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The Role of Technologies in Crossing Boundaries Between Work and Education: Good Practices in Vocational Education and Training (VET)

S.S.D. (Disciplinary sector) M-PED/03

Methodologies of Teaching and Special Education

Coordinator: Prof. Manuela Lavelli

Tutor: Prof. Giuseppe Tacconi

Signature:

Ph.D. candidate: Marco Perini

Summary

Introduction

1 Why and where investigating the role the role of technologies in crossing boundaries between work and education?

As specified by the title, this manuscript aims at discovering the potential of technology in crossing boundaries between work and education. Can the use of technology close the gap - or better articulate the differences - between educational and work context? According to Calvani & Vivanet (2016), the acquired evidence-based knowledge about the use of educational technologies at school seems to have repeatedly highlighted little significant or even nil effect on the students learning achievements. Nevertheless, the use of technologies in the educational context cannot be avoided because:

- the EBE (Evidence-Based Education) approach is not able to investigate all the opportunities offered by educational technologies implementation;
- the topic of educational technologies (as the technologies in general) is still in rapid evolution, and there may still be hidden potential, so this area of research must not be abandoned or opposed on the wave of mistrust or disillusionment;
- technology is part of contemporary society. Therefore, it must be present at least as a cognitive and competence development area, as recommended by the EU (European Council, 2006).

So, is the bridging function between school and work part of the hidden potential of technology referred to by Calvani & Vivanet (2016)? To answer such a broad question, the choice of the right context within which to look for answers is necessary. The distance between the working and the educational context, which is the main problem faced by this study, is present within the Italian Initial Vocational Education and Training (IVET) in a representative way. As a matter of fact, the school compulsory law of 2007, and the related provisions, have created the same gap even within the Italian IVET, where there is a need for connecting the cultural subjects which take place in the classrooms (grouped in *cultural axis*) with the practical training which take place in the laboratories (i.e., *vocational area*) (Tacconi, 2015). If on the one hand the school/work gap is re-proposed, on the other hand, the work-orientation of these training contexts allows greater proximity (even physically) of the two frameworks. Moreover, given that these environments in most cases include periods of training, the contacts with the world of work are much more common. For these reasons, the context of Vocational Education and Training (VET) has been taken as a reference point for the studies here reported.

2 Mixing methodologies

As enhanced by Calvani & Vivanet (2016), the EBE approach is not able to investigate all the opportunities offered by educational technologies implementation. Therefore, various research methods have been used to carry on the studies proposed below. While remaining in the field of empirical research, each method has been chosen and mixed in order to allow the exploration of the research context, in order to avoid leaving unforeseen scenarios hidden. Most of the studies use a mix of data-driven qualitative methods which refer to the grounded theory approach (Charmaz, 2006; Charmaz & Mitchell, 2001; Corbin & Strauss, 2008; Glaser, Strauss, & Strutzel, 1968). In some cases, some simple statistical analysis was also made. The quantitative methods were not used to generalize the results, but for finding connections between elements that would have remained unexplored through qualitative analysis. The data analysis was supported by the use of software for both qualitative and quantitative research (i.e., Nvivo, IBM SPSS Statistics, JASP Statistics, and Mendeley).

3 The structure of the manuscript

This contribution is a collection of 5 studies which, all together, aim at exploring the issue outlined above. Three of these five studies (the 2nd, the 4th, and the 5th) are more extensive than the others and required a significant amount of time and resources. The 4th study, in particular, could be considered the core of the whole dissertation. The 1st and the 3rd studies, which are less articulated than the others, have provided information and ideas that allowed to improve the entire research process. Every study was designed as stand-alone contribute, but it can be considered as a piece of the mosaic that forms this contribution. The sections titled "connecting lines" allows the reader to better understand the fil-rouge that binds the contributes. Each chapter reported below (i.e., each study) reports an introductory section with the abstract, the key words and the list of contributions in which the partial results of each study have already been published.

The first and the second study are focused on the cultural axis.

The first brief study explores the effect of the educational technologies on the students learning outcomes. The grades of a group of VET students which used iPad during lessons were compared with a group of students of the same VET centers which did not use it. 400 VET students from five VET centers were involved. Data about the evaluation concerning the final exam of the third-year students were collected. Specifically, the marks of the

cultural axis subjects (i.e. italian, mathematics, and english) were taken into account. The corpus of data was analysed with a quantitative approach.

In the second study, the project under consideration seeks to analyze the experiences of those included in the pilot project iCnos to obtain a better understanding of the ongoing modification process, and to provide information that may be employed again in different contexts. The iCnos project aims at introducing Information and Communication Technologies (ICT) as a means to support teachers' schoolwork and students' learning processes within VET centers participating in the project. The study focused on four VET centres. The comparison among interviews and other collected data via a qualitative analysis shows different ways of acting on the context to encourage the use of educational technologies.

The 3rd and the 4th studies are focused on vocational area

The 3rd study is a brief literature review which aims at gathering information about the potential of ICT in crossing the boundaries of learning processes between classroom and work within initial vocational education contexts.
The 4th study explores the instructional practices implemented by the teachers in the Italian initial Vocational Education and Training system (VET). This context has rarely been the subject of empirical studies. Moreover, an exploratory literature review produced no results. This kind of instructional practices often runs the risks of being confined within the VET-laboratory framework, leaving their potential, which could be able to cross the existing boundaries between the classroom and the workplace, unexploited. In order to provide transferable and reusable information on the instructional practices of both VET teachers and general-education teachers, the ethnography and Grounded-Theory approaches were combined. The principal findings of the present contribution represent a set of suggestions for VET teachers (both those who teach practical subjects and those who teach cultural subjects) and teachers in general education. Furthermore, results also consist of a model which represents a middle-range theory for the instructional practices of VET-lab teachers, a model which represents the role of technologies in VET-Labs and a set of instruments that could be useful for VET teachers' training and teaching practices – school teachers as well.

With the last study, the characteristics and the effects on learning processes of a specific educational technology (the Hypervideo) have been tested. According to several exploratory studies, the HyperVideo (HV) seems to be particularly effective in highlighting

the existing connections between the classroom and work context, between authentic work situations and theoretical subjects. In particular, the video annotation (an HV' feature) seems to facilitate the student's reflection on practices. Even though several researchers have already studied the efficacy of video annotation, studies concerning the qualitative differences between a reflection process activated by the use of video annotation and a reflection process activated without using it were not found. Therefore, the present study is focused on the reflective processes activated by two groups of students engaged in a higher education course oriented to the Vocational Education and Training (VET) sector while they carry out a reflective activity on work practices using the video annotation tool: how can the HV be useful for them in order to foster the connection between theoretical concepts and work practices? Through multi-step qualitative analysis which combined Thematic Qualitative Text Analysis and Grounded Theory approach, a sample of reflective reports drafted by a group of students who employed HV was compared with a sample of reflective reports drafted by a group who did not use it. The results emerged from the comparison of the coding frequencies between the students who did not use the video annotation (Group A) and the students who employed it (Group B) shows that reflective reports have peculiar characteristics. Furthermore, the category system emerged could be employed in different contexts (in research or teaching filed) to analyze the content of reflexive-reports on work practices.

Connecting lines

- This research aims at exploring the context of IVET in order to understand the role of technologies in the learning process and its possible implications in connecting cultural axis and vocational area.
- Before entering in the quasi-unexplored context of the practical laboratory, two studies have been implemented in order to better understand the role of technologies in the context of cultural axis.
- As mentioned in the before, the most part of the studies concerning the impact of educational technologies on learning outcomes shows a low effect size (Calvani, 2013; J. A. Hattie, 2009).
- Given that none of this research has been carried out under the Italian IVET, it was considered useful to replicate, even if in smaller scale, the same kind of quantitative study in the Italian IVET to verify if what emerged from the studies mentioned above is confirmed or denied.
- Through this study, the first pieces of information on the role of technologies in the context of cultural axis were collected

STUDY 1 - The Use of iPad for Supporting Instructional Practices in Vocational Education and Training (VET) Centers: Searching for Effects on Students Achievements

Abstract

This exploratory study aims to compare the learning outcomes of a group of VET students which used iPad during lessons with a group of students of the same VET centers which did not use it. 400 VET students from five VET centers were involved. The researchers gathered data about the evaluation concerning the final exam of the third-year students. Specifically, the marks of the cultural axis subjects (i.e. italian, mathematics, and english) were collected. Gathered data were analysed with a quantitative approach. Results show that the grades' difference between the group of students which used iPad and the other group is significant only for one subject on three.

Keywords

Educational Technologies, iPad, VET, Students Achievements, Exploratory Study.

Notes

The present section represents the revised version of the following contribution:

Perini, M., Franchini, R., & Pentassuglia, M. (2018). The Use of iPad for Supporting Instructional Practices in Vocational Education and Training (VET) Centers: Searching For Effects On Students Achievements. In M. Carmo (Ed.), *Education and New Developments 2018* (pp. 447–449). Budapest: inScience Press.

4 Introduction

The efficacy and the sustainability of using ICT (Information and Communication Technologies) in supporting instructional practices has been widely investigated during last years. Over the milestone tertiary meta-analysis of (J. A. Hattie, 2009), in which was demonstrated that, in most cases, the use of technologies for supporting instructional practices has a neutral role in the students goals achievements, several contributions highlight the emerged issues about introducing and using ICT in educational contexts (Avvisati, Hennessy, Kozma, & Vicent-Lancrin, 2013; Pellerey, 2015b; Ranieri, 2011; Spector & Ren, 2015). Despite the research on Educational Technologies is still in an exploratory phase, also due to the continue innovations which constantly change this sector, the media emphasis given on them has been encouraging a lot of Italian policymakers to promote the systematic adoption of mobile devices in supporting teachers' instructional practices (MIUR, 2012, 2017; MPI, 2002). As the general school, the Italian initial Vocational Education and Training (VET) promoted several pilot projects with the aim to introduce ICT as a support for didactics and learning processes and good experiences have been identified (Franchini, 2014, 2015). The present exploratory study examines the learning outcomes of a students' group involved in a Pilot Project (PP) promoted by an Italian federation of VET centers, which provides for the use of the iPad in daily teaching and learning activities. The students involved in PP project used iPad' apps and digital contents instead of traditional school books and materials. The VET centers federation promoted the PP through organizational interventions, organizing ICT and pedagogical courses for teachers and families and improving the technological infrastructures of the centers. Given the above, the aim of this study is to compare the grades of a group of VET students which used iPad in the classroom with a group of students of the same VET centers which did not use it. The hypotesis is that the students involved will reach higher grades than the students who were not involved in the PP.

5 Methods

5.1 Participants

Participants were 400 VET students belonging to 20 different classes of 5 VET centers; all the VET centers are located in northern Italy and are part of the same VET centers' federation. The students were enrolled in the last year of the "3 years qualification program" and they were following the mechanic or the electric course option. The target group (n=235) was involved in the PP, whereas the control group (n=165) was excluded from the PP. The VET federation and the participants wanted to be anonymous.

5.2 Data collection

The learning outcomes analysed in this study (i.e. students grades) have been gathered from the multidisciplinary tests of the regional qualification exam. The assessment tests differed depending on the VET center but, were structured according to the same criteria established by the *Istituto nazionale per la valutazione del sistema educativo di istruzione e di formazione* [1] (INVALSI). The classes involved belonged to different professional curriculums, so only the grading score obtained in the three common disciplines - which belong to the cultural axis - were gathered and compared: Italian language, mathematics and English language. Moreover, the grade scales used for the evaluation were different depending on the VET center. To overcome this problem all the grade marks were brought to 100/100 scale. Table 1 reports the students' attributes in detail.

Table 1. Groups characteristics

Pilot Project	**Group**	**Students**	**Disciplines**
Yes	Target (1)	235	Italian language
			Mathematics
			English language
No	Control (2)	165	Italian language
			Mathematics
			English language

5.3 Data analysis and results

In order to compare the target group and control group, descriptive statistics and t-test were applied. “JASP Statistics,” software (2018) was used to perform all data analysis. As reported in Table 2, results of descriptive analysis show that the mean of the students grades in the target group are higher only for the English Languages (M=63.50, SD=15.54). Countrarerly, the control groups of students engaged in Italian languages and Mathematics obtained higher grades (M=69.24, SD=17.74; M=62.48, SD=25.15) than the target group (M=66.06, SD=14.11; M=58.54, SD=18.14).

[1] ENG: National Institute of Educational System Assessment

Table 2. Descriptive Analysis

	Italian language		**Mathematics**		**English language**	
Group	1	2	1	2	1	2
Mean	66.06	69.24	58.54	62.48	63.50	60.95
Std. Deviation	14.11	17.74	18.14	25.15	15.54	16.19

The T-Test analysis was applied in order to verify the hypothesis: Group 1 > Group 2. Thus, as shown in Table 3, this hypothesis is confirmed only for English language course. This means that only in this subject there is a significant variation (p= 0.056) of students grades between the two groups (i.e. student grades of target group in the English course are higher than the control group of the same discipline). The hypothesis has not confirmed for Italian languages (p= 0.976) and for mathematics (p= 0.965)

Table 3. Independent samples T-Test

	t	**df**	**p**
Italian language	-1.992	398.0	0.976
Mathematics	-1.818	398.0	0.965
English language	1.590	398.0	0.056

6 Conclusions

Comparing the analysis, the results of the descriptive analysis were confirmed by the T-Test. Having regard to this, technologies education does not seem to have a beneficial impact on the learning outcomes, except for the foreign languages. This situation, in broad terms, is similar to what Hattie (2009) had highlighted. According to this author, the use of educational technologies has not a direct ameliorative effect on specifics disciplines grades. Indeed, when technologies have been investigated by his tertiary meta-analysis, a low Effect Size (ES) has been found (i.e. *Use of calculators* ES= 0.27; *Computer assisted instruction* ES= 0.37, *Web-based Learning* ES= 0.18 in the range of -0.2 to 1.2). According to these considerations, two new research questions emerge: 1) why the use of iPad has an effect only for foreign languages disciplines? 2) Are there other areas in which the use of educational technologies could have an improving effect? Hattie himself, together with other authors (Archer et al., 2014; Bonaiuti, Calvani, Menichetti, & Vivanet, 2017; J. Hattie, 2012; J. Hattie & Yates, 2013; Pellerey, 2015a), suggests that the improvement effect of the use of ICT in the educational field could be obtained only in those cases where the learning context conditions are set in order to effectively promote the self-regulation of

students. This positive effect of educational technologies could be also related to technological and pedagogical skills of teachers.

Connecting lines

- The short study proposed in the previous section confirms for IVET what has already emerged from other studies that investigated the effects of the use of technology to support teaching (Archer et al., 2014; Bonaiuti, Calvani, Menichetti, & Vivanet, 2017; J. Hattie, 2012; J. Hattie & Yates, 2013).
- Due that the improvement effect of the use of ICT in the educational field could be obtained only in those cases where the learning context conditions are set in order to effectively promote the self-regulation of students. Consequently, it is better to focus on the learning context, in order to make it suitable for enhancing the potential of educational technologies. Before making an educational choice centered on the individual need it is necessary to take care of the context.
- The context of the cultural axis, like the general scholastic context, had to be activated or adapted to the arrival of the technologies.
- How could this favorable context be set? Could technologies be useful for something else?
- The next study will try to answer the first of these questions, searching for a better understanding on how a federation of VET centers promoted the use of technology to support teaching activities (especially in the classroom - in the cultural axes)

STUDY 2 - ICT Integration in Instructional Practice: Can we Go Beyond Experimentation?

Abstract

The project under consideration seeks to analyze the experiences of those included in the pilot project iCnos to obtain a better understanding of the ongoing modification process, and to provide information that may be employed again in different contexts. The iCnos project, promoted and conducted by the National Directors' Board of the CNOS-FAP Federation, aims at introducing Information and Communication Technologies (ICT) as a means to support teachers' schoolwork and students' learning processes within VET centers participating in the project. The study focused on four VET centres. The comparison among interviews and other collected data via a qualitative analysis shows different ways of acting on the context to encourage the use of educational technologies.

Keywords

Educational technology, innovation process, vocational education and training, pilot project.

Notes

The present section represents the revised version of the following contribution:

Perini, M., & Tacconi, G. (2017). ICT integration in teaching practice: can we go beyond the experimentation? Form@ Re-Open Journal per La Formazione in Rete, 17(3), 101–115. https://doi.org/10.13128/formare-21252 [Journal paper]

The phases which compose this study were also previously presented and published as follow:

Perini, M., & Costantini, A. (2017). How Can The Technology Introduction Foster Educational Innovation In VET Centers? A Comparative Case Study. In Education and New Developments - 2017 (pp. 248–252). Lisbon: InScience Press. [Conference Paper]

Perini, M., & Pentassuglia, M. (2017). The management of institutional innovation process through the introduction of instructional technology in vet centers. A comparative case study. In EDULEARN PROCEEDINGS (pp. 3631–3639). Barcellona: IATED Academy. https://doi.org/10.21125/edulearn.2017.1788 [Conference Paper]

1 Introduction

1.1 The Italian Approach and Support Technologies for Teaching.

Since Information and Communication Technologies (ICT) were introduced as part of daily work and home life, the Italian education system has repeatedly attempted to promote technological innovation in schools. At the endo of the eighties, the Italian Minister of Public Education begun financing projects providing for introduction and use of technologies in schools for educational purposes, due to the pressing requests of the production system and the favour demonstrated by the EU towards such an operation. One of the first traces of regulation dates back to 1985, the year in which the first National Plan for Information Technology was launched, involving all schools at the secondary level. This operation was meant to allow for the introduction of information technology within mathematics and physics through regularly provided intensive update courses for teachers (Bonaiuti, Calvani, Menichetti, & Vivanet, 2017). This pioneering plan was then extended to the humanities in 1991 (MPI, 1991). Given the constant evolution of ICT, as well as the increasing importance that the same were gaining around that same period, the Government intervened systematically with the Programme for the Development of Educational Technologies in 1995 and 1997 (MPI, 1995, 1997), and with the *Piano nazionale per la formazione dei docent sulle tecnologie dell'informazione e della comunicazione*[2] (ForTic) in 2002 (MPI, 2002). The first was aimed at making the use of multimedia and the internet more widespread in all school grades (including preschool), whereas the second ensured that all teachers at all levels were involved in ICT courses that could in turn be used to support their own teaching activities. Since 2008, the Minister for Education, University Studies, and Research, has introduced and carried out the National Plan for Digital Schooling. This ongoing initiative was re-launched in 2012 and 2015, allowing for distinct projects, Cl@ssi 2.0 e Scuol@ 2.0 among others, to be financed and implemented. The aforementioned projects sought to encourage the daily use of technology in school environments (interactive whiteboards, tablets, e-books, etc.), and the Digital Editorial project promoted the use of educational resources in a digital format (MIUR, 2012). In the first phase of the national program (2008-2011) instances of excellence were looked upon with favour, in the hope that other teachers and schools would follow by example, whereas in the second phase (2012-2014) the good practices that had previously emerged were reinforced through specific education plans that involved different actors within the school environment. In its most recent version (2015), the plan in question seems to have shifted its focus to the development of digital literacy on students' part (Bonaiuti et al., 2017), and

[2] ENG: National Plan for Educating Teachers on Information and Communication Technology

it is referenced in the recent education reform "*La buona scuola*[3]" (L. n. 107/2015) and its related body of implementing regulation (MIUR, 2017).

1.2 Going beyond experimentation

Studies dealing with ministerial interventions in the last decade have raised some doubts with regard to the efforts required for their implementation. Specifically, the Review of the Italian Digital Strategy for Digital Schools (Avvisati, Hennessy, Kozma, & Vicent-Lancrin, 2013) brought the following issues to light:

- the uneven involvement of teachers in projects;
- the paucity of the allocated funds, which stunted a systematic change;
- the lack of adequate training for teachers;
- the absence of a salary increases or one-off compensation for teachers taking part in the projects.

Moreover, the inclusion of technology in an all-encompassing manner, such as to include cultural subjects, has not yet occurred (Moricca, 2016). Further issues were brought to light, for instance the lack of adequate lesson planning activities, the inefficiency of tech-related school infrastructure – particularly with regard to internet connectivity -, the obsolete nature of the devices provided to schools and teachers, teachers' resistance towards any change in their instructional practices, and finally, the overestimation of ICT potentials for the purpose of education (Pellerey, 2015a; Ranieri, 2011). However, teachers' efforts were not in vain. The implementation of the various plans has brought about many laudable initiatives, carried out by schools and teachers and characterized by experimentation and the sharing of innovative instructional practices. Nevertheless, It seems that the initiatives promoted over almost forty years rarely succeed in going beyond the experimental phase by consolidating the obtained results. The habit of introducing educational technologies in educational contexts without modifying the existing teaching approaches nor challenging teaching and educational goals has thus re-emerged (Spector & Ren, 2015). Setting aside general education, the use of ICT to support teaching activities was also an innovative feature in Vocational Education and Training (VET) , already structured so as to favour the use of new technologies in strictly vocational fields. Among them is the iCnos project, which seeks to make ICT a permanent feature of daily school activities in VET centers - especially for cultural axis - within the CNOS-FAP federation (Franchini, 2012). It is therefore useful to analyse the various steps making up the iCnos project, given that, based on the available data (Franchini, 2015a), the same was not characterized by sporadic or

[3] ENG: The Good School

nuclear actions, but rather by the stap-by-step involvement of an entire VET federation into an ICT-mandated educational and organizational innovation process. The main goal of this study is to bring to light the dynamics of change that have allowed – and still allow – the iCnos project to strengthen and broaden itself, bringing good managerial practices and critical issues to the forefront without ignoring the pedagogical aspects. Fare riferimento alla cura del contesto??

