisition, which should be carefully researched.

Fourthly, another interesting aspect that could be considered while implementing this type of scenario is associated with the competence and self-efficacy beliefs associated with writing. This represents a very interesting factor, which could impact the results obtained with this task, and also an instructional

element, as the participation to this activity could have the side-effect of having a beneficial impact on apprentices' competence in writing, as well as the perception they have of their ability to write.

It is important to mention here that a new intervention, based on an adapted and longer-term version of this scenario, has been implemented. Its results could not be published in this PhD thesis in reason of the timeline foreseen for this project. This new study intended to address part of the research perspectives mentioned above, while, at the same time, representing the concrete solutions to overcome the limitations encountered in the two interventions described in this manuscript. Additionally, the aim of this implementation is also to refine a sustainable learning design that teachers could use routinely, in line with the design-based research approach. This new intervention was designed with the objective of implementing our pedagogical scenario throughout a full semester, as part of the regular school curriculum. In addition, conducting the intervention several times could lead to the construction of a collaborative knowledge base of all experiences described by apprentices, clustered and organised by the teacher and commented by the peers. In this sense, the main characteristics presented in our second study were maintained in this new research, while the element of discontinuity is associated with the fact that in this case the scenario is implemented multiple times, and learners are encouraged to build on the experiences previously described, as well as on the situations described the previous year, for the learners in the second year of the curriculum.

This new study aims at providing the opportunity to further observe the impact of this scenario, when implemented on a longer period of time, on apprentices' competence and self-efficacy beliefs, as long term scenarios are needed in order to produce effective and substantial change in knowledge and beliefs.

This study will also allow us to observe whether the results of the research conducted on our scenario were influenced by a novelty effect or if, on the other hand, the same apprentices confronted again with a peer-commenting activity will have a more positive attitude towards the task, maturing their conceptions towards the idea of receiving peer-comments on their behaviour and work practice, as well as improving their competence in giving helpful feedback.

Finally, once this new implementation of the scenario will be concluded and the above mentioned aspects will be observed, this pedagogical activity will be ready to be implemented in different educational contexts, which may include other vocational education paths, within and outside of the health domain. This same scenario could also be used in any educational contexts in which students should articulate workplace, experiential learning and formal, conceptual learning to get full insights of their practice.

Conclusion

The research project presented throughout this thesis aimed at finding practical solutions to support vocational education students in the difficult task of bridging the gap perceived between school learning and workplace training. The solution identified and tested in this context is characterized by the use, in the school setting, of computer-supported collaborative writing activities based on workplace experience. This scenario is conducted on a computer-supported environment, a wiki site, which provides all the instruments and tools necessary for the implementation of such a pedagogical activity.

The scenario designed and implemented in the three studies conducted in this project aimed at integrating school and workplace learning through the articulation of the individual and collective dimensions of learning, which are both extremely relevant in the context of vocational education. In order to do so, we designed a learning activity based on writing, and more particularly on individual and collaborative writing, following the prescription of the domain of computer-supported collaborative learning, mentioning the importance of combining both individual activities and collaboration. To this regard, the scenario implemented in this context required learners to write individually about a critical experience encountered in the workplace, with the objective of unleashing the cognitive processes associated with the writing activity, implicating knowledge constitution and organisation, as well as abstraction. Apprentices were subsequently asked to collaborate with their colleagues by providing and receiving comments about their situations and to consider possible alternative solutions, elaborated thanks to the different perspectives and points of view of others. This second activity had the objective of exposing learners to various situations, beyond the ones that can be directly encountered throughout the internship programs and to comments and ideas of others on their experience and their way of handling difficult situations, taking a step back from their own practice and embracing new perspectives.

We believe that this type of activity could have an impact on apprentices' professional development, which we measured, in this research, in terms of the competence acquisition of vocational students throughout their participation in this activity, and of the adjustment of their self-efficacy beliefs. These were therefore our main research hypotheses, which we tested through the progressive implementation of the studies composing this project, in a perspective of always improving the scenario characterizing our study and adjusting the challenging elements emerging from its implementation, following a Design-Based Research Approach. Additionally, we observed and analysed the collaboration patterns of apprentices throughout this activity.