2 The Research Context

2.1 The CNOS-FAP Federation

The CNOS-FAP Federation has been active since 1982, and it is promoted by the *Centro Nazionale Opere Salesiane*[4] (CNOS). The federation has 64 VET centers spanning across 17 Italian regions. VET centres' educational syllabus mainly provides for 3-year and 4-year courses in initial VET in distinct professional sectors: mechanical, electronic, graphical, tertiary, and touristic. These paths aim to develop basic, transversal, and technical-occupational skills in order to obtain the Professional operator certificate (3 years program – Level 3 EQF[5]) or the Professional technician diploma (4 years program – Level 4 EQF). The centres within the federation are coordinated via a national office that promotes and monitors activities through a hierarchical structure made up of sectorial representatives and regional delegations. (CNOS-FAP, 2017).

2.2 The iCnos Project

The iCnos project, launched in 2012, was promoted and carried out by the national coordinating unit of the CNOS-FAP federation. The main characteristics and implemented actions within the project were publicly documented by the federation (CNOS-FAP, 2016; Franchini, 2012, 2014, 2015b; Pellerey, 2015b). This experimental project began in the academic year 2011/2012, and it involved 7 VET centers, 744 students, and 210 teachers. The centres in question decided to be a part of the project in a wholly spontaneus manner, and each in accordance with their own, distinct operational strategies and specificities. The central coordinating unit of the CNOS-FAP federation financed and promoted the following activities: courses targeting teachers; guidelines containing pedagogical and technical information extrapolated from the relevant literature on educational technologies; revision and correction of the same based on teacher feedback and ongoing experimentations; enhancement of the technological infrastructures at the training centres, especially with regard to WiFi and internet connection; proactive parent involvement,

[4] ENG: National Centre for Salesian Works
[5] European Qualification Framework

which also involved asking them to buy iPads in lieu of traditional textbooks. At each establishment, a single teacher was entrusted with the task of coordinating the innovation process with a great deal of independence. Over the course of five academic years (2011/2012 to 2016/2017), other centres were involved in the experiment: as things stand (2016/2017), 26 centres, 3100 students, and 350 teachers from the federation are involved in the project. In the academic year 2016/2017 the experiment was declared complete, and the use of technologies to support teaching activities has become a regular feature in the syllabus of many federation centres. In spite of the fact that the project is no longer in its experimental phase, many centres and/or professional fields do not perceive education-related technologies as an integral part of their eductional strategies, but nevertheless, the federation is persisting with its promotional activities, in order to increase the number of involved schools. Each centre in the project is free to plan and manage the transformation process autonomously, no matter the aspect (e.g., pedagogical, technological, organizational, etc.), for instance by determining which sectors and actors ought to be involved, and what manner of technical intervention is required.

3 Research Questions

Anylizing the narrations and experiences of the people who were directly involved in the innovation process may allow for a better understaning of the process itself, and may also provide transferrable, reusable information, both for the federation centres that have yet to become a part of the initiative and other institutions, such as schools.
The following questions were given particular focus:

- How can a process of institutional innovation promote and support pedagogical and structural changes within VET centers? Which principal solution did each centre deem appropriate?
- How is the completion of an experimental phase managed in order to spread its results?
- How ought the inclusion of technology in supporting teaching activities be provided for within general education?

4 Research methodology

In order to answer the aforementioned research questions, the comparative-case study (CCS) and the Grounded Theory (GT) approach were blended together. This choice was made for the following reasons:

a) CCS is an appropriate method to compare different contexts, especially for what concerns their organizational aspects and programmes or strategies (Campbell, 2010; Yin, 2009), and the methodology in question has already been used in previous studies in order to ascertain the benefits and limits of projects that dealt with the including technology in school and educational programmes (Luo, 2015);
b) the Grounded Theory approach allows for the inception of a "grounded-in-data" analysis (Charmaz, 2006; Glaser, Strauss, & Strutzel, 1968), which in turn voices the experiences of the actors involved in the process (Mortari, 2007; Tacconi, 2011).

The aforementioned methodological approaches were mixed as a way of outlining a theoretical model capable of mirroring the macro dynamics of the innovation process actuated by the CNOS-FAP federation, while simultaneously shedding light on the specific initiatives that each centre involved in the research based on their contextual specificities. The manner in which the data was collected, analyzed, and processed is clarified in the following paragraphs.

4.1 Involved Subjects and Data Collection

The study involved four VET centers in the CNOS-FAP federation that had previously taken part in the iCnos experiment. By involving each director, the teacher in charge of coordinating the iCnos project within each VET centers was identified and contacted as a "star witness". The coordinating teachers were interviewed twice, once in 2015, when the iCnos project was still in its experimental phase, and a second time in 2017, around the time the CNOS-FAP federation declared said phase complete, thus initiating a systematic reordering of the results. The second interview was not an option for one of the centres (see Case 2). The interviews were conducted by employing the method of the focused narrative interview, in order to maintain focus on the object of the research without being tied to a rigid question structure. The 2015 interviews focused on the iCnos project's innovation process, in order to highlight its features, implemented actions, significant experiences, and so on, whereas the second interview, dating back to 2017, focused on the changes that that had occurred in the meantime. Table 1 shows a sample of the canvas for each interview.

First Interview
Data • What is your role within the VEC? • Since when is the iCnos experiment being implemented at this institution? • How many classes were involved? And which ones? • …

Significant experiences •Based on your experience, how are teachers responding to the use of technology for teaching activities? •Were you made aware of a particular experience you believe is worth investigating in detail, documenting, and sharing? Could you give a few examples? •What kinds of teaching materials do you employ?
Second Interview
Data • How many and which classes are employing technology to support learning activities this year? • How many teachers are involved?
Significant Experiences • How are you making the experiment systematic? • Are you aware of or do you remember some recent experiences that you believe are worth investigating more in detail, documenting, and sharing? Could you provide a few examples?

Table 1 – Canvas for the first interview

Pursuant to the Grounded-Theory principles, the outlines for the interviews were revised and modified after each interview for the purpose of getting a well-rounded view of the experiences that those directly involved in the experiment went through (Charmaz, 2006; Sità, 2012). Appendix A and B report the final version of the interviews'canvas. All of the interviews were audio-recorded and then transcribed. Moreover, thanks to the directors' involvement, documentation relating to the project and put together by the CNOS-FAP was collected. A progressive code that included turns to speak was assigned to each interview and answer (Tacconi, 2011) - e.g., the tenth reply from the third interviewee was assigned the following code: [INT3/10].

4.2 The First Step of the Analysis – Grounded Theory (*Open Coding* and *Axial Coding*)

A recursive approach was employed during the first step of the analysis, pursuant to the GT procedure suggested by Corbin & Strauss (2008). The coding was carried out with the support of the Nvivo 11 software primed for qualitative analyses. *Open coding* has produced several reading threads for the texts, through which relevant narratives for the scope of the research were identified. When appropriate, descriptive labels were attributed to the units in order to summarize their respective meanings. These narratives were then compared, grouped, and conceptualized, bringing to light 53 subcategories representing significant actions implemented within the iCnos project by the involved subjects. Table 2 shows an example of how a subcategory is constructed: on the left, a series of narratives

grouped based on affinity are shown with their respective identification codes, whereas on the right the subcategory, or rather the principal action that emerges, is found. Other than the implemented actions, all the descriptive data referring to the interviewees were coded and grouped, such as the sectors and classes involved in the various centres, the year in which the experimentation began, or general information concerning the various contexts.

Table 2 – Open-Coding Examples

Narratives	**Significant Actions (subcategories)**
There was little time to reflect, I believe… we went full throttle right away without stopping to ask how it was going [INT2/24] The time issue is real, but there are a lot of us, we struggle to meet all together, because we have classes in the mornings and afternoons, so we are forced to make do with these things… [INT3/40] … the difficulties came later, and the solutions followed a bit at a time. [INT3/42] Clearly you're proposing a massive change, so to speak, in terms of workload […] Everything needs to be well structured, well organised, and at an appropriate pace, without overdoing it. I think that there ought to be a constant battle against relying on old "marker-based" methods, up until the mentality changes. [INT4/41] This requires a lot of time, […] being a teacher who deals with such instruments requires a significant time investment, maybe only initially, but not necessarily so, that is to say people need to believe in the efficacy of them, and find the time to educate themselves accordingly. [INT1/36]	Giving teachers time to get used to the innovation process
…	…

Later on, through the *axial coding* procedure, the significant actions identified in the *open coding* phase were revised and regrouped via a recursive comparison with the collected data. In light of this procedure, 8 categories were identified and conceptualized at a superior level, allowing for a provisional hierarchy to emerge. Table 3 shows what a category is made up of: in the right-hand column, the name of the category is found; in the left-hand column, the principal actions that allowed for the former to be identified are listed.

Table 3 – Examples of *Axial Coding*

Subcategories	**Principal Actions**
Supporting the innovation process at a global and local level	Including the actors of the innovation process (teachers and coordinator) in decision-making processes, both at the local (VET centers) and national levels. Making internet connectivity better. Sharing best practices with others.

	Giving teachers time to get used to the innovation process. Organizing training courses for teachers, held by expert colleagues, to bring more professional fields into the project. Favoring the sharing of good instructional practices in informal moments. Maintaining contacts with outside experts and the Apple community.

Once the hierarchy of categories had been outlined, the resulting structure and connections were examined anew and subsequently validated through the *selective coding* procedure, which purports a recursive re-examination of the interview transcriptions and memos drafted throughout the analysis in order to conceptualize a provisional theoretical model. In the first step of th analysis the data was treated as one corpus, without distinguishing among the various origin points. As previously suggested, in order to enrich and give more depth to the emerging theoretical model, and to underline the singular actions implemented by each VET center, the Case-Comparison method was used to revisit the data.

4.3 The Second Step of the Analysis - Case Comparison

In the second step of the analysis, the cases were compared, and a distinction was made between the origin point of the significant actions and the respective narratives that had emerged from the grounded analysis. This operation was made possible by a specific function within Nvivo 11 called *matrix coding query*. This particular function made an origin-based redistribution of the hierarchy-model elements (categories, significant actions, and narratives) possible – i.e., VET center-based. Moreover, it was possible to divide the results pursuant to when the interviews were conducted (a.y. 2014/2015 and 2016/2017). The various elements from each centre were then merged with the descriptive data relating to the same that had been analyzed and grouped in the first step of the analysis (e.g., the professional sectors involved in the project, the year in which the project began, the involved students, and so on). Thanks to this triangulation, the outcomes of which are summarized in tables 4 and 5, the significant actions that were commonplace in all the centres and those that were peculiar to single centres were underscored, thus providing a complete report on the innovation process. The significant actions and the categories remained anchored to the answers in the interviews because of the code attribution and functions of the Nvivo 11 software, thus allowing for a return to that data if and when necessary.

Table 4. Summary of the Matrix Coding – First Interview (a.y. 2014/2015)

	Case 1	**Case 2**	**Case 3**	**Case 4**
Descriptive Data				
Launch of the project (a.y.)	2012/2013	2012/2013	2013/2014	2012/2013
Professional fields involved	Graphic design	Electronics, graphic design, mechanics	Mechanics and electronics	Mechanics, graphic design, and electronics
Involved Students	2nd and 3rd year students	All students	2nd and 3rd year students	2nd and 3rd year students
Technological Infrastructure	The students autonomously secured their own iPads (the centres made the minimum specification standards clear).			
	Internet connectivity upgrade.			
	Apple TV and projectors installed in some classes.			
	MDM[6] not employed.	MDM not employed.	MDM not employed.	Only some MDM functions employed.
Categories	***Significant Actions***			
Implementing the innovation process through training strategies [C1]	Organizing teacher training before involving the students in the experiment.			
	Organizing teacher training around both the use of iPads (technical aspects) and of teaching activities (pedagogical and educational aspects).			
	Obtaining support from the students' families.			
	Adapting the national CNOS-FAP guidelines to local contexts.			
	Obtaining support from the national office of the CNOS-FAP.			
	Favoring the sharing of experiences among teachers during institutionally-manadated encounters (teachers' meetings and conferences); Organizing courses for the students' parents.		Informally identifying the teacher in charge of the process.	Organizing reciprocal moments of observation among teachers in their respective classes.

[6] MDM stands for "Mobile Device Manager", a kind of software employed to control the use of multiple devices connected to a single server in a centralized manner.

Supporting the innovation process both locally and globally [C2]	Involving the innovation-process actors (teachers and coordinators) in the decision-making processes at the local (VET centers) and national levels.			
	Sharing best practices with other centres.			
	Allowing teachers the time to get used to the innovation process.			
	Organizing training courses for teachers held by expert colleagues to involve more professional fields.		Favouring the sharing of best instructional practices during informal moments.	Keeping in touch with outside experts and the Apple community.
Basing the innovation process on instructional practices [C3]	Sharing teaching materials though the cloud (e.g., iTunes U, Dropbox, Drive, etc.).			
	Organizing the training and up-to-date knowledge of teachers around instructional practices rather than device or software technicalities.			
	Suggesting software and apps that are particularly appropriate for teaching, without any form of imposition.			
	Letting teachers choose how to make use of the devices.			
	Drafting teaching materials in conjunction with the students (e.g., e-books).			
	Centering educational innovation on vocational training.	Centering educational innovation on vocational training.	Centering educational innovation on a cultural axis.	Centering educational innovation on a cultural axis.
	Putting students at the centre of teaching activities.	Putting distinct technological devices at teachers' disposal (video cameras, laptops, etc.).	Answering the educational needs of teachers.	Supporting teachers as they prepare their lessons.
	Drafting manuals in an e-pub format together with the students.	Creating a blog where student activities are made public.	Employing the flipped classroom approach; creating tutorials for students.	Making connections between classroom activities and lab activities through the use of video.
	Making internet connectivity better.			

Enhancing the infrastructure [C4]	Continuously incrementing the efficiency of centre infrastructure, especially the internet connection.			
	Solving connectivity problems.			
Overcoming resistance by encouraging mutual acknowledgement and support among teachers [C5]	Including teachers who are wary of using iPads; Organizing training courses for new teachers.	Creating spaces and moments of dialogue among teachers.	Including teachers who are wary of using iPads; creating spaces and moments of dialogue among teachers.	Acknowledging and giving value to teachers' experiences.

Table 5. Summary of the Matrix Coding – Second Interview (a.y. 2016/2017)

	Case 1	**Case 3**	**Case 4**
Categories	***Significant Actions***		
Giving value to and institutionalizing emerging roles [C6]	Recognising the role that coordinating teachers play through an institutionalization process; creating an official sector in which coordinating teachers can interact on a national basis (creation of the "didattica digitale[7]" sector).		
Enhancing the infrastructure [C4]	Activating MDM (upon teachers' request).		
	Optimizing internet connectivity.		
Including new actors [C7]	Organizing training courses for newly involved teachers before they interact with students at this level.		
	Leaving centres and teachers free to experiment new teaching methods.		
Capitalizing on best practices [C8]	Sharing the best practices identified when experimenting with new teachers.		
	Creating an app inventory at teachers' disposal.		
Centering the innovation process on instructional practices [C4]	Centering teacher training on innovating instructional practices rather than on technical aspects.		
	Centering educational innovation on crosscutting competences, in an attempt to create a link between cultural axis and vocational education.	Centering educational innovation on cultural axis.	

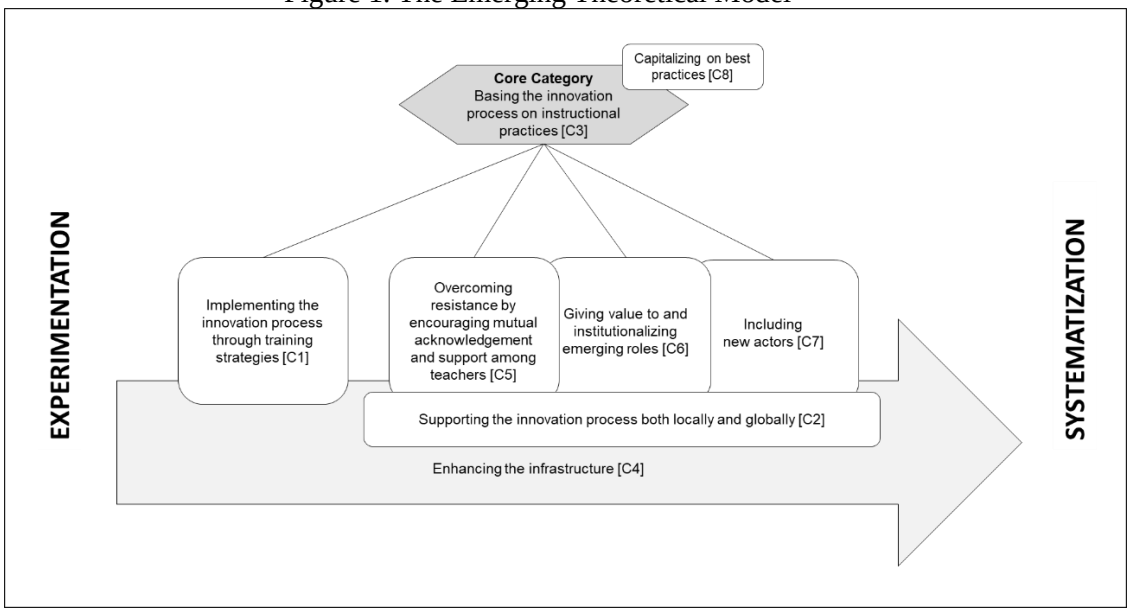
4.4 The Third Step of the Analysis – Redefining the Model

The new elements resulting from the case comparison have permitted a review of the theoretical model outlined at the end of the second step of the analysis, and to order the

[7] Educational Technologies

categories in a sequential manner, so that the latter could in turn recount the ongoing innovation process in VET centers to the fullest extent. This could be achieved by highlighting the core category, or rather the action that had influenced the innovation process the most. The model was then summarized and rendered graphically (see Figure 1). A code was assigned to each category to make the debate on the results easier and understandable.

Figure 1. The Emerging Theoretical Model



5 Discussion

The results of this study – the theoretical model shown in Figure 1, together with the outputs of the case comparison in Tables 4 and 5 – provide a comprehensive framework of the innovation process in question. Firstly, it is possible to deduce that the operational and decision-making freedom left to VET centers at the national level has allowed them to place the project within local peculiarities by comparing the distribution of significant actions implemented in the centers during the experimental phase (Table 4) with the ones identified at the end of the trial period (Table 5), even if the implementation guidelines became homogenous at a later time, albeit still guaranteeing operational autonomy. Even though the project was put forward by the national coordinating office pursuant to a top-down logic, the choice to make room for ample autonomous decision-making on centres' part, while simultaneously guaranteeing technical and methodological support to the latter, constituted the crucial element in creating bottom-up innovation processes that were later strengthened through the sharing and spreading of good organizational and instructional practices [C2/C8]. This process looks very similar to the "glocalized" strategy designed by the Ministry for Education in 2012. Bonaiuti et al. (2017) spoke of that strategy as being global

in its aims and structure, but grounded in a specific context at the same time, and taking local needs into account. That same combination of seemingly conflicting elements can be found in the very concept of E-Leadership resulting from Gurr's report (2004). As previously suggested, the CNOS-FAP federation has declared the experimental phase of the iCnos project complete, and is currently working with the participating centres towards making the inclusion of technologies in teaching activities a commonplace approach [C7]. In this particular phase, the institutionalization of a *animatore digitale*[8] figure has been crucial, as well as the national coordination among such figures, which has in turn allowed for the enhancement of the coordinating-teacher figure by making sure they always remain in contact with their peers from other centres and organizing national refresher courses for them [C6]. Moving on to how the categories are organized, the importance accorded to innovating instructional practices [C4], promoted through repeated training for teachers and parents [C1], appears to be of paramount importance. This framing is supported by the high degree of cooperation among the various positions (teachers, coordinators, and the federation's national office) [C5], and also by the human and financial resources that were invested into making and maintaining the technological infrastructure at the centres efficient [C4]. The actions implemented at both central (national) and local (VET centers) levels seem to be aimed at acting on the various elements which compose learning context in order to make it favourable to the use of ICT in support of teaching. The results were compared with similar cases identified through a selected bibliography (Franchini, 2015a; Giuseppina, 2014; Pellerey, 2015b; Ranieri, 2011), and what emerges is a confirmation of the centrality of a pedagogical approach and instructional practices, as well as the efficiency of technological infrastructures (devices and connectivity) as necessary albeit non-exclusive preconditions to guarantee that ICT and education combined are a success. From this standpoint, it could be argued that an infrastructure capable of supporting a process of technological innovation in the field of education should not only include ICT elements, but also practices that support and keep teachers up to date. Nevertheless, the case studies recognised as being relevant in the brief literature review above represent isolated and relatively small contexts. By contrast, the iCnos project includes a great number of VET centers, classes, and actors. The appropriateness of the organizational choices and the actions implemented by the CNOS-FAP, and subsequently by the centres under consideration, seems to be backed by Porter, Graham, Spring, & Welch (2014), who identified some key elements when dealing with a research project on the inclusion of blended learning within a university system (wide and structured educational context):

[8] Digital coach

a) the strategic necessity of developing so-called “innovation supporters” at multiple institutional levels;
b) the choice of defining the structure of the project in such a way that teachers are allowed to make pedagogical-educational decisions autonomously;
c) the choice of adequately enhancing the infrastructure;
d) the crucial choice of ensuring a good education both from a technical and pedagogical standpoint;
e) the choice of providing an adequate and constant technical and pedagogical support.

6 Limitations and further research

The main limitation of this study is that the non-coordinating teachers and the students were not interviewed. The inclusion of multiple points of view could add further levels of complexity to the emerged model. Furthermore, it could be useful to extend the scope of this study to other centres and concentrate on instructional practices, other than on the organizational processes in place to support educational innovation, thereby enriching not only the inventory of educational means, but also the availability of models that support a way of thinking and strategizing education as being naturally “mediated” by technology. Moreover, we propose to verify whether the use of ICT in support of education within VETs is capable of changing the learning processes for students, and if so in what way, but, in order to do this, it will be necessary to wait for technology to become a more widespread education and learning instrument incorporated into day-by-day school practices.