The results emerging from this research provide some very interesting elements going in the direction of our hypotheses. If our first intervention did not produce conclusive results but represented a fundamental step for the refinement of the scenario and measures used, the analysis of second intervention allowed us to identify interesting effects. In particular, an impact on apprentices' competence acquisition was observed for both first- and second-year apprentices (even though this progress was identified on different parameters in the two classes), revealing an effect of the scenario on learners' ability to react to a difficult situation and on their way of explaining their reaction. Self-efficacy beliefs as well reported interesting modifications, even if this result only concerned second-year learners, revealing that this scenario has a strong impact on the way students in the beginning of their educational path perceive their ability of performing a number of tasks. Finally, the patterns of interaction between apprentices highlighted a high level of participation associated with the task of providing each other with comments and suggestions on a critical situation, while students' engagement is less developed when it comes to integrating the comments received, considering the suggestions and elaborating new possible solutions for the problems encountered. This result reveals that peer-feedback tasks should be trained and require multiple implementations for learners' to really collaborate and integrate others' perspectives.

A second aim of this project, aside from the verification of our research hypotheses, was associated with the development of a pedagogical scenario, which would work efficiently to support learners in the integration of school and workplace learning. The objective was therefore to design a functional activity, which could be implemented in this and other contexts of vocational studies, in which learners are confronted with a similar challenge associated with the integration of concept-based learning with practical experience. A first design of our scenario, based on different pedagogical models, developed to support the integration of school and workplace practice and adapted to the specific characteristics and constraints associated with the professionals involved in our research, was tested and progressively modified. This process allowed us to refine the pedagogical activity composed of both writing and discussion sessions, starting from an individual activity to move into the collaborative tasks. The scenario we designed, and that was described in this manuscript, represents a learning activity that can be repeated various times throughout a school year, becoming progressively fully integrated in the school curriculum. This implementation permitted us to elaborate some recommendations that should be considered when implementing this type of activity, in order to make them successful. Namely, we realized the importance of integrating this activity in the curriculum of the school, so that this will not be perceived as an external intervention, not associated with the other activities of the school year. Additionally the presence of both written and oral interactions revealed particularly useful to stimulate the participation of all learners, as some demonstrate more ease with the written interaction, while others seemed to be more comfortable discussing orally with their colleagues.

Globally, this activity revealed successful in terms of the participation of the students. In both studies, and particularly in the second one, more integrated in the curriculum of the school, apprentices engaged in the activity, by writing interesting situations and interacting with their colleagues in a constructive manner. Additionally, the teachers participating in this research were particularly satisfied with the way students interacted, both in terms of their engagement in the writing and collaboration activity, and with respect to the professional attitude with which they faced the task. It would be interesting, in future research, to observe longitudinal implementations of such activities in order to observe apprentices' participation on a longer-term base.

For all of the above mentioned reasons, we consider that we reached the goal of designing an effective scenario, encouraging students to write and share the experiences they encountered in their practice, bringing their workplace into the school environment. The scenario allowed us to verify our main hypotheses associated with the impact of such an activity on competence acquisition and self-efficacy beliefs. On the other hand, a longer term implementation is needed, in order to confirm our results and obtain more solid conclusions. In particular, a longer-term scenario, as the one implemented as a development of this research project, will provide the opportunity to measure the effect of a longer intervention on students' competence and their self-efficacy beliefs, and to consider whether this longer exposure to the activity will produce an increased participation in the activity, or rather become boring and reduce the engagement of apprentices in the task. Additionally, this new implementation will provide additional evidence associated with self-efficacy beliefs of first- and second-year students.

On the basis of the results obtained through our interventions, we believe that it will be possible to modify, adapt and reuse the pedagogical scenario developed for this activity in different educational contexts, represented by vocational education patterns preparing for different professions, as well as higher education in which the integration of school and the workplace will be required to the learners. In sum, we believe that our scenario represents a practical and effective solution for the problem of bridging the gap between these two learning environments through the introduction of workplace episode in the classroom and the integration of individual and collaborative learning activities.