7 Conclusions

The process of educational innovation involves people (teachers, students, parents, and principals) who are willing to put themselves out there to change their practices and routines on the basis of an efficient technological and organizational infrastructure. The foremost results of this study, which are represented by the theoretical model developed in the analysis (Figure 1), together with the case-comparison outputs in Tables 4 and 5, should be regarded as a set of suggestions to be taken into consideration by the CNOS-FAP federation to better manage the inclusion of new actors in the currently ongoing implementation process of the experiment results. Moreover, these same elements can be used in other educational contexts as useful tidbits towards the introduction of systematic action plans providing for the use of ICT in support of teaching activities. The experiment has shown that a bottom-up approach is useful, in the sense that incremental changes for the better ought to be situated in conjunction with infrastructural, educational, and consulting resources to favour such development. The national federation is in a position

to promote autonomous decision-making and activate local resources. Now that the experimental phase is complete, the federation is still consistently investing in education and research, and this represents an essential prerequisite for the spreading of the achieved innovations to different contexts. The analysis of the interviews brought to light a repertoire of best practices actuated by the teachers involved in the project, which is however beyond the scope of this paper, but nonetheless to be reassessed and provided to the participants together with the other outcomes of the research.

Connecting lines

- The just proposed study highlighted which elements are useful in order to act on IVET context to encourage the use of educational technologies.
- The next study aims to explore whether technologies can perform other functions than produce a poor impact on students' learning outcomes. Specifically, we want to see if it is used in the IVET to facilitate the link between school and work.
- before taking the field for a field research (reported in the 4th study) the brief literature review presented in the next section was done.

APPENDIX A – FIRST INTERVIEW

Domanda di ingresso

- Da quanti anni è partita la sperimentazione iCnos nel suo centro?
- Quante classi sono state coinvolte? Con quali criteri sono state scelte le classi da coinvolgere nella sperimentazione?

Infrastruttura

- Che tipo di tecnologia si è scelto di utilizzare? (caratteristiche hardware, software)
- Gli alunni utilizzano un device personale?
- Sono stati necessari interventi di natura infrastrutturale? Se sì, quali interventi sono stati effettuati? Rileva qualche spazio di miglioramento dal punto di vista infrastrutturale?
-

Materiali didattici

- Stando alle informazioni in suo possesso, ci sono dei particolari prodotti editoriali (e book, video etc.) e strumenti informatici (piattaforme didattiche, app, software, etc.) che vengono usati in aula?
    - Quali vengono usati?
    - Come vengono usati?
    - Quali con particolare successo?
    - Esiste uno spazio per la condivisione e lo sviluppo dei materiali?

Aspettative

- L'introduzione dei dispositivi ha generato delle aspettative? Quali?
    - … e per gli insegnanti?
    - … e per gli studenti?
    - … e per i genitori?

Esperienze significative

- Da quello che riesce a percepire, i docenti come stanno utilizzando le tecnologie per la didattica?
- Le è stata segnalata qualche esperienza particolarmente positiva che ritiene valga la pena di approfondire, documentare e condividere? (esempi)

Step introduzione

- Quali sono gli step principali attraverso i quali sono state introdotte le tecnologie a supporto della didattica?

- È stata fatta una formazione specifica per i docenti? Se sì, Quali sono state le modalità dell'aggiornamento e quali temi sono stati trattati? Sono state analizzate esperienze fatte da altri? Se sì, da chi?
- Sa se i docenti di questo centro sono coinvolti in reti professionali interne e/o esterne a supporto della loro attività didattica?
- È possibile incoraggiare i formatori/docenti a prender parte ad in esperienze di questo tipo?

FP e tecnologie

- Secondo il suo parere, quale valore aggiunto possono dare le tecnologie alla didattica della formazione professionale?
- Secondo il suo parere, quali sono le motivazioni che possono giustificare la diffusione sistematica delle ICT nella didattica?

STUDY 3 - Crossing boundaries between classroom and work learning processes through ICT: a systematic Review

Abstract

Within Initial Vocational Eeducation and Training (IVET), technologies are involved in the learning processes taking place in the classroom, in the laboratory and during traineeship. In the laboratory and during the traineeship, technologies are used in different ways: on one hand, they are, and they have always been, a regular part of the work activities, which are the subjects of learning; on the other hand, they "can serve many roles to support work-based learning" (Margaryan, 2008). But can the use of technologies enhance WBL activities while students sit in the classroom (off the job)? This review aims at gathering information about the potential of ICT in crossing the boundaries of learning processes between classroom and work within initial vocational education contexts.

Keywords

Vocational Education and Training, Systematic review, Work Based Learning, ICT, Apprenticeship.

Notes

The present section represents the revised version of the following contribution:

Perini, M. (2017). Crossing boundaries between classroom and work learning processes through ICT: a systematic Review. In *Crossing boundaries in VET* (pp. 264–267). Rostock: University of Rostock. [Conference paper]

1 Introduction

Since the mass diffusion of Information and Communication Technology (ICT), both educational institutions and business enterprises have been implementing software and technological infrastructures in order to enhance learning experience as well as productivity (Biondi, 2007; Magone & Mazali, 2016; Moricca, 2016; M. J. Spector & Ren, 2015). The Initial Vocational Education and Training (IVET), in parallel with general education, has been part of this process of changes with several pilot projects, such as *iCnos* (a project financed by the CNOS-FAP federation) and *iVideo* (a project financed by the Swiss Federal Institute for Vocational Education Training), which aim at introducing ICTs as support for didactics and learning processes (Cattaneo, Nguyen, Sauli, & Aprea, 2015; Franchini, 2015). Within the IVET, technologies play a central role, because they are involved in the learning processes which take place in the classrooms, in the laboratories (i.e., the places where the students participate in practical training) and during traineeships. In the classroom, technologies are mainly used to support learning activities (e.g., assignments, team-work, assessments) in general and cultural subjects (Franchini, 2016; Pellerey, 2015b, 2015a). In laboratory and during the traineeship, technologies are used in different ways: on the one hand, they are, and they have always been, a regular part of the work activities, which are the subjects of learning; on the other hand, they "*can serve many roles to support work-based learning*"(Margaryan, 2008, p. 17). For instance, the World Wide Web – specifically in the 2.0 and 3.0 forms "*significantly improves knowledge creation and sharing in the workplace by involving, engaging and empowering people* (Wang, 2015, p. 843)" allowing the implementation of collaborative environments both online and in real life.

According to Schaap, Baartman, & de Bruijn (2012), students use specific and different learning styles depending on whether they are involved in learning activities that take place inside vocational-school or in the workplace. Consequently, their learning processes need to be enhanced through adaptive and differentiated strategies. On this basis, it is thought that technologies risk remaining caged to each training context (classroom, laboratory, workplace), leaving unexploited their potential as a learning tool which could be useful to foster WBL-oriented activities in the various IVET contexts.

This brief literature review aims at gathering information about the potential of ICT in crossing the boundaries of learning processes between the classroom and work within IVET contexts.

2 Research questions

As mentioned above, this contribution aims at exploring the international empirical research on IVET for better understanding the role of ICT in WBL-oriented training activities. Therefore, the research was guided by the following questions:

- Could the use of technologies allows WBL activities while students sit in the classroom (off the job)?
- If so, could the ICT-supported-WBL be useful for learning activities in general cultural subjects?

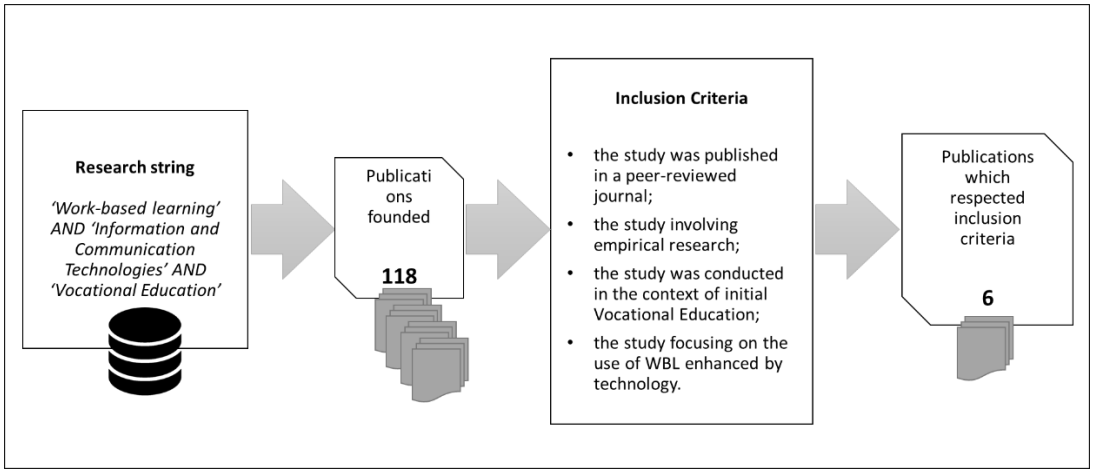
3 Methodology

The methodological guidelines suggested by Petticrew & Roberts (2006) for systematic literature reviews in social sciences was applied in order to answer the proposed questions. This methodological choice stems from the need to identify studies which concern the review topics precisely. The following databases were employed for searching relevant papers regarding educational research: Scopus, ERIC, Web of Science, Emerald, Springer, Taylor & Francis Online, Oxford University Press. Given the rapid evolution of technological innovations, the search was limited to publications after 2012. Three search terms, related to the aim of the study, have been used: "Work-based learning", "Information and Communication Technologies" and "Vocational Education". The search terms were combined using Boolean AND. All founded publications (118) were imported in Mendeley. Thanks to the support of this software the papers were organized and analyzed. Titles and abstracts were scanned using the following inclusion criteria:

- the study was published in a peer-reviewed journal;
- the study involving empirical research;
- the study was conducted in the context of initial Vocational Education;
- the study is focused on the use of WBL enhanced by technology.

Moreover, relevant studies appeared among the referent bibliography of these results were eventually included. At the end of the selection phase, only 6 of the 118 imported publications respected the selection criteria. Figure 1 shows the synthesis of the process just described.

Figure 1 – Papers' selection process



After the selection phase, data extraction process was conducted to collect following information from each selected study: general information about the study (authors, research design, country etc.), professional sectors involved, number of participants and main characteristics (if available),

theoretical-reference model/s of the implemented instructional strategy, name of the technology-supported teaching tools employed during the activities, emerging advantages, problems or risks highlighted.

4 Results and discussion

The gathered data were analyzed and synthesized in a matrix (see Table 1). The low number of selected studies seems to underline a lack of empirical research on ICT-supported WBL in IVET. This element is not necessarily synonymous with neglect of interest about this topic, because – given the local characterization of VET systems – the dissemination of research outputs often doesn't cross the regional or local-language boundaries. Moreover, several contexts of IVET – e.g., practical training laboratories, etc. – seems to be unexplored by the international VET research, given the fact that six studies out of 6 took place in the context of the apprenticeship. Through the results' analysis, two theoretical-reference concepts, which guided the implemented instructional activities in different ways to connect classroom and workplace activities with ICTs support, emerged: collaborative learning and reflection. The first one, to which reference is made in 3 studies out of 6, had a strong diffusion thanks to the introduction of educational technologies, has been and still is the subject of a scientific debate over its features and possible ways of employing it in education (Resta & Laferrière, 2015). The second one, to which reference is made in 2 studies out of 6, "*has been widely discussed in literature as an important approach for […] developing professional practices and, facilitating and structuring learning through experiences*" (Looi & Wu, 2015, p. 610). In all six studies the choice of the pedagogical model, the instructional design and the choice of ICT altogether seem to be a highly

important common pattern. The implemented instructional strategies were complemented and supported with different kinds of technology, i.e., e-learning platform, e-portfolio, mobile and computer-based learning journal, wikis, mobile video recording, tangible user interfaces. None of these ICTs is "typical" of the professional sector where the selected studies were carried out. This suggests that ICT which *come from outside* could be useful in supporting WBL in the various IVET contexts. In all analyzed studies, ICT support facilitated and enhanced the link between practical dimension and the theoretical one.

Table 1 – Overview of the selected studies (part 1)

1st Author and publication year	Involved professional sectors	Participants	Other info	Theoretical-reference concepts	Technology-supported teaching tools	Emerging advantages	Problems detected
(Callan, Johnston, & Poulsen, 2015)	Bakery industry; building and construction; stonemasonry; and plumbing	Teachers; programme managers; directors; employers; Apprentices.	AU AP QL	Recognition of Prior Learning; flexible learning.	E-learning platform (blended approach); e-portfolio.	Increase access to apprenticeships through greater flexibility; improvements in teacher-student communication and interpersonal relationships; higher levels of student satisfaction and cost savings for employers.	Attitudes of many teachers to the use of new technologies in the classroom.
(Mauroux, Könings, Zufferey, & Gurtner, 2014)	Bakery	16 apprentices	FR AP MM	Reflection.	Mobile Learning Journal.	Useful for learning and sharing experience in vocational training; students' interest in the use of a smartphone at the workplace.	Requires strong guidance in the design of the learning journal as well as support and feedback from supervisors.
(Boldrini & Cattaneo, 2014)	Office clerks	111 apprentices	SW AP QT	Scaffolding, Reflection	Computer-based learning journal	The tool used has a significant role in scaffolding (quantity of comments developed).	The tool used has not effects on the quality of comments developed.
(Ortoleva & Bétrancourt, 2016)	Health and social care assistants	21 second-year apprentices	SW AP QL	Collaborative learning, peer-feedback.	Wikis	Instructionally relevant collaborative writing activities have been detected.	
(Gurtner, Cattaneo, Motta, & Mauroux, 2011)	Car mechanics	19 apprentices	SW AP QL	Self-regulated learning, collaborative learning	Mobile video recording	Support the monitoring of student activities at the workplace.	

(Cuendet, Dehler-Zufferey, Ortoleva, & Dillenbourg, 2015)	Train carpenter	40 second-year apprentices	SW AP QT	Collaborative learning, classroom orchestration	Tangible user interfaces (TUI)	The activity proved usable and fostered many connections to the workplace engagement in the activities.	Learning gain measured did not show any significant difference

Notes

The "Other info" column contains the following information: Country[a], Education Setting[b], Research Design[c]

[a] Australia (AU), France (FR), Switzerland (SW)

[b] apprenticeship (AP)

[c] Qualitative Research design (QL), Quantitative Research design (QT), Mixed Methods (MM)

5 Limitations

The methodology (systematic review) and the inclusion criteria used for this brief review are too restrictive to identify a large corpus of studies. Perhaps, narrowing the research field to IVET alone has reduced the scope of the study. The keywords used for the query of this study should be expanded and integrated, also referring to what emerged from this exploratory study.

6 Conclusions

The outputs of selected studies and its synthesis (Table 1) could offer useful information for undertaking further studies about the possibility of connecting the different learning settings, situations, and IVET contexts through ICTs and for developing new Work-Based pedagogical models. Moreover, the experience reported in each study could be good examples of transferable situations in similar contexts.
In summary, is possible to draw the following considerations:

- the proposed topic seems to be a necessary but under-researched area. Moreover, further interesting data could emerge by exploring the work-related IVET contexts which are not part of the apprenticeship (or dual-system), e.g., the VET-laboratories;
- the ICTs used in the analyzed experiences, carefully mixed with specific instructional strategies, seem to strengthen the connection - *crossing boundaries* - between the different learning contexts (workplace and classroom) even if these technologies are not part of traditional instruments of respective professional sectors;
- the use of ICT is always accompanied by the care of the instructional setting, by the instructional design and by choice of a pedagogical model of reference; all this in accordance with the aim of the instructional activity.

These remarks are aimed both at guide further researches about the role of technologies in crossing the boundaries of the VET contexts, and at IVET and general education teachers in order to implement WBL-oriented instructional actions which could allow closing, or better articulating, the distances between the classroom and the workplace. The small size of the study presented here does not allow to answer the research questions fully, but it provides new elements that bring closer to possible answers.

Connecting lines

- According to these results, the reflective and the collaborative dimensions seems to have an important role.
- All the studies that emerged by the literature review took place in the context of apprenticeship. In Italy, despite the recent apprenticeship reform, the main context of IVET is still the VET-laboratory, i.e., the place inside the VET centers where the practical training of vocational area take place.
- As mentioned in the conclusive section of the literature review, further interesting data could emerge by exploring the VET-labs, as they are work-related IVET contexts which are not part of the apprenticeship (or dual-system).
- According to the review results, it seems that the technologies coming from outside the working context can assume the bridging function.
- This suggests the existence of bridging technologies, which can connect the various areas because they can be used in all contexts with common objectives
- In which way this function can be implemented? Which role the technologies have that do not come from outside? Can these also have a bridging function?
- The next study will try to answer these questions through field research.

STUDY 4 - Advancing knowledge on Italian VET-laboratory instructional practices: practice and technologies

Abstract

The instructional practices implemented by the teachers in the Italian initial Vocational Education and Training system (VET) has rarely been the subject of empirical studies. Moreover, an exploratory literature review produced no results. This kind of instructional practices often runs the risks of being confined within the VET-laboratory framework, leaving their potential, which could be able to cross the existing boundaries between the classroom and the workplace, unexploited. In order to provide transferable and reusable information on the instructional practices of both VET teachers and general-education teachers, the ethnography and Grounded-Theory approaches were combined. The principal findings of the present contribution represent a set of suggestions for VET teachers (both those who teach practical subjects and those who teach cultural subjects) and teachers in general education. Furthermore, results also consist of a model which represents a middle-range theory for the instructional practices of VET-lab teachers, a model which represents the role of technologies in VET-Labs and a set of instruments that could be useful for VET teachers' training and teaching practices – school teachers as well.

Keywords

Vocational education and training, instructional practices, work-based learning

Notes

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1 Introduction

Since 2012 the unemployment rate of Italian people between 15 and 24 years old remains above the 30% (Istat, 2018b), furthermore, in 2014 the early school leaving had an average rate of 15% on the national territory (Istat, 2018a). This worrying situation led the Italian government to promote several policies aimed at counter this problem by closing the gap between work and school contexts. As a matter of fact, in 2015 the Ministry of Education, University and Research (MIUR) implemented two important reforms. The first action concerned the establishment of the "*alternanza scuola-lavoro*" [9] (art. 33 and 43, L. 107/2015), which introduced the mandatory internship for students of general secondary school, from 200 to 400 hours in the last three years of school. The second action has concerned the introduction of Dual-System through the reform of the apprenticeship regulations (State-Regions agreement of 24 September 2015). These arrangements have been integrated in the Italian Initial Vocational Education and Training (IVET) system in place, named Istruzione e Formazione Professionale (IeFP). The IeFP, unlike the general education system, demonstrated a good connection with the labor market and the local production base even before the apprenticeship reform, given the positive relation between VET-centers presence and the low rate of early school leaving in the corresponding regions (INAPP, 2017a). Another necessity accompanies the urgency of bringing the world of work closer to the education system: the need for keeping up with technological innovation, as also suggested by the last recommendations on key competencies proposed by the European Commission (2018). The attempt to introduce technology within educational paths is not a new topic for Italian policy makers (e.g. MIUR, 2012, 2017 etc.), but, the relationship between education and technology always had a dichotomic role. On one side, the technologies are tools to support instructional practices, and on the other, they are a mere subject of study. The policies described above are the first step to achieve their own goals, but they are not enough. Further initiatives should accompany these actions to favor a better distance' articulation between work and school. One of these actions should promote the connection between theory and practice, i.e., between cultural axis and vocational area, through the innovation of instructional methods, taking into account the role of technologies in the educational and work fields. This change in instructional practices should not concern a mere use of educational technologies during lessons, but at the same time keeping up with the work-related technological evolving is mandatory. This

[9] Work-school alternation

study aims to better understand the role of technologies inside the IVET context and to outline a model of work-oriented instructional practices that could favor the achievement of the aspirations mentioned above. Given its just described peculiarities, the IeFP training context could be the ideal place to look for answers and suggestions in order to develop the model. In the next sections, the characteristics of IeFP will be described in detail.

1.1 The main characteristics of italian IVET system

Before describing the specific training context in which the present study took place, a brief description of the IeFP could be useful to understand the research process better. The IeFP was introduced in the school year 2011/2012 through several regulations issued by the state-region conference. The core of the system resides in the 3 and 4 years programs. These paths aim to develop basic, transversal, and technical-occupational skills in order to obtain the Professional operator certificate (3 years program – Level 3 EQF) or the Professional technician diploma (4 years program – Level 4 EQF). The 3 and 4 years programs are provided by VET centers (private training centers accredited by the Region according to nationally established criteria) or by public vocational schools in subsidiarity form (CEDEFOP, 2014). Also 1 and 2 years higher technical education and training programs are provided but, the participants are still low. The elements that lay the foundations of the IeFP system are (CEDEFOP, 2014):

- a set of training standards for basic skills to be developed during 3 and 4 years programs;
- a set of minimum standards (valid at national level) for technical and vocational skills in relation to the occupation profiles included in the national qualifications register (the occupation profiles are currently around 22)
- a set of intermediate and final certifications that are valid at national level.

Probably because of the poor visibility (Scalmato, 2015), the IeFP system includes about 10% of the entire population of the secondary level (MIUR, 2016). The management of the system is divided up between the central government and regions, consequently, there are a lot of variation in terms of participants, quantity and quality of the courses region by region (CEDEFOP, 2014; INAPP, 2017a). The new Italian dual system introduced in 2015 by the reform of the first kind of apprenticeship (i.e. Apprenticeship for the fulfillment of the right-duty of education and training) is interconnected with 3 and 4-year programs and then it is provided and managed by VET centers and VET schools in subsidiarity.

According to the monitoring actions conducted by INAPP (2017b) does not yet cover the whole national territory and the number of apprentices is still very low, about the 7% of the students enrolled in IeFP at the end of 2016. The IeFP is smaller in size compared to general education system, but nevertheless several policy makers acknowledge it as the place where the work-oriented instructional practices take place (Tacconi & Gomez, 2018).

1.2 The IeFP instructional activities and the VET-labs

The instructional activities which are carried out during the 3-4 years programs are divided into 2 groups. The first group, named *cultural axis*[10], comprehend all the activities which concerns cultural/theoretical subjects, and it is generally associated with classroom-based activities. The second group, named *vocational area*[11], includes all the activities related to the curriculum profession, and it is generally associated with practical training. This distinction, that is required by law for fulfilling compulsory schooling, is likely to replicate the separation between school (theory) and work (practice) even inside the IeFP. Several studies were carried out to counteract this phenomenon(Gomez & Tacconi, 2013; Nicoli, 2012; Tacconi, 2011; Tacconi & Gomez, 2010). Its results provide a repertoire of activities which teachers can use to plan teaching activities. The main limitation of most of these accounts, however, lies in the fact that they are based on the teacher experiences belonging to the cultural axes, and its rarely refer to work-oriented instructional practices. As stated before, despite the recent apprenticeship reform, the new Italian dual system is not yet neither stable nor widespread. So, actually, the most part of the students' work practice activities do not take place in the workplace, but in the IeFP laboratories. As a matter of fact, students only can work in a company during the 3rd year for a 2/3 month internship. The IeFP laboratory (VET-Lab) is a specific instructional setting, inside the VET centres, where workplaces are simulated through the presence of professional instruments and equipment. Inside the VET-Labs, students' learning takes place as result of real practice activities, in real situations. These activities seem to be motivated by the students' interest, and often for the pleasure of solving concrete and challenging professional problems. Although these activities take place in formal context (VET centres and VET schools), the just outlined learning process seems to have many things in common with the non-formal learning. In this practice-oriented setting, which is often characterised by high technological density, students also seem to improve their knowledge about cultural

[10] Assi culturali
[11] Area professionalizzante

subjects, e.g. mathematics, literature, foreign languages, etc. (Tacconi, 2011, 2014b; Tacconi & Gomez, 2010). Technologies could have a relevant function in this learning context because they "can serve many roles to support Work-Based Learning (WBL)"(Margaryan, 2008, p. 17). The role of technologies and the instructional practices [12]implemented by the teachers within the IeFP practical training arena have rarely been the subject of empirical studies. Indeed, exploratory research by keywords on international academic database[13] showed no relevant results. This kind of instructional practices dense of technology risks being confined in the VET-laboratory framework, leaving unexploited their potential that could be able to crossing boundaries between the classroom and the workplace. Therefore, on that basis, the analysis of instructional practices of practical teachers could be useful for understanding both the main characteristics of the work-oriented activities which take place inside VET-Labs and how technologies are exploited to enhance the connection with external contexts like the workplace and the classroom. The outcomes could offer transferable and reusable information for implementing work-oriented teaching activities, also with the use of technology, by both all the teachers of VET (also those of cultural axis) and the teachers of general school.

2 Research questions

This study aims to understand the role and the use of technologies in VET-lab teachers instructional practices to highlight suggestions and good practices able to better articulate the distances between *cultural axis* and *vocational area* of the IeFP and, secondly, between school and work context. In order to achieve this, an extensive exploration of both the practical training context and the instructional practices which take place in it is deemed necessary.

As result, the research questions that guided the present study are as follow:

1. Which are the teaching strategies implemented in the VET-labs? Which are their features? Which are the features of the VET-Lab context?

[12] There is no general consensus on the definition of non-formal learning. According to OCED (2018) it is configured as a middle way between formal learning and informal learning. The first one (the formal learning) always presents explicit aims, is always organized and structured, involve learners which are voluntarily engaged in the learning process in order to acquire knowledge, skills, and abilities. The second one (informal-learning) is never organized, has no pre-established objectives, and learners are unintentionally involved in the learning process. Non-formal learning could be considered as a fairly organized learning that can have goals.

[13] Scopus, ERIC, Web of Science, Emerald, SpringerTaylor & Francis Online, Oxford University press

2. How are technologies used for fostering VET-Lab instructional practices? Which is their role in the learning process?

3 Methodology

Given the lack of empirical research on VET-labs' instructional practices highlighted above and the need for comprehending the processes behind the instructional practices which are rooted in the specific context of VET-Labs, the ethnographic method (Van Manen, 1990) and the constructivist current of Grounded Theory (GT) approach were combined (Charmaz, 2006; Glaser, Strauss, & Strutzel, 1968) in order to answer to the proposed research questions. This methodology mix has been recognised as a good solution for exploring new research topics because (Bamkin, Maynard, & Goulding, 2016; Charmaz & Mitchell, 2001):

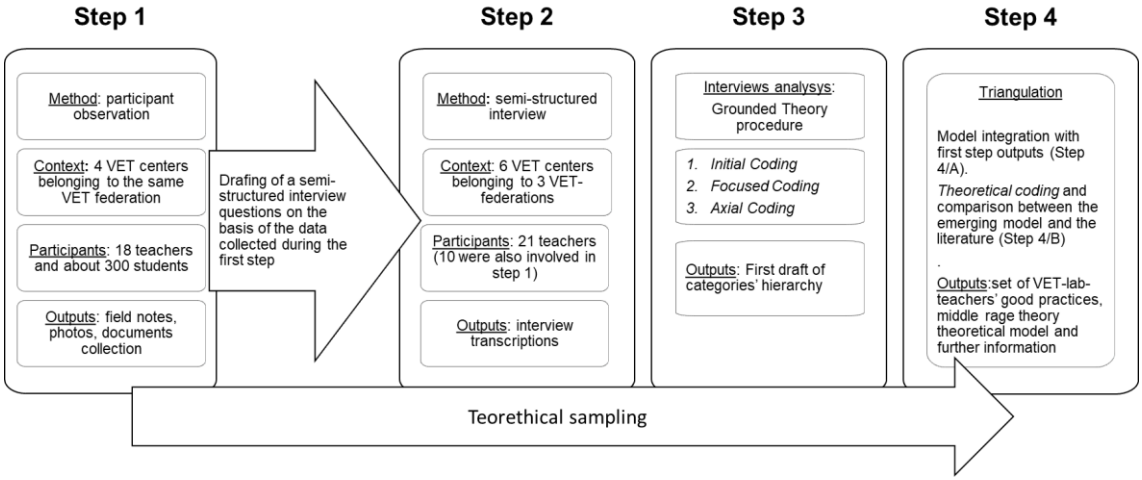
1. the ethnographic elements allow the researcher to deeply enter in the studied environment and permits participants to be active in the research process;
2. the GT approach provides a structural framework for the data analysis, maintaining the emergent theory grounded in data.

Thanks to this methodological choice, the voices and the experiences of the involved actors can be enhanced (Mortari, 2007; Tacconi, 2011) and the good practices can emerge without isolating them from the context in which they take place (Lipari, 2016). The characteristics of the research context didn't allow to implement a long-stay ethnography, therefore, also considering the explorative nature of the study-object and the need to compare different practical instructional situations, the ethnography was carried out in a *multi-sited* mode. The *multi-sited* ethnography allows researchers to replace a long-term stay in the field with brief ethnographic visits in various contexts focusing the attention on a defined object of study (Marcus, 1995). In accordance with guidelines[14] suggested by Marcus (1995), the present study was carried out "*follow the people"* (Marcus, 1995, p. 106) who are involved in leading the students' practical learning processes, i.e. the VET-lab teachers. The combination of the ethnographic method with GT approach leads to " *(1) compare data with data from the beginning of the research, not after all the data are in; (2) compare data with emerging categories; and (3) demonstrate relations between concepts and categories*"

[14] Marcus (1995), suggests the following strategies for constructing a multi-sited ethnography and defining the object of study: follow the people, follow the thing, follow the metaphor, follow the plot, story, or allegory, follow the life or biography, follow the conflict.

(Charmaz & Mitchell, 2001, p. 161). Furthermore, the GT procedure allow to better focus, organize and structure the research activities, helping the researchers in guiding and keeping control on the research process (Bamkin et al., 2016; Charmaz & Mitchell, 2001). As shown in Figure 1, the just described qualitative methodology mix was implemented trough the 4 steps described in the sections below. Given the large amount of data which needed to be managed and analyzed, Nvivo 11, a software for qualitative data analysis, was used.

Figure 1 – The steps of the study



As mentioned before, the aim of this study is to highlight the VET-Lab' teacher instructional practices in order to develop a model through which summarize the good practices maintaining results grounded in data.

3.1 Exploring the research context - Step 1

3.1.1 Participants

In the first step, 4 VET centres belonging to the same VET-federation (CNOS-FAP) were selected for the participant observation through a convenience sampling strategy (Pole & Morrison, 2003). The dean of each center was consulted to identify the practical teachers and the students to involve in the study. The observations took place over the course of the 2nd semester (4 months – about two days a week) in 17 classes of the 3rd year during the VET-Lab' activities. In total, 18 teachers and about 300 students were involved in the observed activities. The selected classes belonged to the professional sectors reported in Table 1. Also also the name of the practical subjects taught during the observations and the respective number of classes involved were reported in the same table.

Table 1 – Professional sector of the 1st step participants

Professional sector	Practical subjects	Classes involved
Mechanic	Computer Numerical Control (CNC)	4
	Welding	1
Automotive	Auto repair and car electronics	2
Energy	Hydraulics and thermal plants	1
Elecreic	Domotic systems	2
	Programmable Logic Control (PLC)	2
	Electronics	1
Graphics	Multimedia	1
	Visual design	1
	Printing Techniques	1
Marble	Computer Numerical Control (CNC)	1

3.1.2 Method and data collection

In order to allow the researcher to become familiar with the fieldwork, the participant observation method was employed in the opening step of the study. In particular, given the educational peculiarities of the research context, the version of participant observation named "participation as observer" was used, as suggested by Pole & Morrison (2003). Therefore, the participants - both the teachers and students - knew the role of the observer, allowing him "*witnessing first hand and in intimate detail the events of interest"* (Denscombe, 2007, p. 218). As a matter of fact, every teacher involved in the study had been informed about the aim and the characteristics of the study before the participant observations kick-off. During the data collection, the observer main focuses were the teacher instructional practices and the role of technology in the students learning processes. But, at the same time, his attention was also directed to get familiar with the laboratory setting and the technical language concerning the professional sectors involved in the research. The gathered data mainly consists of field notes in the form of written records and sketches of VET-lab settings. The observer had the opportunity to take notes even during the fieldwork, given that the observed activities took place in a training context. In accordance with Denscombe (2007) reccomendations, the observer integrated the

condensed notes taken in the arena of action with further details immediately after each observed practical lesson. Pictures, teaching materials, and documentation about curricula were collected wherever possible. Further information was collected through dialogue with students and teachers, during and after lessons. All field notes were digitally transcribed and labelled with a progressive code and the date. For instance, the label [OSS8/14.11.16] was assigned to the eighth observation session held on the 14th November 2016. In all, 35 observation sessions were held for a total duration of 75 hours. All the collected data were imported in Nvivo 11 software.

3.2 The interviews – Step 2

3.2.1 Participants

In the second step 21 VET-lab teachers belonging to 3 VET-federations in the north east of Italy were interviewed. The participants were selected using a snowball-sampling strategy. The dean of each center was consulted to identify the participants, as in the first step. The interviewees' group was composed as follows:

- 6 teachers of three VET centers belonged to ENAIP federation, 5 teachers of two VET centers belonged to Scaligeraformazione federation and 10 teachers of 1 VET center belonged to CNOS-FAP federation (they also participated in the observation phase - first step);
- The interviewees had an average of 19 years of teaching experience in the VET field (M = 19.14, SD = 9,39);
- 16 of the 21 interviewees had had a job connected with the current teaching activities before start to teach, the average of their job-years is 11 (M = 11.43, SD = 10,66).

Furter information about interviewees' are reported in Table 2.

Table 2 - Professional sector of the 2nd step participants

Professional sector	**Practical subjects covered by the interview**	**Interviewees**
Mechanic	Computer Numerical Control (CNC)	4
	Welding	1
Automotive	Auto repair	2
	Car electronics	1
	Autobody repair	

		1
Energy	Hydraulics and thermal plants	2
Elecreic	Domotic systems	2
	Programmable Logic Control (PLC)	2
	Electronics	3
Graphics	Multimedia	1
	Visual design	1
	Printing Techniques	1

3.2.2 Method and data collection

A semi-structured track questionnaire (Appendix A) was drafted both on the basis of the research questions and the data gathered during the first step (Mortari, 2007; Tacconi, 2011). Given the the work-oriented framwork of the research questions, the interview track was also inspired by the the practical research hints outlined by Matthias, (2009) for conducting *Action-Oriented Specialised Interviews (AOSI),* that is frequently used in the field of work processes studies beside further methods. During and after the second phase, the interviews were recursively analysed following the GT procedure. Following the AOSI guidelines (Matthias, 2009), the interviews were conducted inside the interviewee' VET-labs, after visiting the VET centers. All interviews were audio recorded and then transcribed. Before being analyzed, each interview and each answer were labelled with a progressive code (Mortari, 2007; Tacconi, 2011) . For instance, the label [INT4/06] was assigned to the sixth question of the third interview. Following the principles suggested by GT, the questions were revised and corrected after each interview with the aim to improve the quality of the investigation (Charmaz, 2006). All the collected data were imported in Nvivo 11 (2015) software.

3.3 Interviews' analysis - Step 3

The the first two of the 4 coding phases proposed by the constructivist GT approach (*initial, focused, axial* and *theoretical coding*) were conducted. The *initial* and *focused coding* required a recursive read of interviews' transcripts. The texts were coded, compared, and merged without distinction between the interviewees. Through this process, VET-lab teachers main actions (subcategories) were condensed "using the most significant and/or

frequent earlier codes to sift through the large amonts of data" (Charmaz, 2006, p. 57) answers (e.g. Table 3). Many significant units (about 100) were identified on the basis of the research questions.

Table 3. Example of Focused Coding

Main actions (subcategories)	**Narratives**
Reflecting with students on which could be the mistakes' consequences in the real workplace	• Even facing small problems, is important to find and understand a solution in order to create an attitude that could be a students' advantage in the future, because knowing how to solve small problems today means maybe be equipped for the resolution of major problems tomorrow. [INT1/53] • Whenever there is a problem, I usually stop the lesson. I show the problem to the students and I ask him to think about a solution, taking the opportunity for testing their problem solving ability. Some issues are simulated, but they are simpler. I say them that the customer demands an answer in a short time. [INT10/15] • I always explain that most of the calls for those who is an industrial technician are related on breakups and failures. So, if you are no able to go to repair the faults ... it's a big problem. [INT16/31] • Here, [during VET-lab activities] we forgive the mistakes. But, in the workplace, they will be not forgiven and they ll'have to pay through losing the job contract or in losing customers [INT5 / 30] • …
…	…

After the *initial* and *focused coding*, the *axial coding* procedure was done. All the main actions (subcategories) identified in the first phase were compared with each other and clustered by affinity. Thanks to this recursive process of analysis, 13 categories emerged, composing a provisional hierarchy of VET-lab teachers' good practices.

3.4 The data triangulation – Step 4

In the last step, the emerging model was triangulated with the data collected during the first step and the relevant literature to obtain a middle-range theory through the procedure described below. Firstly (step 4/A) , the field notes and the rest of data collected during the first step were incorporated in the emerging category-system through a recursive comparison. The choice to compare the field notes with the emerging model after the

interviews analysis is due to the need to give priority to the teacher' voices in laying the foundations of the theoretical model.

Secondly (step 4/B), all categories were compared with each other and with the relevant literature through *theoretical coding*. The relationships between categories were enhanced, and the core categories were identified. Moreover, thanks to the features of Nvivo 11 (e.g., matrix coding[15], see also links[16], relationship nodes[17], etc.) the corpus of data was recursively analyzed from different perspectives to enrich the theoretical model and to keep the focus on the role of technologies (Appendix A, Appendix B, Appendix C).

4 Results and discussion

4.1 The VET-lab-teachers' good practices

Table 4 reports the list of actions emerged by the procedure implemented at the beginning of the fourth step (step 4/A). The main actions implemented by the teachers, which are reported on the right-column, are clustered into categories, which are reported on the left-column. This output, even if it is not a theoretical model, could be considered a set of VET-lab-teachers' good practices which can be useful to other practical trainers, in order to improve, alternate or change their instructional practices. The actions reported should not be considered as a sequential process to implement, but as possible alternatives from which to take a cue. However, this set of actions could be too specifc for teachers who works out of the VET-lab.

Table 4. *Set of VET-lab-teachers' good practices*

Categories	Main Actions (subcategories)

[15] '*output from a matrix coding query provides a basis for comparative pattern analysis where it can be seen how often different groups report particular experiences or attitudes. […] On the other hand, comparison of the text for a particular node for those in different groups allows you to see in what way different groups report particular experiences, and so has the potential to reveal new (or previously unobserved) dimensions in those data, and potentially raise further questions about why this group was different from that'* (Bazeley & Jackson, 2013, p. 141).

[16] '*A see also link will connect from a point (an anchor) in the text of the memo to selected text within a source document, so you can easily check the basis for the thoughts you are recording. Then, when you review your memo, you can also see the linked segment highlighted within its source context'* (Bazeley & Jackson, 2013, p. 38).

[17]'*A relationship in NVivo is a record created by the researcher to show how two entities or concepts relate. These might be people or ideas or abstract concepts. […] If you use relationship nodes, you can easily obtain a visual of the interconnected relationships using a model, and if you have coded evidence of the connections between the items at the node, this evidence can be instantly accessed from inside the model, and examined in its original context'* (Bazeley & Jackson, 2013, p. 230)

Choosing and developing students' learning materials	• Asking students to search for information and technical documentation through web browsing
	• Developing handouts ad'hoc
	  o Developing handouts based on school handbooks (school-based handouts).
	  o Developing handouts based on the user guide about the machines which students should learn to use (work-based handouts).
	  o Developing handouts with the students.
	  o Integrating school-based and work-based learning materials.
	• Directly using the user guide about the machines that students ought to learn to use.
	• Frequently updating the learning materials.
	• Using traditional educational learning materials (school-based).
	• Using work tools and technologies (tools that belong to each student).

Crafting a professional handbook to be used as a working instrument	• Asking students for a rearrangement of notes to create a professional handbook, integrating it with teachers' handouts and practical-exercises reports. • Asking students to take care of their school notebooks. • Assessing the contents and the quality of school notebooks. • Collecting practical exercises. • Guiding students in organising notes and teachers' handouts. • Using students' handbooks during practical exercises.
Enhancing connections with cultural subjects	• Collaborating with cultural-subjects' teachers in the crafting/drafting of practical exercises, the planning of activities, and the final qualification exam. • Developing students' technical language, communication, and writing skills. • Employing the English users' guide. • Pointing out topics regarding cultural subjects to engage students' attention. • Reflecting with students on the importance of cultural subjects in life. • Supporting the development of technical skills in connection with knowledge of mathematics.

Giving value to students' internship experience	• Bringing innovation to host companies through upgraded student skills. • Comparing internship experiences and previous training, confirming mutual trust between student and teacher. • Selecting a host company for an internship depending on student aptitude. • Visiting students during the internship.
Implementing competence-based learning	• Aiming at the development of competencies through the teaching of work-related procedures (step-by-step approach). • Answering the students' questions with other questions that foster logical reasoning. • Asking students for logical storytelling about their work process – practical exercise execution. • Enhancing connections between theoretical concepts and practice. • Reflecting with students on the importance of knowledge - e.g., definitions and concepts. • Training students' manual dexterity before to deal with topics which requires a high level of logical abilities
Involving students in solving unexpected real problems that occur during the lab' activities	• Asking students to find a solution without continually helping them, but rather by suggesting or giving out useful references. • Considering mistakes and unexpected technical problems as a learning opportunity for students. • Getting the students' attention by talking about problems that emerged in the past as an example in the curse of theoretical lessons. • Including abilities related to problem-solving in the students' curricula. • Reflecting with students on good practices to prevent problems. • Searching for a solution with students through a technical and professional dialogue.

Making students become accustomed to the taking and rearranging of notes	• Asking students to transcribe theoretical lectures and practical demonstrations. • Guiding students in the taking of notes. • Letting students choose how to take notes. • Letting students film lectures and practical demonstrations using mobile devices. • Making students gradually autonomous in taking notes over the course of three years.
Personalizing learning activities	• Actively supporting students with special needs. • Assigning tasks and practical exercises depending on each single student's learning abilities. • Assigning tasks and practical exercises depending on the students learning abilities in a group. • Establishing the minimum level of skill level that students must achieve. • Using educational technologies to support special-needs students.
Planning instructional activities	• Adapting the activity plan and regional-standard curriculum in the course of a year of training on the basis of the class's outcomes and feedbacks. • Adapting the regional-standard curriculum to personal work experiences and companies' needs. • Collaborating with colleagues. • Focusing activities towards the final exam. • Focusing learning activities on product manufacturing and professional work tools. • Integrating the training programme with extraordinary activities - e.g., competitions (announced by technical-equipment providers, among others), participation at fairs, equipment maintenance at VET centres. • Integrating the training programme with additional projects to cope with an external company order. • Planning activities for the whole three-year program. • Referring to the standard curriculum recommended by professional associations. • Sharing learning materials and experiences with colleagues.

Promoting students' autonomy	• Actively supporting students during practical exercises. • Gradually raising the difficulty level of the practical exercises. • Leaving students room to make mistakes. • Planning teamwork or individual activities depending on the characteristics of the assignment and VET-Lab setting (availability of machineries and work-tools) • Promoting peer learning and cooperation between students through the planning of teamwork activities. • Trusting students, by exert a light supervision, gradually letting them to work autonomously
Promoting students' sense of responsibility	• Asking students to take care of laboratory equipment and VET.centre environment (accountability for use and maintenance). • Asking students to keep the learning environment tidy and clean. • Asking students to keep work tools and materials neatly organized during practical exercises. • Assessing students' ability to keep the work environment organized. • Assigning roles to students and/or asking them to attribute roles within the teams. • Implementing work safety courses. • Introducing students to the real world of employment by arranging internships. • Promoting a suitable social and professional behaviour • Reflecting with students about the consequences of their actions in the real employment context.
Promoting students' work adaptability and/or versatility	• Making students become accustomed to asking the right questions. • Finding the right balance between rigour and creativity in the course of execution. • Keeping students' attention focused on the work process instead of the technology or products used in the same. • Providing different versions of the same instruments or technologies to do the same task. • Reflecting with students on internship experiences.
Simulating work contexts	• Using both simulators for current work-related technologies and actual machinery. • Simulating company roles. • Simulating interactions with clients. • Simulating technical failures and mistakes. • Simulating the characteristics of work environment • Using the same kinds of simulators relied upon by employers. • Structuring lessons in work procedure simulations.