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Appendix

Appendix A. Competence test (pre-test) – First Study

Appendix B. Self-efficacy questionnaire – First Study

Appendix C. Competence test (year II) – Second Study

Appendix D. Self-efficacy (year II) – Second Study

Appendix E. Interaction examples – Third Study

Appendix A. Competence test (pre-test) – First Study

Ms Meninos, 55 years old, 1m65, 62 Kg, was hospitalized in your medical service. She had a cerebrovascular accident and presents a hemiplegia in her left arm, which she is unable to move.

She is oriented in time and space, and is able to express herself in English.

She was cashier in a supermarket. She has two sons of 22 at 24 years of age and is divorced since 5 years.

She is generally is in a good mood, and wants to recover as quickly as possible.

Today you are charged of washing this patient.

Answer to the questions below, related to the realisation of this task. Try to answer in a detailed manner, taking into account that you have 15 minutes.

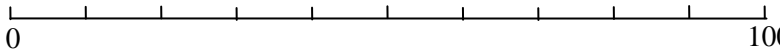
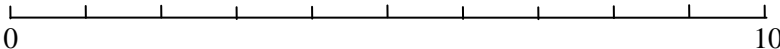
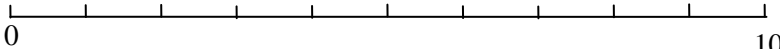
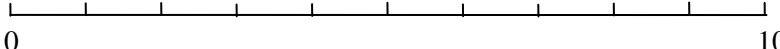
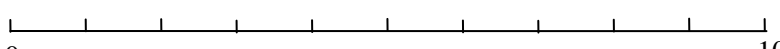

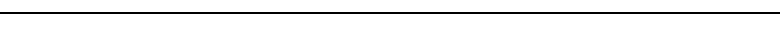
What are the main phases to perform in order to correctly wash this patient?	What are the tools you will need for each one of these phases?	What are the key aspects to take into account at each phase?

Appendix B. Self-efficacy questionnaire – First Study

Name :

Indicate your ability to perform the actions listed below on a scale from 0 to 100, with the following criterion:

0  100
 I am not I am sure I
 able at all am able

I feel confident in any situation.	
I always reach the objectives I establish for myself.	
I keep on trying to perform a task, even when I cannot accomplish it at the first try.	
I overcome the critical moments I encounter.	
I correctly perform the tasks I am required to do in the workplace.	
I feel comfortable with the patients.	
I can efficiently perform my professional tasks with all types of patients.	

I can effectively handle all types of situations I encounter while performing my job.	0	100
I manage to concentrate during classes.	0	100
I understand the concepts discussed in school and in the texts we read.	0	100
I can effectively organize my work during classes and at home, even when I have several things to do.	0	100
I can take notes effectively during classes.	0	100
I master the task of washing a patient.	0	100
I feel comfortable with all patients while I wash them.	0	100
I master all the knowledge needed to wash a patient.	0	100
I can effectively handle unforeseen situations while washing a patient.	0	100
I can effectively handle my embarrassment related to the fact that the patients are naked, while I wash them.	0	100
I talk to the patients and make them feel comfortable while I wash them.	0	100

Appendix C. Competence test (year II) – Second Study

Name:

Situation

You are an apprentice health and social care assistant in your second year and are performing an internship in a retirement home.

This morning, as every morning, you assist the distribution of breakfast to the patients and help those who need assistance.

You awaken a ninety-year-old patient, who complains of a headache and says she feels very tired.

You know this person, and you know that she has an instable mood and tends to complain very much.

1) Considering the situation described, **choose** the reaction you consider the most appropriate.

If needed, you can complete the missing parts of the responses.

1. You try and motivate the patient, encouraging her to react, explaining that everything will be fine, and that she should have a positive attitude in order to feel better. As she has stayed in bed all day, she should have the energy to wake up and eat.
2. You tell her that you will call a nurse or a doctor as soon as possible.
3. You tell her that you will come back after breakfast and will take the time to discuss the issue with her.
4. You explain to the patient that she should not worry about her headache, as many people are suffering from this problem due to the weather. You encourage her to have her breakfast, explaining that this will help in feeling better.
5. You don't pay attention to this episode, as you know that this patient complains very often. You tell her, in order to reassure her, that you will communicate her problem to a nurse.
6. You get worried because of this headache and you ask various questions to the patient to obtain additional information. You talk to her and formulate a hypothesis about the reason for her condition.
7. You decide to give this patient an analgesic, and afterwards you discuss with her in order to understand what is wrong.