- Using actual work machinery

4.2 Moving towards a mid-range theorethical model

The set of VET-lab teachers actions showed before (Table 4) could be too specific for teachers who works out of the VET-Labs, i.e. VET teachers of cultural axis and general education teachers. Given the grounds of the study, the attempt to draft a theoretical model also aims to provide more accessible information to teachers who are not in contact with the educational reality of the practical training context, looking for connection points with already known theoretical models also. Figure 5 show the theoretical model emerged by the triangulation. The model was obtained crossing the set of VET-lab-teachers' good practices (Table 4) with the following elements:

- the output of the matrix reported in Appendix B, which counts the number of respondents who referred to each category and subcategory;
- the analysis of the relationships nodes reported in Appendix C.

As already mentioned, the model emerged from this data triangulation was then integrated comparing it with the relevant literature. The Figre 2 shows the emerged middle-range theoretical model of VET-Lab instructional practices. As reported in the figure, the comparison with the relevant literaure highlighted several links between the emerged practices and theorethical concepts. What follows is a list of teaching strategies and learning models that have points in common with the practices that emerged from data:

- **Simulation learning**

  "*Simulation learning denotes learning within a safe educational environment, in which some form of reality is simulated*" (Breckwoldt, Gruber, & Wittmann, 2014, p. 673). The employment of simulation learning is widespread in trainin contexts and its often provided by the use of computer (Breckwoldt et al., 2014).

- **Personalized learning**

  Personalized learning is generally aimed at the differentiation of learning activities and resources depending on the characteristics and abilities of students, without reducing the teacher intervention to one-to-one tutoring (J. Michael, 2015).

- **Meaningful gamification**

  Gamification, which must not be confused with game-based learning, aims at involving and motivating students within a specific context through different techniques. The meaningful gamification, which is one of these techniques, and it "*creates opportunities for learners to find ways in which the real world context is meaningful*" (Nicholson, 2015, p. 324). It's particularly appropriate for reaching a long-term change in the students (Nicholson, 2015).

- **Experiential learning**

  Experiential learning, introduced by Dewey, (1938) and developped by Kolb (1984) and Rogers (1983), is a student-centered learning process which aims to make him an inventor of knowledge instead of a user. Within this framework, the teacher takes care of the quality of student experience providing guidance and feedbacks.

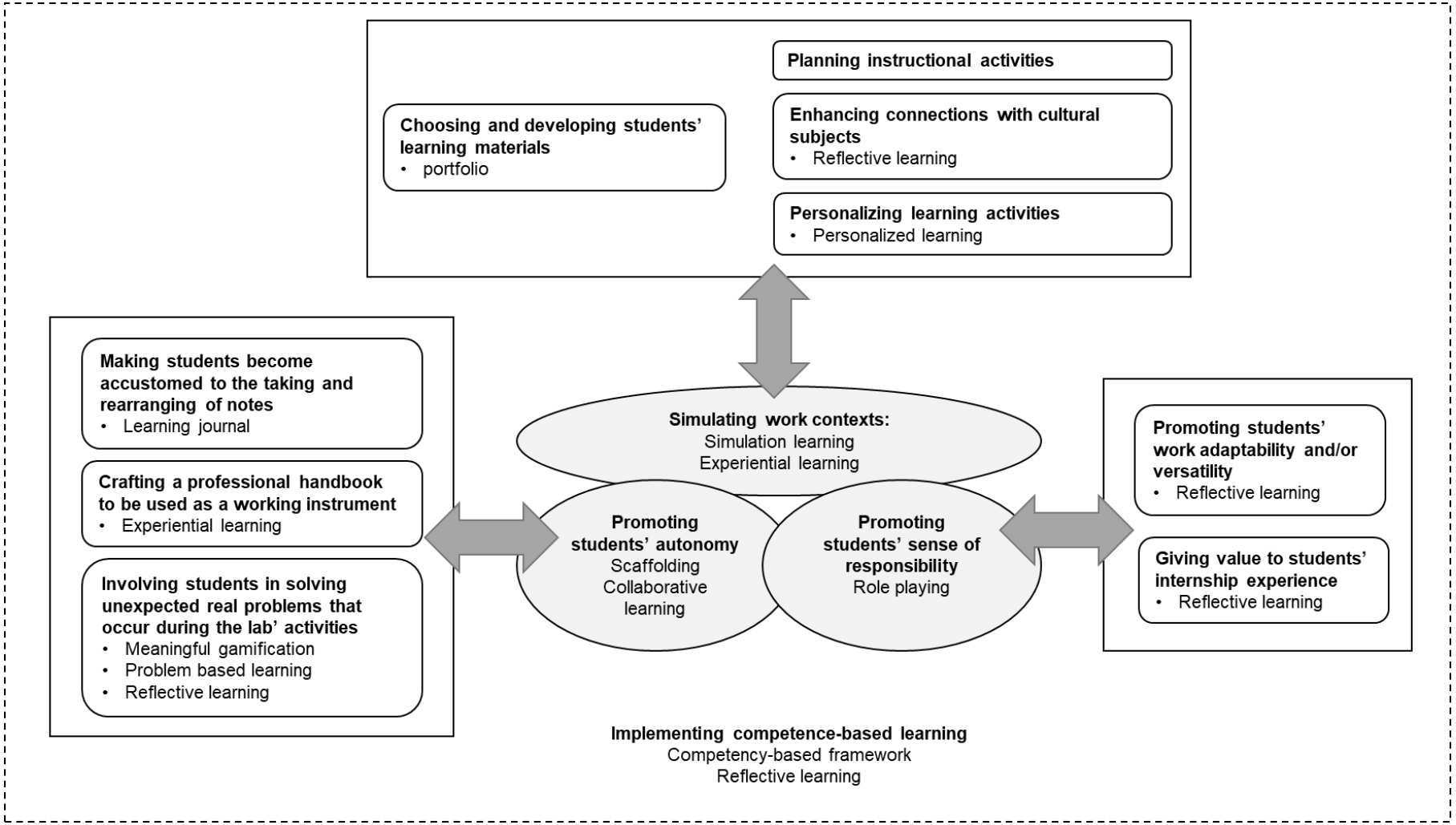
- **Learning journal**

  According to several studies (Boldrini & Cattaneo, 2014; Mauroux, Könings, Zufferey, & Gurtner, 2014), the learning journal is often used in VET and apprenticeship context. Its employment is not restricted to collect the student' exercices and assignment, but also to foster students reflection on simulations and wokplace experiences, integrating the information gathered in different contexts in order to connect workplace and classroom.

- **Problem-based learning**

  Problem-based learning was made known by Barrows & Tamblyn in 1980, but it was already used since 1950 in the medical school of Manchester University. The basis of students learning process is the analysis of an authentic problem suggested by the teacher. During the learning process, the teacher assumes the role of facilitator and to foster the learning activities of students, which works on small groups.

Figure 2- The middle-range theoretical model of VET-Lab instructional practices



- **Reflective learning**

  According to Schön (1987), reflective activities allows to learn from unexpected outcomes and from events that come out of the routinely actions, activating the attention and creating a prerequisite for self-learning which takes place through reflection. This is one of the reason why the reflection process is often included in learning theories concerning VET sector, e.g. the Erfahrraum model (Schwendimann et al., 2015).

- **Portfolio**

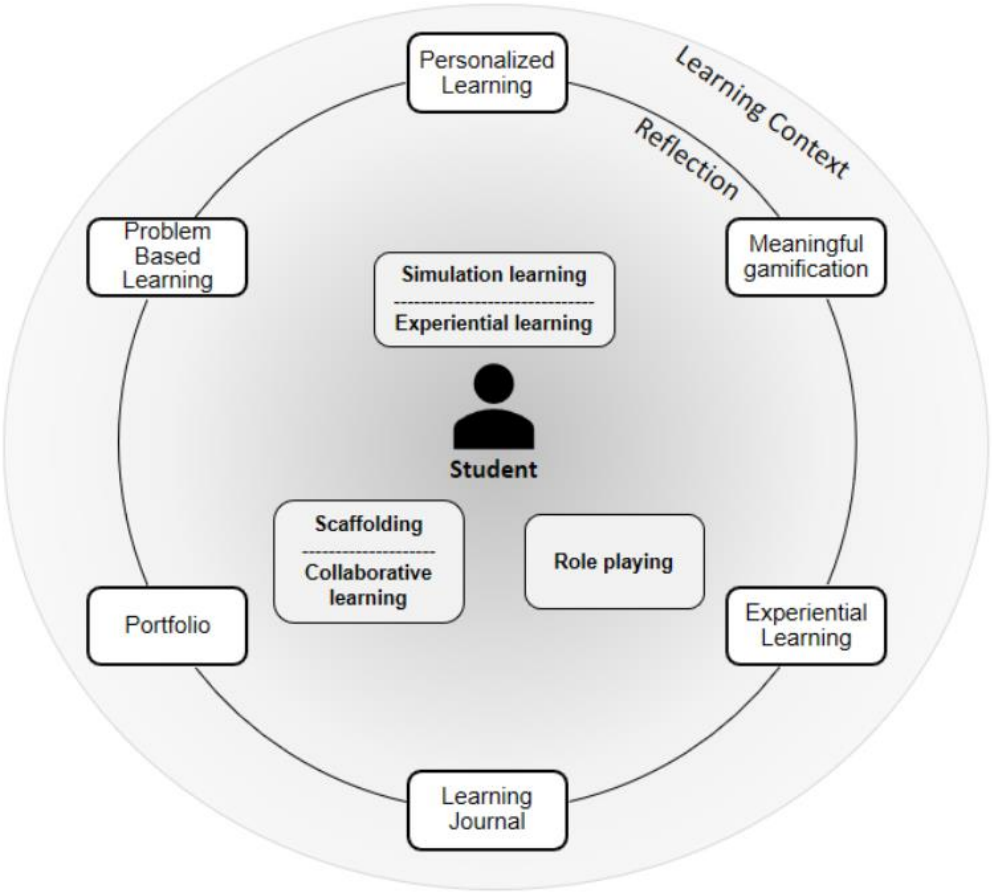
  The portfolio is a collection of student' materials which includes best works, assignments, reflective reports, etc., depending on the teacher requests. Generally, it is used to support and assess students' learning processes (Glaser-Zikuda, 2015). This instrument is often used in VET and professional sector (Comoglio, 2006).

- **Collaborative learning**

  Collaborative learning is rooted in the socio-constructivist theoretical framework (Bruner, 1978; Vygotsky, 1978). Te learning process happens through active and intentional interaction between students, who are actively engaged in working together – in small groups – in order to achieve a common goal.

The model shows that the instructional activities which have been identified as core categories are strictly connected with the students experience (experiential learning), the technical equipment (simulation learning), the relationships with colleagues (collaborative learning) and the roles (role playing). Thease activities could be considered the core of a work-oriented pedagogical model. The groups of activities which surround the core activities allow and foster the students learning processes creating a prolific learning context. Among these, both the three groups of instructional actions and the competency-framework on the background have reflective learning as a predominant activity. in order to correctly read the model it should be noted that the relations between the categories and the various groupings represented on the model do not indicate a univocal relation, either a causal relation. Rather it indicates that the category of actions connected to each other (according to what emerged from the voice of the teachers) share, at least in part, the aims. Another interesting element that can be deduced by observing the model is that most of the activities indicated are lerner-centered. On the basis of these observations a simplified version of the theoretical model have been drafted (Figure 3).

Figure 3 - VET-lab instructional practices. Semplified model



4.2.1 The role of Technologies

To better understand the role of the technologies within this model, a further analytical comeback on data was made. All the excerpt where the interviewee referred to the use of any kind of technology were identified thanks to Nvivo software. Trough this analysis the characteristics of the bridging technologies were highlighted. It is not about specific tools, but a family of technologies with the following characteristics:

- they can be used both in the workplace and in schools with the same purpose of learning;
- they can be used to make a product (phisical or intellectual product);
- their use is essential to complete the task for which they are indicated;
- there are several tools that can perform the same function;
- They are task-dependent, i.e. they lose their usefulness if they are deprived of a sensible task.

5 Limitations

The student outcomes assessment is an important aspect of instructional practices that have been partially sidelined in this study. A return on data should give more attention to this topic. A further crossover of the data would also allow to elaborate further models that could be used in the classroom by the cultural axis teachers, but also during practical training by VET-lab teachers. For example, different instructional models of WB-oriented lessons could be drafted on the basis of teacher experiences, declining in practical terms the models presented above.

6 Conclusions

This study provides three main outputs. The Table 4 shows the first one which represent a set of suggestions for VET teachers, both those who teach in vocational area and those who teach in cultural axis. The second output is summarized in Figure 2 and Figure 3and consists in a theoretical-model' canvas of WB-oriented instructional practices. These two outputs try to answer the first research question, outlying several suggestions. The third output outline a provisional definition of *bridging technologies* accompanied by a set of recommendations for their use. This kind of technologies, which can be useful to close the gap between school and work context, could be very useful both for cultural axis and vocational area. Moreover, they could be employed in general education

APPENDIX A – Track of the semi-structured interview

Informazioni generali

- Che cosa insegna e da quanti anni?
- Ha fatto altri lavori prima?
- In che classi insegna?
- Per la classe terza qual è il carico orario settimanale di laboratorio?
- è tutor in qualche classe?
- Che importanza ha il ruolo di tutor in classe?

Materiali didattici

- Qual è la strumentazione di cui è dotato il laboratorio in cui insegna?
- Quali materiali didattici vengono impiegati per le attività di laboratorio (LIbri etc.)?
- Quali sono gli strumenti (tecnologici e non) a supporto dell'attività didattica che vengono impiegati/utilizzati individualmente dagli studenti in laboratorio?

Progettazione didattica

- Quali sono gli elementi su cui si basa la progettazione didattica? Su che cosa si basano le scelte?

Attività laboratoriali

- Può raccontare/descrivere una tipica giornata in laboratorio?
  - *Come vengono gestite le attività in laboratorio? (~~Lavoro di gruppo o lavoro individuale?~~)*
  - *Come è arrivato a strutturare queste attività?*
  - *Come vengono assegnati i compiti/esercizi agli allievi? con quale logica?*
- Che ruolo ha la manualità degli allievi nella sua materia?
  - *come viene allenata?*
- Durante le attività di laboratorio possono accadere problemi imprevisti (non dovuti ad errori degli allievi come guasti tecnici). Come è solito affrontare questi momenti? può farmi qualche esempio?
- Gli allievi come reagiscono di fronte ad un problema reale piuttosto che ad uno simulato?
- Che differenze riscontra tra il lavorare su di un simulatore e un macchinario reale in termini di apprendimento?
  - *quali sono vantaggi e limiti della simulazione? (del metodo che usa)*
- La cura per l'ambiente di lavoro (laboratorio)
  - che importanza ha?
  - quali sono i fini formativi?
- Ci sono particolari strategie o atteggiamenti che mette in atto per avvicinare le attività laboratoriali a quella che poi sarà l'attività lavorativa?
- L'attività di laboratorio prepara allo stage?
- A suo parere il laboratorio sarebbe pienamente sostituibile con lo stage o attività duale?

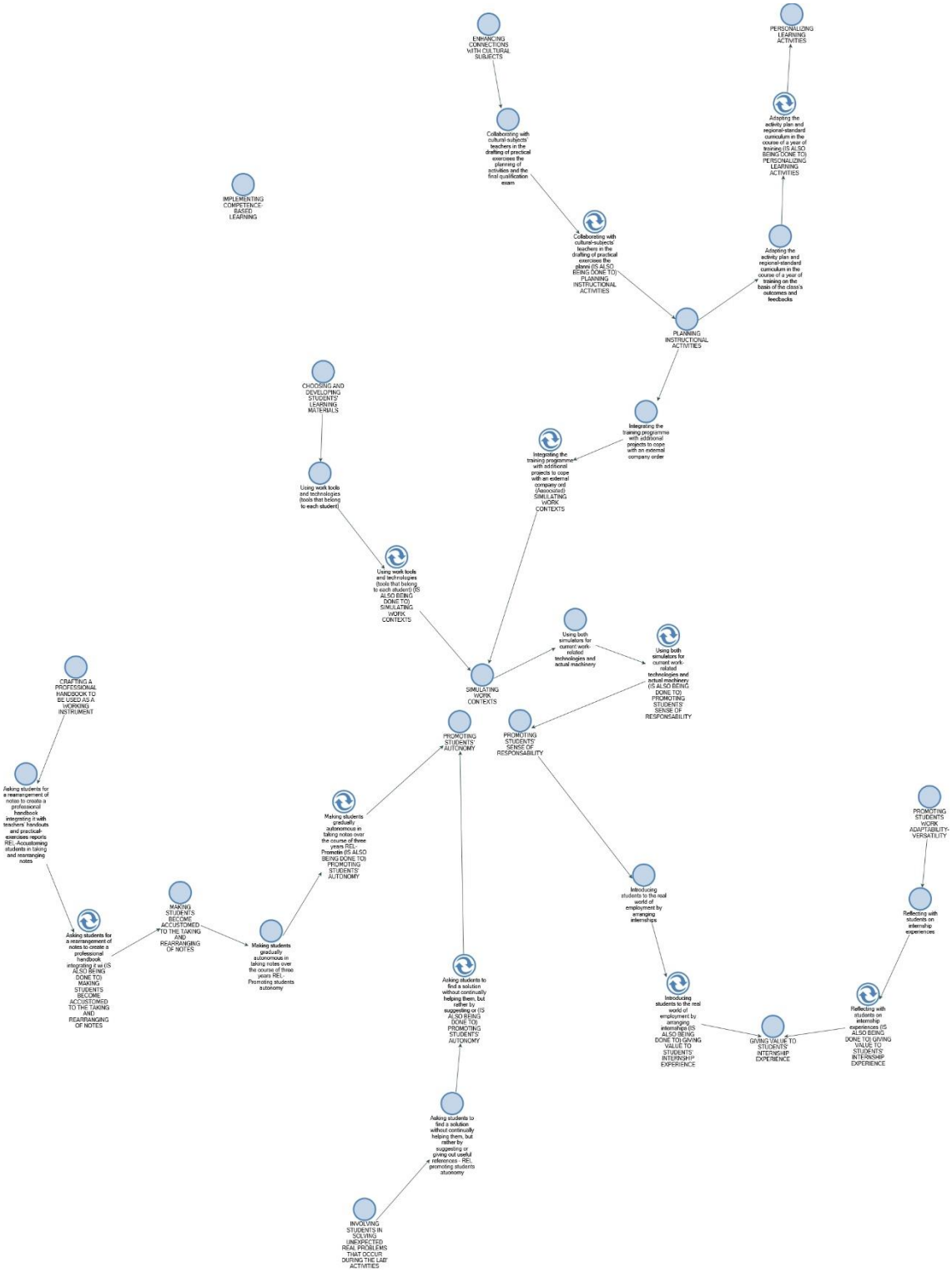
Link

- Ciò che gli allievi imparano dagli altri insegnanti (in particolare degli assi culturali) come possano facilitare l'apprendimento nella sua materia?
  - Può riportare qualche esempio pratico?
- Vice versa, come può essere utile ai docenti deli assi culturali ciò che gli studenti imparano in laboratorio?

Valutazione

- Secondo lei che ruolo ha la valutazione nei processi di apprendimento degli allievi quando questi sono in laboratorio?
- Come si può capire se un allievo ha imparato una procedura o se ha acquisito una competenza?
- C'è differenza tra preparare un allievo all'esame e preparare un allievo al mondo del lavoro? se sì, quale?

APPENDIX B – Categories relationships



APPENDIX C – Matrix Coding Results

		Sectors				
	Teachers	Electric	Mechanic	Energy	Graphics	Automotive
2 : CHOOSING AND DEVELOPING STUDENTS' LEARNING MATERIALS	**23**					
3 : Asking students to search for information and technical documentation thr	9	Yes	Yes	Yes	Yes	Yes
4 : Developing handouts ad hoc	18	Yes	Yes	Yes	Yes	Yes
5 : Developing handouts based on school handbooks (school-based handouts)	2	Yes	Yes	No	No	No
6 : Developing handouts based on the user guide about the machines which st	6	Yes	Yes	No	Yes	Yes
7 : Developing handouts with the students	3	Yes	No	No	Yes	No
8 : Integrating school-based and work-based learning materials	3	No	Yes	Yes	No	No
9 : Directly using the user guide about the machines that students ought to lea	6	Yes	Yes	Yes	No	Yes
10 : Frequently updating the learning materials	2	Yes	No	No	No	No
11 : Using traditional educational learning materials (school-based)	9	Yes	Yes	Yes	No	Yes
12 : Using work tools and technologies (tools that belong to each student)	12	Yes	Yes	Yes	Yes	Yes
13 : CRAFTING A PROFESSIONAL HANDBOOK TO BE USED AS A WORKING INSTI	**16**					
14 : Asking students for a rearrangement of notes to create a professional han	12	Yes	Yes	Yes	Yes	Yes
15 : Asking students to take care of their school notebooks	3	Yes	Yes	Yes	No	No
16 : Assessing the contents and the quality of school notebooks	4	No	Yes	No	Yes	No
17 : Collecting practical exercices	3	Yes	Yes	Yes	No	No
18 : Guiding students in organizing notes and teacher' handouts	6	Yes	Yes	Yes	Yes	No
19 : Using students' handbook during the practical exercices	4	Yes	Yes	No	No	No
20 : ENHANCING CONNECTIONS WITH CULTURAL SUBJECTS	**20**					
21 : Collaborating with cultural-subjects' teachers in the drafting of practical e	11	Yes	Yes	No	Yes	Yes
22 : Developing students' technical language_communication_and writing skil	8	Yes	Yes	Yes	Yes	Yes
23 : Employing the English users' guide	8	Yes	Yes	Yes	Yes	Yes
24 : Pointing out topics regarding cultural subjects to engage students' attenti	3	Yes	No	No	Yes	Yes
25 : Reflecting with students on the importance of cultural subjects in life	4	Yes	Yes	Yes	No	Yes
26 : Supporting the development of technical skills in connection with knowle	6	Yes	Yes	Yes	Yes	No
27 : GIVING VALUE TO STUDENTS' INTERNSHIP EXPERIENCE	**10**					
28 : Bringing innovation in host companies through the upgraded students skil	2	No	Yes	No	No	Yes
29 : Comparing internship experiences and previous training - confirming reci	5	Yes	No	No	Yes	Yes
30 : Selecting the host company for internship depending on the student aptit	2	Yes	Yes	No	No	No
31 : Visiting students during the internship	3	Yes	No	Yes	Yes	No
32 : IMPLEMENTING COMPETENCE-BASED LEARNING	**25**					
33 : Aiming at the development of competencies through the teaching of wor	9	Yes	Yes	No	Yes	No
34 : Answering the students' questions with other questions that foster logica	9	Yes	Yes	Yes	Yes	Yes
35 : Asking students for a logical storytelling about their work process - practic	6	No	Yes	Yes	Yes	Yes
36 : Enhancing connections between teorethical concepts and practice	4	Yes	Yes	No	No	Yes
37 : Reflecting with students on the importance of knowledge - e.g. definition	2	Yes	No	No	Yes	No
38 : Training students manual dexterity before to deal with topics which requi	12	Yes	Yes	Yes	No	Yes
39 : INVOLVING STUDENTS IN SOLVING UNEXPECTED REAL PROBLEMS THAT O	**24**					
40 : Asking students to find a solution without continually helping them, but r	11	Yes	Yes	Yes	Yes	Yes
41 : Considering mistakes and unexpected technical problems as a learning op	13	Yes	Yes	Yes	Yes	Yes
42 : Getting the students' attention by talking about problems that emerged i	5	Yes	Yes	Yes	No	Yes
43 : Including abilities related to problem-solving in the students' curricula	3	Yes	Yes	No	Yes	No
44 : Reflecting with students on good practices to prevent problems	5	No	Yes	Yes	Yes	No
45 : Searching for a solution with students through a technical dialogue	11	Yes	Yes	Yes	No	Yes
46 : MAKING STUDENTS BECOME ACCUSTOMED TO THE TAKING AND REARRAN	**21**					
47 : Asking students to transcribe theoretical lectures and practical demonstra	12	Yes	Yes	Yes	Yes	Yes
48 : Guiding students in the taking of notes	9	Yes	Yes	Yes	Yes	Yes
49 : Letting students choose how to take notes	11	Yes	Yes	Yes	No	Yes
50 : Letting students film lectures and practical demonstrations using mobile d	1	No	No	No	Yes	No
51 : Making students gradually autonomous in taking notes over the course of	8	Yes	Yes	Yes	Yes	Yes
52 : PERSONALIZING LEARNING ACTIVITIES	**10**					
53 : Actively supporting the students with special needs	3	No	Yes	No	Yes	No
54 : Assigning tasks and practical exercises depending on each single student''	5	Yes	Yes	No	Yes	No
55 : Assigning tasks and practical exercises depending on the students learnin	4	No	Yes	Yes	Yes	No
56 : Establishing the minimum level of skill that students must achieve	1	No	No	No	Yes	No
57 : Using educational Technologies to support special needs-students	1	No	No	No	Yes	No
58 : PLANNING INSTRUCTIONAL ACTIVITIES	**20**					
59 : Adapting the activity plan and regional-standard curriculum in the course	13	Yes	Yes	No	Yes	No
60 : Adapting the regional-standard curriculum to personal work experiences	12	Yes	Yes	Yes	Yes	Yes
61 : Collaborating with colleagues	2	No	Yes	No	No	No
62 : Focusing activities towards the final exam	4	Yes	No	Yes	Yes	No
63 : Focusing learning activities on product manufacturing and professional wo	2	No	No	No	Yes	No
64 : Integrating the training programme with additional projects to cope with	3	No	Yes	No	Yes	No
65 : Integrating the training programme with extraordinary activities - e.g., co	6	Yes	No	No	Yes	Yes
66 : Planning activities for the whole three-years program	1	No	Yes	No	No	No
67 : Referring to the standard curriculum indicated by professional association	1	No	Yes	No	No	No
68 : Sharing learning materials and experiences with collegues	1	No	Yes	No	No	No
69 : PROMOTING STUDENTS' AUTONOMY	**25**					
70 : Actively supporting students during practical exercices	9	Yes	Yes	Yes	Yes	No
71 : Gradually raising the difficulty level of the practical exercises	2	No	No	Yes	Yes	No
72 : Leaving students room to make mistakes	3	No	Yes	Yes	No	No
73 : Planning teamwork or individual activities depending on the characteristi	17	Yes	Yes	Yes	Yes	Yes
74 : Promoting and-or allowing peer learning and cooperation between stude	17	Yes	Yes	Yes	Yes	Yes
75 : Trusting students, by exert a light supervision, gradually letting them to w	11	Yes	Yes	Yes	Yes	Yes
76 : PROMOTING STUDENTS' SENSE OF RESPONSABILITY	**24**					
77 : Asking students to keep the learning environment tidy and clean	13	Yes	Yes	Yes	Yes	Yes
78 : Asking students to keep work tools and materials neatly organized during	13	Yes	Yes	Yes	Yes	Yes
79 : Asking students to take care of laboratory equipment and VET centre envi	9	Yes	Yes	No	No	Yes
80 : Assessing students' ability to keep the work environment organized	3	No	Yes	Yes	Yes	No
81 : Assigning roles to students and-or asking them to attribute roles within th	4	Yes	Yes	Yes	Yes	No
82 : Implementing work safety courses	2	Yes	No	No	No	No
83 : Introducing students to the real world of employment by arranging intern	4	No	Yes	Yes	Yes	No
84 : Promoting a suitable social and professional behaviour	11	Yes	Yes	Yes	Yes	No
85 : Reflecting with students about the consequences of their actions in the re	11	Yes	Yes	Yes	Yes	Yes
86 : PROMOTING STUDENTS WORK ADAPTABILITY-VERSATILITY	**13**					
87 : Finding the right balance between rigour and creativity in the course of ex	2	No	No	Yes	Yes	No
88 : Keeping students' attention focused on the work process instead of the te	7	Yes	Yes	Yes	No	Yes
89 : Making students become accustomed to asking the right questions	1	No	No	Yes	No	No
90 : Providing different versions of the same instruments or technologies to d	5	No	Yes	Yes	Yes	No
91 : Reflecting with students on internship experiences	5	Yes	Yes	No	No	Yes
92 : SIMULATING WORK CONTEXTS	**24**					
93 : Simulating company roles	13	Yes	Yes	Yes	Yes	Yes
94 : Simulating interactions with clients	3	Yes	No	Yes	No	No
95 : Simulating technical faliures and mistakes	6	Yes	Yes	Yes	Yes	Yes
96 : Simulating the characteristics of work environment	5	No	Yes	No	No	Yes
97 : Structuring lessons in work procedure simulations	6	Yes	Yes	No	Yes	No
98 : Using actual work machineries and softwares	10	Yes	Yes	Yes	Yes	Yes
99 : Using both simulators for current work-related technologies and actual ma	10	Yes	Yes	No	Yes	Yes
100 : Using the same kinds of simulators relied upon by employers	3	No	Yes	No	No	No

Connecting lines

- This study, in addition to having highlighted the definition of bridging technologies, has highlighted the value and complexity of instructional practices implemented by the VET-lab teachers
- In addition, reflection activities, together with collaborative learning, have been confirmed as important element for a pedagogical model centred on Work-oriented instructional practices.
- the same elements had already emerged from the review.
- On this basis, with the next study we want to test the use of a bridging technology, which provides tools for collaboration and for reflection, used in a context away from the workplace: the university.
- Does the bridging technology allows students reflect on practice even if they are far from the workplace?
- Do bridging technologies have a different effect depending on their functions?

STUDY 5 - Using Hypervideo to support students' reflections on work practices

Abstract

According to several exploratory studies, the HyperVideo (HV) seems to be particularly effective in highlighting the existing connections between the classroom and work context, between authentic work situations and theoretical subjects. In particular, the video annotation (an HV' feature) seems to facilitate the student's reflection on practices. Even though several researchers have already studied the efficacy of video annotation, studies concerning the qualitative differences between a reflection process activated by the use of video annotation and a reflection process activated without using it were not found. Therefore, the present study is focused on the reflective processes activated by two groups of students engaged in a higher education course oriented to the Vocational Education and Training (VET) sector while they carry out a reflective activity on work practices using the video annotation tool: how can the HV be useful for them in order to foster the connection between theoretical concepts and work practices? Through multi-step qualitative analysis which combined Thematic Qualitative Text Analysis and Grounded Theory approach, a sample of reflective reports drafted by a group of students who employed HV was compared with a sample of reflective reports drafted by a group who did not use it. The results emerged from the comparison of the coding frequencies between the students who did not use the video annotation (Group A) and the students who employed it (Group B) shows that reflective reports have peculiar characteristics. Furthermore, the category system emerged could be employed in different contexts (in research or teaching filed) to analyze the content of reflexive-reports on work practices.

Keywords

Hypervideo, Vocational Education and Training, Reflective Activities, Crossing Boundaries, Educational Technologies

Notes

The study reported in this section have been accepted for presentation at the *SFIVET - VET Congress 2019*

1 Introduction

Since the turn of the century, the world economy has constantly been in flux because of globalization and the rapid evolution of technology. In order to meet emerging challenges, policymakers have consistently tried to innovate their respective educational systems in order to effectively face and keep up with the demands of the labor market (Paplova, 2009). By way of example, the European Union (EU) introduced the Lifelong Learning program in 2006, which established a common framework of key competencies that member states had to aspire to in order to try and close the gap between educational and work contexts (European Council, 2006). Despite the educational reforms led by this intervention, the issue is still open. Indeed, the EU recently proposed a renewal effort to address this gap through a new set of recommendations on Key competencies (European Commission, 2018). The need to connect educational and work context is not new in the field of educational research. For example, the studies on educational practices, particularly those which are focused on VET-teachers instructional practices, are aimed to highlight the knowledge inherent in teachers work experience and make them available for in-training teachers (Lipari & Valentini, 2013; Mortari, 2010; Tacconi, 2011; Tacconi, Bekele, & Hunde, 2017; Tacconi & Gomez, 2010). Furthermore, one cannot avoid to cite the studies about community of practices which took place in the social sciences and organizational psychology field (e.g.Bruni & Gherardi (2007); Wenger (1998); Wenger, McDermott and Snyder M. (2002)).

According to Akkerman & Bakker (2011), two theoretical concepts that have a central role in describing potential ways for closing the gap between different learning locations are *boundary crossing*, and *boundary objects.* The concept of "Boundary crossing", introduced by Suchman (1994) and refined by Engeström et al. (1995), denotes how an expert worker or a practitioner may need to combine and negotiate elements belonging to different locations (e.g. routinely workplace, past learning situations, etc.) when she needs to challenge new and/or unfamiliar hybrid situations. Analogously, "*boundary objects […] both inhabit* [these] *intersecting social worlds […] and satisfy the informational requirements of each of them […] maintainin*[ing] *a common identity across the sites*" (Star & Griesemer, 1989, p. 393). The results of a literature review drafted by Akkerman & Bakker in 2011, through which they examinated a corpus of 181 papers to better understand the learning potential of boundaries, reveals reflection to be one of the four potential dialogical learning mechanism taking place at the boundaries, together with identification, coordination and transformation. In particular, reflection "is about expanding one's perspectives on the practices" (Akkerman & Bakker, 2011, p. 150).

1.1 Reflection, technologies and the Efrahrraum model

The relevance of reflection for better articulating the distances between different learning contexts has been enhanced also by more recent studies, which are not included in the review cited above (e.g. Schwendimann, et al., 2015; Bronkhorst & Akkerman, 2016; Perini, 2017). According to the conclusion of an ethnography study conducted into the VET healthcare context, the "reflective processes take place within a range of settings, contacts and through activities, many of which are initiated and enacted by the [participants] themselves" (Wegener, 2013, p. 471). The reflection process is a recurring element in several learning theories, in which it assumes different roles, as can be seen in the following synthetic examples:

a) according to the Dewey's (1933) experiential learning theories the reflective thought allows to verify the foundations of beliefs, and the validity of the routinely practices, as well as the knowledge on which they are based;
b) the four-stage experiential learning model developed by Kolb (1984), provides for a reflective observation phase, between the concrete experience and the abstract conceptualization phases;
c) according to Schön's (1987) views on the nature of the reflective practices, reflection allows to learn from unexpected outcomes and from events that come out of the routinely actions, activating the attention and creating a prerequisite for self-learning which takes place through reflection.

These and many others (e.g., Jarvis, 2009; Moon, 1999) theoretical frameworks define in great detail the role of reflection in learning processes, but, just taking a look at the encyclopedic definition attributed to reflection is possible to understand its role in the learning processes related to work and to the skills development:

> "Reflection plays an important role in experiential learning, both cognitively and metacognitively. It has been widely discussed in the literature as an important approach for promoting learning and higher order thinking skills, developing professional practices, and facilitating and structuring learning through experiences (Looi & Wu, 2015, p. 610)"

Technology is another element besides the reflection that is often identified in the literature as able to foster the *bridging function* between the working and school context, (Margaryan, 2008). As a matter of fact, the "Efrahrraum" is a pedagogical model (Schwendimann et al., 2015a), that *"consists of technology-enhanced spaces that facilitate conversations between work and school […] context in iterative loops* (Schwendimann et al., 2015a, p. 373)" in which the boundary-crossing between the contexts is allowed by a scaffolded space for

reflection on experiences. This model confirms the role of technologies as boundary objects, given that they "*could serve as bridges between the school and the workplace as well as between the actors of these different locations"* (Schwendimann et al., 2015a, p. 371). Furthermore, it highlights the reflection as a technology-scaffolded activity able to turn experiences into knowledge, without restrictions about the types of technology used for implementation. This model, like many of the studies concerning its bridging activity, has been developed in and for the VET context. The vocational education is a privileged location for studying this topic, especially within states that provide a dual-system (e.g. Germany, Switzerland, Austria, Denmark etc.) which allows students (apprentices) to carry out the curricular activities alternating in its different learning contexts: in the VET school (in the classroom) and in the workplace (working for a company) (Cattaneo & Aprea, 2018).

1.2 The Hypervideo and video annotation

According to several exploratory studies conducted within - but not only - the Swiss dual-system, the HyperVideo (HV) seems to be particularly effective in highlighting connections between classroom and work context, between authentic work situations and theoretical subjects (A. A. P. Cattaneo, van der Meij, Aprea, Sauli, & Zahn, 2018; A. Cattaneo & Nguyen, 2016; A. Cattaneo, Nguyen, Sauli, & Aprea, 2015; A. Cattaneo & Sauli, 2017; Sauli, Cattaneo, & van der Meij, 2018). Moreover, as claimed by (Cattaneo & Aprea, 2018; Schwendimann et al., 2015a) it seems particularly suitable for implementing the Efrahrraum model. In 2018 Cattaneo e C published a literature review which aimed at highlighting the concept and the use of HV. The outcomes of this analysis show that is not possible to draft a widely-accepted definition of HV. Nevertheless, the authors drawn the characteristics which distinguish the "classic" video and the HV. The features were split into two groups:

1) the fundamental features allow a non-linear video navigation (e.g. through segmentation or visual tables of content), advanced control features and the possibility to link or include additional material to it (e.g. documents, other videos, descriptions etc.);
2) the optional features allow to insert individual or collaborative video annotation and/or generate manual or automated feedback (Sauli et al., 2018).

All the second features' group "*allow reflection about the contents and deeper understanding, which is an important aspect of learning with videos*"(Sauli et al., 2018, p. 126). Particularly, according to several studies summarized by Cattaneo and Boldrini (2016), "*Video annotation facilitates individual reflection on practices, thereby supporting*

ex-post monitoring and evaluating processes, as well as anticipatory ones (Cattaneo, Nguyen, Sauli, & Aprea, 2015, p. 41)". As reported above, the efficacy of video annotation has already been studied by several researchers. At the same time, studies about the qualitative differences between a reflection process activated by the use of video annotation and a reflection process activated without using it were not found. Furthermore, the use of this particular kind of technology (HV) should be used also out of VET context, in order to foster the connection between different learning location, workplace, and school in particular.

2 Research aims and questions

It is thought that having more information about the qualitative features of the reflective process activated by the video annotation could support teachers and trainers - especially those on the Vocational Education and Training (VET) - in teaching design, because, in order to obtain an effective learning process support, technologies need to be adapted and contextualized depending on the learning context, as remarked by the Hattie metanalysis (2009). Therefore, the present study is focused on the reflective processes activated by the students while they carry out a reflective activity using the video annotation tool. This study aims to verify whether the use of this innovative teaching tool in a VET-oriented university context can stimulate learning processes that encourage reflection on working practices. So, the research question that guided the present study is the following:

- does the use of the video annotation, a feature of the HV, allow the students to activate a qualitatively different reflective practice compared to the reflective practice activated without the support of this technology?
- or better yet, how can the HV be useful for VET teachers and training operators to foster a connection between theoretical concepts and work practices?

This study represents the first, exploratory, phase of a wider research project aimed at discovering the potential of video-related technologies in VET-teacher education.

3 Methods

In order to answer the proposed question, given its descriptive nature, a Thematic Qualitative Text Analysis (TQTA) was conducted, because "thematic analysis is primarily a descriptive strategy that facilitates the search for patterns of experience within a qualitative data set" (Ayres, 2008, p. 867). Specifically, the analysis procedure for TQTA proposed by Kuckartz (2014) was employed. The choice fell upon Kuckartz's proposal because, unlike the classic version of TQTA (Ayres, 2008), it lends itself to a data-driven

approach. The topic under investigation is too detailed to use a qualitative methodology directly with a broad and generative outlook, such as the Grounded Theory (GT) (Glaser, Strauss, & Strutzel, 1968), and at the same time no theoretical models have been found in the relevant literature to be used as a reference point for the construction of the codebook. The analysis was carried out in two macro-steps: in the first step a codebook was drafted on the basis of the category system that emerged by analyzing a random sample of reflective reports in accordance with the GT approach; in the second step a larger sample of texts was codified through the coding scheme laid out in the codebook. After the analysis process, the coding frequency (in terms of number of words) of the texts belonging to the students who used iVideo was compared with those of the students who did not receive any indications regarding the software tools for carrying out the assignment. To this end, descriptive statistics, correlational analysis and T-test were employed. The next sections report the data collection and data analysis processes.

3.1 Context and participants of the study

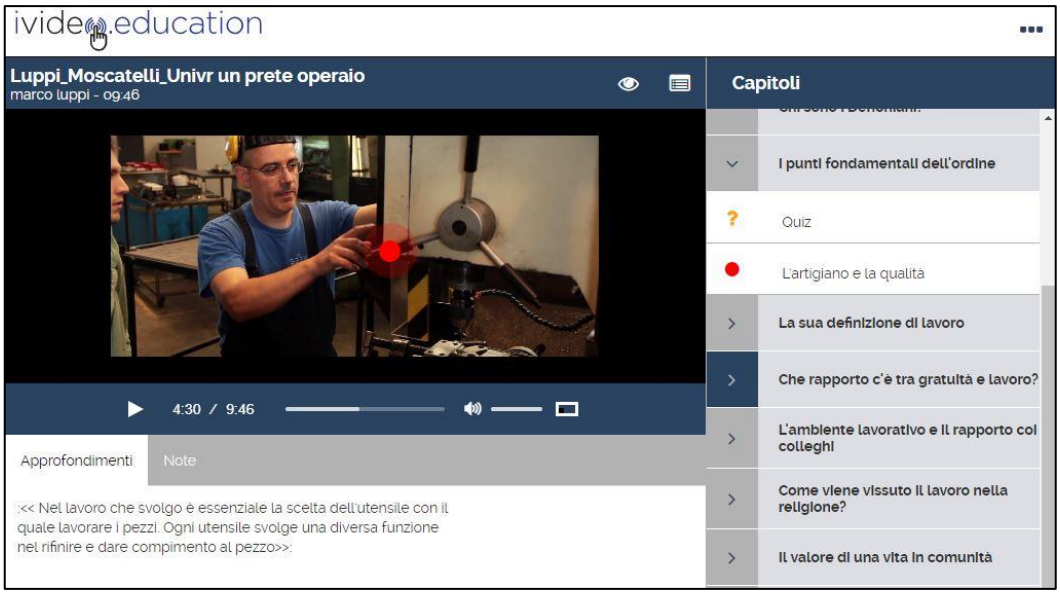
The context in which the present study took place is the bachelor course "Educational Sciences in Organizations" held at the University of Verona, during the academic years 2015/2016 and 2016/2017. Specifically, the study-setting is the module titled "Training didactics" which is scheduled for the first year of the course outlined above. The primary reason for this choice was that this course eventually gave to the students the opportunity to operate in the VET sector. Furthermore, the main objective of the module is to improve the course participants' knowledge and competencies by reducing the gap between the students and professional practices, in order to make the students capable of conceptualizing and designing appropriate instructional activities in accordance with the specific learning situations offered by the relevant work practices and the training courses linked to work contexts. Therefore, the training activities foreseen in the module have been chosen and designed in order to develop the students' skills in work-practice analysis, i.e., to achieve a deep understanding of the practices' crucial characteristics through a reflective approach, which in turn directs them in putting into words the new acquired knowledge (Tacconi, 2015). Both in the academic years 2015/2016 and 2016/2017, the final exam for the module was structured in three parts: 1) written exam, 2) oral exam, 3) project work completion. Each part of the examination is evaluated on its own merits by the teacher: the final grade of the module is made up of the sum of the grades pertaining of each section. The third part of the exam gave the students two options (between which they could choose). One of these two options asked the students to a) make a video on a work practice (a professional activity) and, b) draft a reflective report on the content of this video and the

thought process put in place during the video making. The assignment described above had different rules of implementation in the two academic years:

- the students of in the a.y. 2015/2016 (*Group A*) had to make the video and write the reflective report without receiving restrictions or suggestions;
- the students in the a.y. 2016/2017 (*Group B*) had to complete the same tasks using the "iVideo" software (2018).