2) **Explain why** you consider the chosen reaction the most appropriate in the given situation.

3) **Explain what else** you would do after this interaction with the patient.

Appendix D. Self-efficacy questionnaire (year II) – Second Study

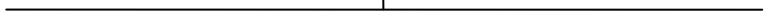
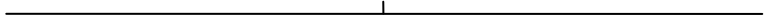




Name :

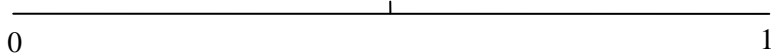
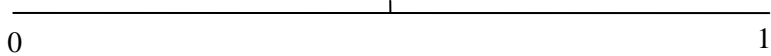
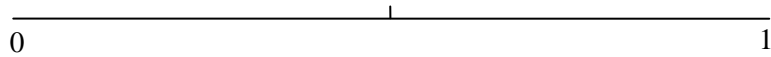
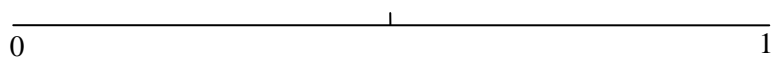
Indicate your ability to perform the actions listed below on a scale from 0 to 100. 100 corresponds to the expertise of a professional with several years of experience, e.g., a person with whom you work with in your internship and who has several years of professional experience in the field of health and social care:

0  100

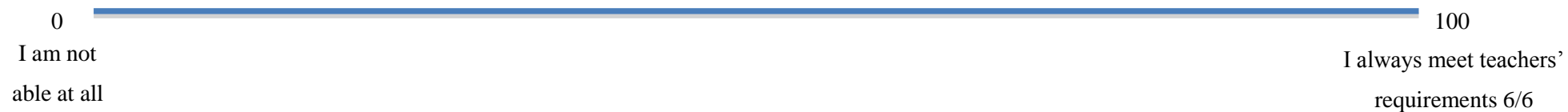
I am not
able at all

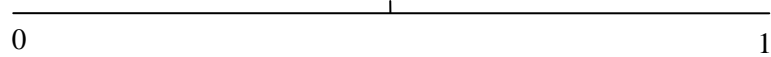
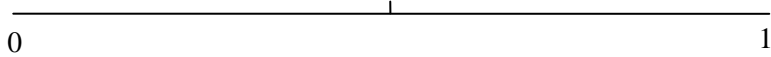
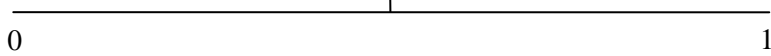
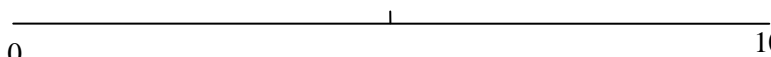
I have the ability of a
professional with
several years of
experience

I can correctly perform all the tasks I am required to do in the workplace.	
I can effectively handle all types of situations I encounter while performing my job.	
I can effectively handle unforeseen situations while performing my job.	
I master all the knowledge needed to perform the tasks I am required to do in the workplace.	
I can efficiently perform my professional tasks with all types of patients.	
I feel comfortable with all patients.	

I manage to remain calm, even when patients are unpleasant to me.	
I effectively handle my embarrassment due to the nudity of patients while I perform my professional duties.	
I am able to listen to my patients, and I always try to understand their problems when I have the feeling that something is wrong.	
I am able to talk to patients, make them comfortable, and reassure them when I have the feeling that something is wrong.	

For the following items, use a scale from 0 to 100, in which 100 corresponds to teachers' requirements, therefore a note of 6 out of 6.



I manage to concentrate during classes.	
I understand the concepts discussed in school and in the texts we read.	
I can effectively organize my work during classes and at home, even when I have several things to do.	
I can take notes effectively during classes.	

Appendix E. Interaction examples – Third Study

Below there are four examples of apprentices' interaction exemplifying different types of exchanges. The situation is briefly explained, while the underlined text corresponds to comment 1, the bold text to comment 2, and the italic to the conclusion.

Example 1 - Interaction on Vanessa's critical incident

Situation: Home care service, Friday afternoon. Vanessa is asked to go visit and take care of a patient she does not know. She is stressed, because of the fact that she has never met this person. Once she gets to his house, he refuses to open the door. Vanessa calls her chief nurse, and she confirms that this situation happens with this patient.

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

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

Julie: Did you talk about her with your colleagues?

V: Yes

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

J: Why were you scared? You never know the patients before going to their houses

R: Did you call before going there?

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

J: You should never force a patient, he must agree, otherwise there is nothing we can do.

V: I did not force him at all. I call my nurse to explain her the refuse.

Example 2 - Interaction on Amanda's critical incident

Situation: Amanda has to take care of a patient who is extremely slow and talks all the time about her mother, and this makes her lose focus on what she has to do. Amanda explains they will talk later and she has to focus on what she is doing. This makes her late for the other patients she has, and she is worried the patient could feel rejected by the fact that she postpones the discussion.

Jessica: Does she take any medications?

Is her mum alive?

You should discuss about her mother while you take care of her.

Edith: why is she attached to her mum?

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. That is why we need to keep her focused, otherwise she gets lost. She talks about her mother because she was mistreated by her.

J: You should leave her some time, as she needs to talk, and maybe ask for specialists help, as psychologist.

A: She is in treatment with a psychologist, but she does not get to forgive her mum and therefore talks about her.

J: I think that she may feel bad, as she may feel that you refuse her.

A: I cannot do otherwise during the morning.

Example 3 - Interaction on Albert's critical incident

Situation: Albert has to go to house of an elderly patient, suffering from dementia. Albert has to provide this patient with her medication, prepare breakfast, help her with the shower and dressing, and assist to her departure in a daytime retirement home happening that morning. The patient is feeling stressed and gets disturbed by the presence of Albert. The first part of the morning advances without problems, but while time passes, she feels more stressed and does not listen to Albert anymore. When the moment of preparing her shower comes, the patient is not listening to Albert anymore and refuses his help. In the end, after long negotiation Albert could only partially execute his task.

J: Personally, I think that the patient was right in refusing your assistance, as you were a new intern and you should have gone with another member of the team. 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

Helen: 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: First of all, I was there with a nurse during my first visit and even with them it is very difficult to make this patient accept to take her shower, especially when she has to do it with a man. 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 has to take care of a schizophrenic patient, with an aggressive behaviour. She has to provide her with the medications she needs, but the patients does not want them and throws them on the floor and she starts acting in a very aggressive manner. Deborah says she tried various approaches with this patient, without finding a way of calming her down a little bit. This patient tries to get what her wants by threatening of jumping off the window, as she has already done. Deborah tries to acts calmly and say to the patient that it was her doctor prescribing the medication, as she knows that she is more respectful towards the doctor and her prescriptions, but this does not work. Once the situation becomes too dangerous, Deborah lives the apartment and suggests increasing the tranquillizers taken by this patient.

Melissa: 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... I let her say what she wanted, shutting on me, hoping this would calm her, but it did not work.

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

D: I read all her file, asked colleagues and observed her entourage. I kept in mind what she says while she is mad.

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 for which she has a very expensive treatment, which she is not able to follow on her own and she needs assistance for her personal hygiene.

Fiona: Have you ever been scared while you were taking care of this patient?

D: Yes, I did feel scared that she would hurt herself after my treatment and that I would feel responsible because of it.

F: Does this patient have a family?

D: No, she does not, she is alone.

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. I would explain the effect of the treatment and try to have a closer contact with her. I would also try to find possible accommodations with the patients (e.g. she takes her medicine and you do not bother her with her toilette).

D: We ask the doctor to help quire regularly. On the other hand, I would not like to use the accommodation system you suggest (if you do that, I don't bother you with that...) because she could take advantage of this behaviour.

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 will really need my help, she will ask me to go there.