Specifically, the second group had to make the video in the form of an HV and to draft the reflective report by inserting video annotations through the dedicated iVideo feature. The same *Group B* also participated in a training session on the HV and were assisted by a tutor in order to solve any technical problems that could arise. On the contrary, as previously mentioned, the students of *Group A* didn't receive any dedicated training or support.

Figure 1 – Screenshot of an Hypervideo



All the students involved (Group A and Group B) could choose the working method for video production, that is to say, teamwork or individual work. The students who chose to produce the video together with other peers also had to write a part of the reflective report individually. The students of *Group A* and *Group B* who chose to make the video and draft the reflective report (the option explained above) to carry out the third part of the exam were involved in the research. The Figure 1 shows a screenshot of HV, the Figure 2 shows an excerpt of reflective report drafted with the video annotation tool.

Figure 2 - An excerpt of reflective report drafted with the video annotation tool

3.2 Data collection

All the videos produced and the reflective reports drafted by the students of Group A and Group B were collected and cataloged. The materials of the students who did not comply with both the requests or who did not receive an evaluation on the same were not taken into consideration for the purposes of the study. All of the formats of the text files were checked and, if necessary, converted to ensure compatibility with Nvivo 11. The materials gathered with respect to each group have been divided into as many sub-groups, depending on the working methods employed by the students (teamwork or individual work). The following Table (Table 1) shows the numbers pertaining to the materials collected for each group. 197 reflective reports and 112 videos were collected altogether.

Table 1 – Collected data

Academic Year	Technology used	Sub-group	Students' Working Method	Amount of collected videos	Amount of collected reflective reports	Amount of selected videos
2015/2016	Gr. A (unspecified)	At	team work	38	84	14
2015/2016	Gr. A (unspecified)	Ai	Individual work	29	29	14
2016/2017	Gr. B (iVideo)	Bt	team work	30	69	14
2016/2017	Gr. B (iVideo)	Bi	Individual work	15	15	14

In addition to the materials submitted by the students, the grades attributed by the teacher to the students were also collected. Only the marks related to the third part of the exam described above were taken into account for the analysis because the other two parts concerned different contents and learning materials.

In order to define the corpus of data relevant for the analysis, the reflective reports of each sub-group were ordered from the lowest mark to the highest mark. After that, in every sub-group, 7 reflective reports with the highest grade and the 7 reflective reports with the lowest grade were selected for the analysis, for a total of 56 texts. The length of both the reflective texts (measured in words) and the corresponding videos (measured in seconds) was collected and added to the data set.

3.2.1 Step 1 – the codebook' drafting

As mentioned above, in order to outlying a codebook based on the students' reflective reports, a sample of 7 reflective texts was randomly taken out of the entire corpus of data. In accordance with the Corbin & Strauss' GT approach (2008), the selected reports were analyzed by following the *open coding* and *axial coding* procedures, which provide for the establishment of a category system based on data. The analysis was conducted pursuant to the following research questions: What are the characteristics of the reflective reports? What are the main topics discussed by the students in their reflective texts? The coding was carried out separately by two coders who generated two different sets of categories and coding. The two coders and a third member of the research team compared the sets of categories in order to obtain a unique and shared coding system through a process of dialogue. The obtained coding system – which is reported in Table 2 – is composed by a hierarchy of categories and sub-categories inductively based on data with 21 coding possibilities.

Table 2 – Category system emerged

Hierarchy of categories			
1st Hierarchy Level		**2nd Hierarchy Level**	**Category Label**
The Student	reports / Describes / Narrates	Work-related events	A
		education and / or training-related events	B
		Assignment-related events	C
	reflects on the job or the work (regarding)	the interviewee	D
		their work	E
		Work in general	F
	reflects on education and / or training (regarding)	regarding the interviewee	G
		their education and training	H

		education and training in general	I
	reflects on submitted assignments	reflective-report drafting	L
		videomaking (technical aspects)	M
		interview preparation and conducting	N
		post-production (editing etc.)	O
		cooperating with peers	P
		the assignment in general	Q
	reports on what the interviewee disclosed - through a description - about experiences regarding	work and personal life	R
		interpersonal relationships	S
	reports on what the interviewee disclosed - through a reflection - about experiences regarding	work and personal life	T
		interpersonal relationships	U
Cross-cutting categories*		the student refers to specific moments in the video or interview	V
		the student refers to the teaching module's contents	Z

* Unlike other coding possibilities, cross-sectional categories can be used by programmers on already encoded portions of text

On the basis of the hierarchy reported in Table 2, a guideline document for coders - a codebook - was drafted. The codebook contains the following elements: the coding procedure; the minimum size of the coding units; the category system; the description and explanation of categories and subcategories; examples of pieces of text coded using the procedure. The codebook (reported in appendix A) was tested and tuned up by the research team employing it on a sample of reflective reports which were randomly selected from the sources excluded from the corpus of analysis. Before proceeding with the coding of the sample, the two coders were involved in a intense training on the use of codebook and Nvivo 11 software: several tests were made to ensure that they understood the meaning of the categories and how to attribute them to the parts of the text.

3.2.2 Step 2 –The sample' coding

The 56 reflective reports selected for the analysis were distributed to the two coders and were analyzed separately using the Nvivo 11 software and following the codebook' guidelines. Three texts were analyzed by both the coders to check the intercoder agreement. Given the high number of coding options (21), the coefficient of interclass correlation through test F was calculated on the three texts' encodings using SPSS software. The intercoder agreement was confirmed as the coefficients resulted > 0.6 in all three cases and their mean was 0,801 (SD = 0.1583). After that, thanks to the *matrix coding* feature of Nvivo 11, the coding frequencies of all categories, in terms of words' number, have been obtained. The words' number was chosen as the unit of measurement because it could well

express the space dedicated by the students in the reflective reports to the topics identified through the categories. All the emerged data were organized into a data set which was then analyzed using SPSS software. The use of quantitative analysis methods reported below does not have the ambition to generalize the results of this explorative study, but to provide a precise and detailed answer to the research question and to highlight also unexpected outcomes, which are not inherent to the research question, but still interesting for the research topic.

4 Results

4.1 Reflective reports and corresponding video characteristics

Descriptive statistics (means (M) and standard deviations (SD)) about the characteristics of reflective reports and corresponding videos split into group A and group B are reported in Table 3.

Table 3 –Report and video characteristics split into Group (A and B) and subgroups (At, Bt, Ai, Bi)

	Sub-group/group	**N**	**M**	**SD**
Video Time (in seconds)	At	14	779,64	295,189
	Ai	14	847,50	326,643
	A	**28**	**813,57**	**307,442**
	Bt	14	625,14	155,593
	Bi	14	595,57	216,685
	B	**28**	**610,36**	**185,714**
Reports' length (Words number)	At	14	1315,71	311,955
	Ai	14	1265,93	425,771
	A	**28**	**1290,82**	**367,127**
	Bt	14	611,36	384,896
	Bi	14	919,29	604,213
	B	**28**	**765,32**	**521,237**

Looking at the differences between the group means, the Group B condition (the use of HV and video annotation) seems to affect the video duration and reflective report length. The Pearson coefficients confirmed the presence of a correlation both between video length and study group conditions (r (56) = - .377, p < .005) and between the latter and report length (r (56) -.510, p < .001). On the contrary, the correlation between video and report length is not significant (r (56) .112, p = .372). The independent-sample T-test and the effect-size coefficient confirmed the trend:

- there was a significant difference in the video length for Group A and Group B conditions; $t(54) = 2.994$, $p < 0.01$, $d = 0.800$
- there was a significant difference in the report length for group A and Group B conditions; $t(54) = 4.362$, $p < 0.001$, $d = 1.166$

Significant correlations between working methods employed by the students (teamwork or individual work) and the video-time or the reports' length were not found.

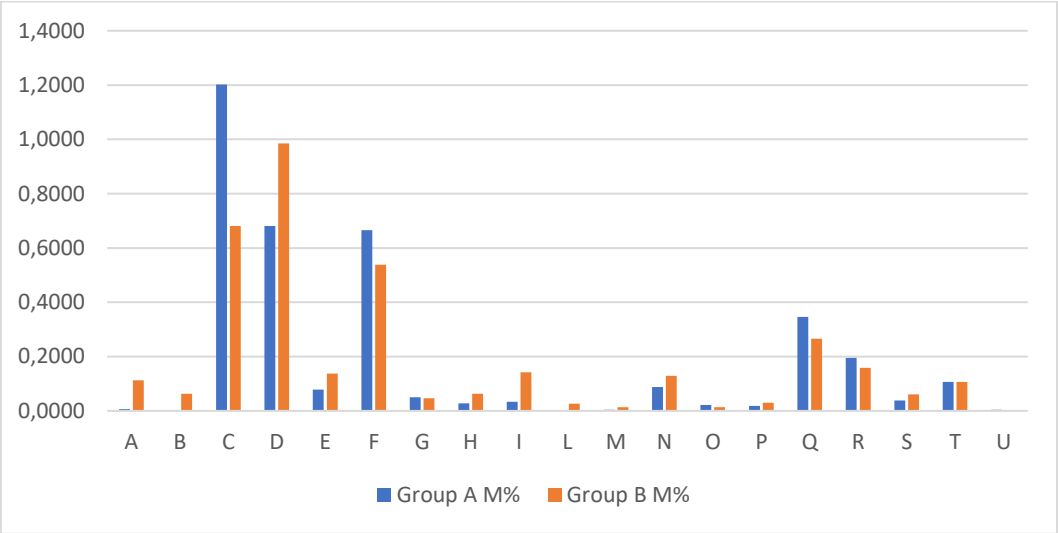
4.2 Frequencies of the coding categories

Due to the difference between the resources of group A and B, the frequencies of the coding words in each group needed to be uniform in order to allow the comparison to take place. To this end, the percentage of coded words in each category has been calculated based on the number of coded words for each group individually. Given the peculiarities of the cross-cutting categories V and Z, the percentages referring to the same have been calculated separately. Table 4 reports the descriptive statistics about the categories' coding frequencies split into group A and group B: the sum, the mean, and the standard deviation of coded words (∑, M, SD), and the respective uniformed values for the purpose of a comparison (∑%, M%, SD%). Looking at the combination of M% of group A and B, that is highlighted in Figure 3, several differences between group A and B can be observed.

Table 4 – Descriptive statistics concerning coding frequencies of the coding categories

Category label	GROUP A						GROUP B					
	Σ	M	SD	Σ%	M%	SD%	Σ	M	SD	Σ%	M%	SD%
A	62	2.2143	11.7169	.1830	0.0065	.0346	663	23.6786	86.0715	3.1540	.1126	.4095
B	33	1.1786	6.2364	.0980	0.0035	.0185	368	13.1429	56.0877	1.7510	.0625	.2668
C	11384	406.5714	183.7652	33.6510	1.2018	.5432	4011	143.2500	135.9372	19.0820	.6815	.6468
D	6449	230.3214	155.0544	19.0600	.6807	.4584	5799	207.1071	180.2684	27.5900	.9854	.8577
E	741	26.4643	50.3650	2.1910	.0783	.1490	806	28.7857	86.8811	3.8350	.1370	.4134
F	6302	225.0714	194.1246	18.6270	.6653	.5738	3165	113.0357	148.1392	15.0590	.5378	.7048
G	478	17.0714	33.7199	1.4130	.0505	.0997	277	9.8929	16.9735	1.3180	.0471	.0808
H	261	9.3214	44.1547	.7720	.0276	.1306	372	13.2857	45.5110	1.7690	.0632	.2164
I	316	11.2857	35.2618	.9330	.0333	.1042	833	29.7500	46.4532	3.9650	.1416	.2211
L	0	.0000	0.0000	.0000	.0000	.0000	154	5.5000	21.6820	.7320	.0261	.1031
M	42	1.5000	4.9103	.1250	.0045	.0146	81	2.8929	10.7267	.3860	.0138	.0511
N	836	29.8571	47.8336	2.4720	.0883	.1414	757	27.0357	60.9155	3.6020	.1286	.2899
O	208	7.4286	21.1843	.6150	.0220	.0626	77	2.7500	10.6549	.3670	.0131	.0508
P	178	6.3571	17.9283	.5270	.0188	.0531	177	6.3214	20.9674	.8420	.0301	.0997
Q	3282	117.2143	100.6377	9.7030	.3465	.2974	1566	55.9286	60.8446	7.4490	.2660	.2895
R	1848	66.0000	73.9124	5.4630	.1951	.2185	932	33.2857	56.4983	4.4350	.1584	.2689
S	358	12.7857	29.3350	1.0580	.0378	.0867	356	12.7143	31.1280	1.6920	.0604	.1480
T	1009	36.0357	53.7618	2.9820	.1065	.1589	625	22.3214	37.6770	2.9730	.1062	.1792
U	43	1.5357	8.1262	.1270	.0045	.0240	0	.0000	0.0000	.0000	.0000	.0000
Σ	33830			100			21019			100		
V	1287	45.9643	53.2642	27.9540	0.9984	1.1569	1516	54.1429	64.6694	38.1740	1.3634	1.6285
Z	3317	118.4643	104.6360	72.0490	2.5732	2.2728	2455	87.6786	104.2590	61.8230	2.2080	2.6254
Σ	4604			100			40967			100		

Figure 3 – Uniformed means comparison



Statistics were employed to underline the main differences in this instance as well. In particular, a correlation matrix has been employed to highlight the principal correlations between variables, and a T-test was used to confirm the differences between the Groups. According to the results of the correlation matrix (Appendix B), the categories "C" (r (56) = - .406, p < .005) and "I" (r (56) = - .304, p < .005) have a significant correlation with the use of video annotation. Even the correlation with category "D" (r (56) = - .220, p =0.103) was taken into account because its p-value is closer to 0.05 than the other categories. The independent sample T-test was applied to the categories highlighted above to verify the hypothesis: Group A ≠ Group B. The effect size value was also calculated. As shown in Table 5, this hypothesis is thus confirmed for categories C and I. This means that there is a significant variation in the number of coded words between the groups both for category C (p= .002) and for category I (p= .023). The hypothesis is not formally confirmed for category D (p= .103), but, given that the p-value is marginally significant, that the value of Cohen's d suggest a slight effect (d= -.443), the difference between Group A and Group B for this category were taken into account.

Table 5 - Independent Samples Test for Equality of Means

	T	**df**	**p**	**Cohen's d**
C	3.260	54	.002	.871
I	-2.345	54	.023	-.627
D	-1.658	54	.103	-.443

Descriptive statistics also show that the means of cross-cutting categories (V and Z) are greater for Group B than for group A, but the correlation coefficient didn't result significant for any of the two.

4.3 Characteristics of analyzed reflective reports

Given the exploratory nature of this study, it is also useful to report the information that emerges from the analysis that does not respond directly to the research question. The present section shows what emerged from the data analysis concerning the characteristics of the reflective reports. Looking at the correlational analysis results matrix (Appendix B), information about how students refer to specific video and / or module's contents emerged. As a matter of fact, significant correlations between cross-cutting categories and the other categories emerged. In accordance with the statistical analysis results, there is a positive and significant correlation between the category that identifies the excerpt where students refer to a specific moment of the related video or interview (V) and the following categories:

- "The student reflects on the job or the work regarding the interviewee" - Category D - ($r(56) = .548$, $p < .001$)
- "The student reflects on the job or the work in general" - Category F - ($r(56) = .454$, $p < .001$)
- "The student reflects on submitted assignments in general" - Category Q - ($r(56) = .294$, $p < .05$)
- "The student reports on what the interviewee disclosed - through a description - about experiences concerning work and personal life" - Category R - ($r(56) = .502$, $p < .001$)

There is a significant and positive correlation even between the categories D ($r(56) = .456$, $p < .001$), F ($r(56) = .604$, $p < .001$) and R ($r(56) = .325$, $p < .015$) and the cross-cutting category Z (the student refers to the teaching module's contents). Looking at the correlations between the variables "Work capacity (individual / team)" and "Student marks (Lowest / highest)", more information emerged. The correlations between the students' working method and categories didn't result significant under any case. On the contrary, there are significant and positive correlations between the student marks and the following categories: C ($r(56) = .270$, $p < .05$), D ($r(56) = .459$, $p < .001$), F ($r(56) = .345$, $p < .01$) and O ($r(56) = .269$, $p < .05$). There is a significant correlation even with the cross-cutting categories V ($r(56) = .383$, $p < .004$) and Z ($r(56) = .360$, $p < .006$). The results of T-test reported in Table 6 also confirm a significant correlation between the group of students with higher marks and the categories already mentioned.

Table 6 – Descriptive statistics and T-test results for equality of means

Marks	Lowest			Higher			T-test results
	M	N	SD	M	N	SD	
C	,76843	28	,570907	1,114893	28	,682298	t(54) = 2.061, p < 0.05
D	,51518	28	,465883	1,150893	28	,753174	t(54) = 3,798 p < 0.001
F	,38271	28	,479456	,820357	28	,710866	t(54) = 2,701 p < 0.01
O	,00243	28	,012851	,032643	28	,076818	t(54) = 2,053 p < 0.05
V	,64504	28	,865594	1,716679	28	1,647692	t(54) = 3,047 p < 0.01
Z	1,52039	28	1,911346	3,260750	28	2,627497	t(54) = 2,834 p < 0.01

5 Discussions

By cross-referencing all the results concerning the reflective reports and the corresponding video characteristics, we could deduce that the students who completed the task employing HV and video annotation (Group B) produced videos and reports that were shorter than the students who completed the tasks employing unspecified tools (Group A). This outcome suggests that the students Group B followed the guidelines proposed during the training on HV which suggest an average duration of 3 to 5 minutes (A. Cattaneo & Sauli, 2017). This element confirms that the HV' editing features (e.g. the possibility to add links, information and attachments in particular times of the video) lead the user to produce videos which are more concise but richer of information than a standard video.

With regard to the frequencies of the coding categories, according to the emerged pieces of evidence, the use of HV technology led students to edit videos and to draft reflective reports differently. As a matter of fact, comparing the results of the T-test with descriptive statistics, it seems that the students who used HV and its features to carry out the assignment focused on describing assignment-related events significantly less than the students who didn't use this specific educational technology (category C). On the contrary, the students who used HV focused their reflective activity on the topic of education and training significantly more than the other group of students (category I). Furthermore, even if the T-test results are only marginally significant, the use of HV seems to facilitate students in reflecting on the interviewee' work activities (category D). On this basis, it can be deduced that on one hand the group of students who used video annotation allowed more room and paid more attention to reflection activities than the other group, on the other and, the group that didn't use the video annotation kept more attention to descriptions. This outcome could be due to the fact that the use of video annotation forces the users to write the reflective reports while they are watching the video. In this way, the students may could pay more attention to the reflective thinking as they did not need to remember the contents

of the video. This outcome also confirms that the cognitive load theory (e.g. Sweller, 1988, 2011) has implication in HV and instructional design, as highlighted by several authors (Bonaiuti, 2012; Bonaiuti, Calvani, Menichetti, & Vivanet, 2017; A. A. P. Cattaneo et al., 2018; Sauli et al., 2018).

The following information emerged by looking at the outputs regarding the characteristics of analyzed reflective reports regardless of the groups' conditions. Descriptive statistics reported in Table 4 and Figure 3 show that the students focused their reflective reports mainly on the description of the events related to the assignment (category C), the reflection on the work of the interviewee (Category D) and, the reflection on the work in general (Category F). This output suggests that the students of both groups well understood teachers' requests, given the compliance of the latter with the reflective-report' contents. The significant correlations between the cross-cutting categories and topics also suggest that this kind of assignment allow students to connect their reflections, and their learning processes, with work practices and modules contents. Moreover, the significant correlation between the performance level of the students and the categories V (the student refers to specific moments in the video or interview) and Z (The student refers to the teaching module's contents) suggests that the specific characteristics of the assignment (i.e. the combination of the video production and the written reflective activity) allowed the best students to get closer both the work practice and the theoretical contents of the course. Moreover, this result – which has also confirmed by the triangulation with descriptive statistics and the independent-sample T-test – could prove the validity of the task evaluation process carried out by the teacher, considering that the students who have most adhered to the assignment have received an average higher grade.

5.1 Limitations and implications for further research

The results of this study were limited by the following factors:

- because of the lack of additional coders available, not all the collected data were analyzed, forcing the researcher to restrict the data-corpus of the analysis
- the students' grades concerning the whole exam were not taken into account in the data analysis. This element could have provided an additional piece of information regarding the performance of the students;
- All the participants who carried out the assignment, did it on a voluntary basis, as the realization of the video was not mandatory. This automatically excluded all the students who were not motivated for - or frightened of - the use of technology.

6 Conclusions

As shown in the section before, the results of the statistical analysis highlighted two sets of information. The first set answers the research question about the use of HV and video annotation, while the second provides new elements concerning the use of reflective activities and video technologies regardless of their specific characteristics - to better articulate the gap between education and work context. Furthermore, the category system emerged from the first macro-step is composed of a hierarchy of categories and sub-categories inductively based on data with 21 coding possibilities. This coding system could be considered one of the study outcomes because it could be employed in different contexts (in research or teaching filed) to analyze the content of work practices reflexive-reports. In summary, the use of HV and video annotation seems to allow students to better center their focus on reflection instead description and the efficacy of the use of video as educational technology, already outlined by the Hattie (2009) meta-analysis results, have been confirmed. Furthermore, in line with the Efrahrraum model (Schwendimann et al., 2015b), the effectiveness of the technology and reflexive activity combination effectiveness in VET-related learning contexts have been highlighted: the use of video associated with a reflective activity allows students to improve pedagogical skills, approaching at the same time specific vocational skills, going beyond the boundaries of the classroom learning context. So, ultimately, the HV and video annotation could be considered an appropriate tool for supporting instructional activities in higher education courses concerning the VET field.

Appendix A – The Codebook

Guidelines for reflective reports coding

Il presente documento è stato pensato con un duplice fine: facilitare l'analisi e la codifica dei testi ai coder e garantire rigore metodologico alla ricerca. Pertanto si consiglia di leggerlo attentamente prima di iniziare la codifica dei testi riflessivi e di tenerne una copia stampata sotto mano durante la codifica.

Unità minima di codifica: l'unità minima di codifica è una frase di senso compiuto (la frase deve avere un senso anche quando presa singolarmente). Pertanto non possono essere codificate singole parole o pezzi di frase.

Procedura:

- Aprire il progetto Nvivo e fare il login con il proprio nome e codice user (vedi "tabella Coder")
- Aprire un documento non ancora codificato
- Assicurarsi che Nvivo evidenzi solo le parti di testo già codificate dal coder che sta effettuando l'analisi. Per fare questo, cliccare su *view* ➔ *Highlight* ➔ *coding for selected Items*… ➔ *Highlight coding by* (cliccare sulla freccia del menu a tendina) ➔ *Current User.* Questa impostazione va inserita soltanto nel caso in cui il testo sia già stato codificato da un altro coder.
- Leggere una prima volta il testo attribuendo soltanto i nodi trasversali (se rilevati). Inoltre, individuare qual è il lavoro dell'intervistato, cioè la professione oggetto di indagine. Questo permette di prendere familiarità con lo stile di scrittura dell'autore del testo e di effettuare una codifica attenta e accurata.
- Leggere il testo una seconda volta, codificando soltanto i passaggi di cui si è assolutamente certi e che non presentano particolari ambiguità, senza codificare le frasi su cui si hanno dei dubbi. In questa fase può essere d'aiuto consultare il "grafico gerarchia" e la "tabella nodi": si consiglia di tenerne una copia cartacea sotto mano e di scorrerlo prima di assegnare ogni nodo.
- Leggere il testo una terza volta concentrandosi sui passaggi dubbi lasciati senza codifica. Nel caso di particolari difficoltà si invita a seguire i seguenti passi per ogni frase dubbia:
    - Rileggere i passaggi precedenti e successivi alle frasi in questione per capire il contesto in cui è inserita
    - Identificare i nodi a cui potrebbero essere attribuite le frasi dubbie
    - Scorrere la gerarchia dei nodi aiutandosi con il "grafico gerarchia" e identificare il punto in cui c'è un dubbio di attribuzione
    - Consultare la "tabella nodi" per vedere se le spiegazioni dei nodi e gli esempi riportati possono fare chiarezza e chiarire il dubbio (i codici attribuiti ai nodi dovrebbero rendere più agevole la consultazione del grafico e della tabella).
    - Solo nel caso in cui non si riesca ad assegnare una categoria alla frase in questione, codificarla con il nodo "Incerto". Tutti i testi codificati con questo nodo verranno poi discussi assieme agli altri coder.
- Si ricorda che l'attribuzione dei nodi trasversali va sovrapposta agli altri nodi. In altre parole, una volta attribuito un nodo trasversale ad una frase o ad un gruppo di frasi, queste possono essere codificate anche con altri nodi
- Una volta terminata la codifica di un documento, attribuire il proprio colore al documento codificato (se il testo è già stato codificato da un altro coder, saltare questo passaggio.

Tabella coder

Nome coder	Abbreviazione	Colore
Coder 1	C1	BLU
Coder 2	C2	GIALLO

Si ricorda che le frasi vanno codificate utilizzando solo i nodi di livello più basso (quelli contrassegnati con una lettera), gli altri hanno lo scopo di guidare la codifica al fine di identificare il nodo più appropriato.

Grafico Gerarchia

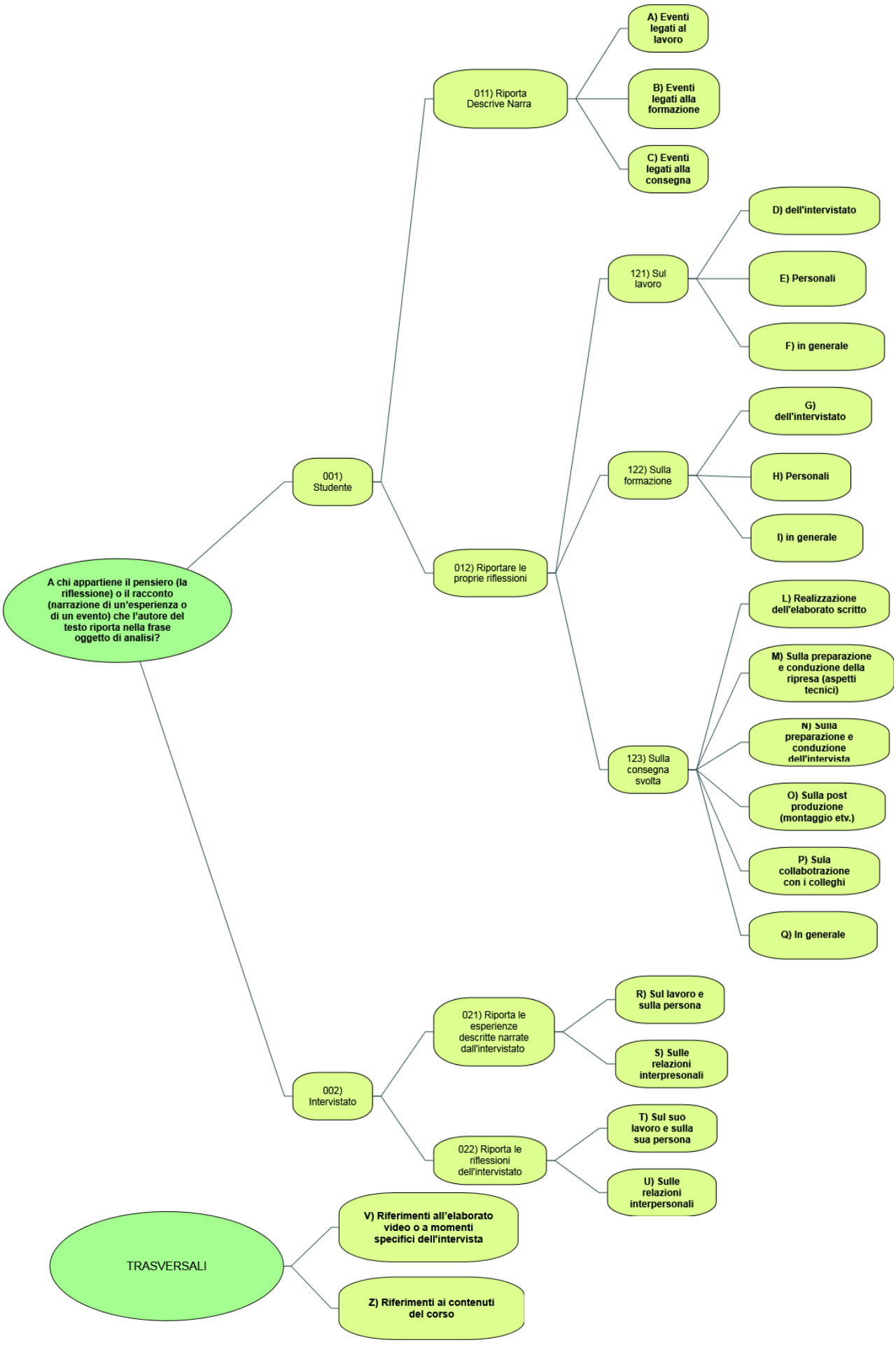


Tabella nodi

Domanda di apertura: A chi appartiene il pensiero (la riflessione) o il racconto (narrazione di un'esperienza o di un evento) che l'autore del testo riporta nella frase oggetto di analisi?			
001	Lo stesso **studente**		Lo studente (autore del testo) scrive facendo riferimento a sé stesso o al suo gruppo di lavoro, riportando le proprie riflessioni o eventi che ha vissuto (nel passato o durante lo svolgimento della consegna - esperienze vissute).
011	**riporta** e/o **Descrive** e/o **Narra**		Il testo si limita a riportare, descrivere, narrare eventi ed esperienze dello studente, senza aggiungere riflessioni/considerazioni personali
A		<u>*eventi legati al lavoro*</u>	• Fa riferimento a eventi legati al lavoro, eventi che può aver vissuto in prima persona o eventi vissuti da altre persone (escluso l'intervistato) <u>Esempi:</u> *"Mi viene in mente per esempio quando nel mio ruolo di cassiera mi trovo ad avere a che fare con i più svariati problemi che possono andare dal dover affrontare e gestire la coda alle casse e la diversità tra le esigenze dei clienti (dal più frenetico o ansioso che teme di intralciare o che semplicemente ha fretta, al più calmo che invece desidera riordinare la spesa con tranquillità) ad un codice di un prodotto che la cassa non riconosce."*
B		<u>*eventi legati alla formazione*</u>	• Fa riferimento a eventi legati alla formazione, eventi che può aver vissuto in prima persona o eventi vissuti da altre persone (escluso l'intervistato) <u>Esempi:</u> *"Per quanto riguarda la mia esperienza sin da subito non ho avuto problemi a dar senso a ciò che facevo. Diciamo che raggiungendo il termine della scuola superiore ho attraversato un periodo per me un po' cupo in cui trovavo poca soddisfazione in tutto ciò che facevo per problemi di altro tipo che mi distraevano dal dare importanza e priorità alla mia formazione. Sapevo di voler proseguire gli studi ma non sapevo che strada seguire. Nel frattempo per non restare immobile nel vuoto in cui mi sentivo ho cercato lavoro e sono stata contatta dopo pochi mesi, quando tra l'altro avevo già cominciato la carriera universitaria"*
C		<u>*eventi legati alla consegna*</u>	• Fa riferimento a eventi legati allo svolgimento della consegna (preparazione dell'intervista, realizzazione delle riprese, montaggio del video, scrittura del testo riflessivo etc.) <u>Esempi:</u> *"Grazie a questa ho avuto modo di potermi confrontare con una persona che ha una grande esperienza lavorativa, specialmente nel settore in cui opera, in questo caso quello dell'estetica, e prima d'ora non avevo mai avuto la possibilità di fare ciò, e chiarire così dei dubbi e apprendere nuovi aspetti del mondo del lavoro; ho colto quindi questa opportunità di lavoro con molto interesse e curiosità."* *"Io ho avuto il compito di montare il video e migliorarlo graficamente quanto più possibile. Avevo già avuto in precedenza qualche esperienza di questo genere, quindi sapevo come orientarmi, ma ho comunque deciso di chiedere qualche consiglio a qualcuno più esperto di me che potesse suggerirmi un programma migliore da utilizzare e potesse svelarmi qualche trucco per rendere*

						il lavoro più semplice ma allo stesso tempo efficace. Così ho avuto modo di imparare nuove tecniche per creare video e di sperimentare nuovi programmi multimediali. Purtroppo sono andato incontro a delle difficoltà, infatti ho dovuto rielaborare il video due volte, dato che il primo programma ("Filmora") che avevo utilizzato non mi permetteva di salvare il video senza che il nome stesso del programma venisse sovrapposto alle riprese. Allora sono ricorso a "Windows Movie Maker" e ho cercato di riprodurre il filmato seguendo le linee generali che avevo già impostato durante il primo tentativo. Per quanto riguarda il lavoro di gruppo non sono stati riscontrati problemi, anzi è stata un'agevolazione, perché abbiamo potuto confrontarci e discutere su come sarebbe stato meglio procedere e inoltre è stato decisivo per la scelta del soggetto da intervistare."
012		**riporta le proprie riflessioni**				Il testo riporta considerazioni personali e/o interpretazioni dello studente (autore del testo) su diversi temi, nello specifico: sul lavoro, sulla formazione e sullo svolgimento della consegna (predisposizione intervista, somministrazione e ripresa dell'intervista, montaggio del video).
121			**sul** tema del **lavoro** …			Le riflessioni fanno riferimento al tema del lavoro.
D				*<u>dell'intervistato</u>*		• Le riflessioni fanno riferimento a considerazioni personali dello studente (autore del testo) rispetto al lavoro dell'intervistato. Ad esempio riconosce il lavoro dell'intervistato, discute le sue caratteristiche etc. <u>Esempi:</u> *"Dal modo in cui Giulia spiega cosa significa per lei essere dietro quel bancone a servire la gente si capisce che ha ben chiaro come comportarsi e come dietro quel bancone non ci sia solo Giulia-lavoratrice ma anche Giulia-persona, o meglio donna."* *"Dal modo in cui Giulia spiega cosa significa per lei essere dietro quel bancone a servire la gente si capisce che ha ben chiaro come comportarsi e come dietro quel bancone non ci sia solo Giulia-lavoratrice ma anche Giulia-persona, o meglio donna."*
E				*<u>personali</u>*		• Le riflessioni fanno riferimento a considerazioni personali (su sé stesso) dello studente (autore del testo) rispetto al tema del lavoro. Ad es. cambi di prospettiva, riconoscimento del valore di un lavoro svolto in passato etc. <u>Esempi:</u> *"Ancora oggi posso dire che l'entusiasmo non si è affievolito, anzi rendetemi conto dei miglioramenti e della manualità e soprattutto della capacità di "problem solving" che ho appreso col passare del tempo mi dà molto entusiasmo e mi fa sentire sempre più un pezzo costruttivo dell'insieme."* *"il "pensare i pensieri" ossia una meta-riflessione che ci porta a creare sapere sull'esperienza analizzando il pensiero che seguiamo per arrivare a una soluzione (come quando in una situazione di disagio trovi il modo per uscirne e poi rifletti su come ci sei riuscito in modo che se dovesse ricapitare sapresti già come comportarti)."*

F					*<u>in generale</u>*	• Le riflessioni fanno riferimento al tema del lavoro in generale, <u>senza</u> fare riferimento al lavoro presente, passato o futuro dello studente (l'autore del testo) o al lavoro dell'intervistato. Ad esempio riporta riflessioni sul valore sociale del lavoro, sulla difficoltà di accesso etc. <u>Esempi:</u> *"Secondo il mio punto dl vista, ha fatto emergere come l'impiego di lavoratrici e lavoratori si preoccupi della loro formazione e valorizzazione, e che le persone stesse siano meno motivate a sviluppare una appartenenza organizzativa, cosa che porta ad una perdita di conoscenza a livello sia individuale che collettivo."* *"La realizzazione di sé, che comprende il soddisfacimento di bisogni fisiologici, relazione e associazione con gli altri sono gli elementi necessari alla strutturazione del se e il contesto in cui tutto ciò è realizzabile è proprio l'ambiente lavorativo, in quanto contesto di confronto sociale e crescita personale."*
122			sul tema della **formazione** …			Le riflessioni fanno riferimento al tema della formazione.
G					*<u>dell'intervistato</u>*	• Le riflessioni fanno riferimento a considerazioni personali dello studente (autore del testo) rispetto al percorso formativo dell'intervistato. Ad esempio riconosce come la formazione abbia avuto un ruolo fondamentale sulla sua professionalità, sull'importanza del continuare a formarsi etc.. <u>Esempi:</u> *"Tornando alla storia di Elena, lei fu molto fortunata a trovare una persona che fosse disposta ad insegnarle il mestiere partendo da zero e che fosse pronta ad accoglierla e a prepararla al mondo del lavoro, oggigiorno occasioni simili sono molto rare."* *"Il lavoro probabilmente non l'ha formata e cresciuta solo a livello professionale ma anche a livello personale portandola a ragionare, agire e progettare come una persona adulta nonostante fosse ancora una ragazzina."*
H					*<u>personali</u>*	• Le riflessioni fanno riferimento a considerazioni personali (su sé stesso) dello studente (autore del testo) rispetto al tema della formazione. Ad es. cambi di prospettiva rispetto al proprio percorso formativo, riconoscimento o mancato riconoscimento del percorso formativo fino ad ora svolto etc. <u>Esempi:</u> *"Mettendomi a confronto con l'intervistato ho capito il valore della formazione e mi ha motivato a procedere con più convinzione in questo percorso universitario"*
I					*<u>in generale</u>*	• Le riflessioni fanno riferimento al tema della formazione in generale, <u>senza</u> fare riferimento al percorso di studi intrapreso, a quello passato o a quello futuro dello studente (l'autore del testo) o alla storia formativa dell'intervistato. Ad esempio riporta considerazioni sull'importanza di investire sulla formazione, sull'importanza di una formazione anche di stampo culturale etc.

					Esempi: *"Inoltre è stato utile ascoltare ciò che l'intervistata aveva da dire riguardo al suo orientamento alla scuola e al lavoro per potermi creare un modello mentale di confronto tra le modalità di allora e quelle di oggi"* *"Questo mi ha fatto capire che dopotutto non è cambiato molto il modo di rapportarsi rispetto all'orientamento alla scuola superiore"*
123			**sulla consegna svolta**		Le riflessioni fanno riferimento alle attività che hanno reso possibile lo svolgimento della consegna
L				*realizzazione dell'elaborato scritto*	• Le riflessioni fanno riferimento alla stesura dell'elaborato scritto Esempi: *"Scrivere questa riflessione i mi ha spinto a ripensare alle mie esperienze e di dar loro un nuovo significato alla luce di quanto fatto durante il corso"*
M				*sulla preparazione e conduzione della ripresa (Aspetti tecnici)*	• Le riflessioni fanno riferimento a tutti gli aspetti tecnici/tecnologici che hanno riguardato la preparazione e la conduzione dell'intervista. Esempi: *"Ho provato molta ansia misurandomi con il funzionamento della telecamera: mi sono resa conto che ci sono tanti aspetti da tenere in considerazione per fare delle buone riprese, come la luce, l'inquadratura etc."*
N				*sulla preparazione e conduzione dell'intervista*	• Le riflessioni fanno riferimento alla predisposizione e alla conduzione dell'intervista (NON si fa riferimento ad aspetti tecnici e tecnologici). Esempi: *"Pensare a quali domande fare è stato molto interessante, mettermi nei panni della giornalista mi ha permesso di fare una piccola esperienza anche nell'ambito di questa professione"*
O				*sulla post produzione (montaggio etv.)*	• Le riflessioni fanno riferimento alla fase di post produzione, cioè alla fase di montaggio e arricchimento del video Esempi: *"il software utilizzato per il montaggio del video era molto difficile da adoperare e penso che questo abbia portato via tempo prezioso alla riflessione e al confronto con i temi del corso"*
P				*sulla collabotrazione con i colleghi*	• Le riflessioni fanno riferimento alle dinamiche interpersonali e lavorative intercorse con i colleghi durante lo svolgimento della consegna Esempi: *"Collaborare con i miei compagni di corso ha reso molto più semplice lo svolgimento della consegna, in quanto se mi fossi trovato a farla da solo sari stato preso dall'ansia, dato il gran numero di cose che abbiamo dovuto imparare per la realizzazione del video".*
Q				*In generale*	• Le riflessioni non fanno riferimento ad una fase specifica dello svolgimento della consegna Esempi: *"In conclusione questo lavoro di gruppo è stato un'utile esperienza perché mi ha permesso di imparare molto, spaziando dalla creazione*

		multimediale del video all'interessante intervista ad Elena" *"Ritengo che quest'esperienza sia di fondamentale importanza perché mi ha permesso di applicare anche da un punto di vista pratico quanto appreso durante il corso e dai libri in forma teorica."*
002	All'**intervistato**	Lo studente (autore del testo) riporta eventi narrati dall'intervistato o considerazioni e riflessioni fatte dall'intervistato.
021	**riporta esperienze descritte narrate dall'intervistato**	Lo studente riporta/parafrasa eventi ed esperienze raccontati dall'intervistato
R	*sul suo lavoro, sulla formazione e/o sulla sua persona*	• Ciò che viene narrato dall'intervistato fa riferimento al suo lavoro e/o alla sua persona Esempi: *"Una cosa che mi ha colpito della storia di Elena (l'intervistata) è che i suoi genitori non volevano lasciare che dopo le scuole medie lei scegliesse liberamente che percorso intraprendere. Probabilmente volevano che lei intraprendesse una carriera scolastica più di tipo tradizionale, che ampliasse la sua cultura nozionistica, piuttosto che professionale, che l'avrebbe preparata direttamente ad entrare nel mondo del lavoro."* *"L'avvocato ha messo in luce come si stia assistendo ad una vera e propria flessibilizzazione del lavoro, a causa anche dell'apertura di un gran numero di uffici, in questo caso legali."*
S	*sulle relazioni interpersonali*	• Ciò che viene narrato dall'intervistato fa riferimento alle sue relazioni interpersonali Esempi: *"Giulia afferma che dei clienti sono diventati per lei amici"*
022	**riporta le riflessioni dell'intervistato**	Lo studente riporta/parafrasa considerazioni, interpretazioni e riflessioni/considerazioni/interpretazioni espresse dall'intervistato
T	*Sul lavoro, sulla formazione e/o sulla sua persona*	• Le riflessioni dell'intervistato fanno riferimento al lavoro, alla sua esperienza personale e alla sua persona Esempi: "*Dalle sue parole emergevano l'amore e la dedizione con le quali ogni giorno affronta il proprio lavoro, ci ha fortemente consigliato di intraprendere in futuro una professione che ci appassioni, e che ci permetta di essere sempre sereni perché altrimenti saremo costretti a condurre una vita triste, priva dl veri e propri significati fondamentali*."
U	*sulle relazioni interpersonali*	• Le riflessioni dell'intervistato fanno riferimento alle sue relazioni interpersonali Esempi: *"Francesco ha affermato che il costante confronto con i colleghi gli ha permesso di accrescere di molto la sua professionalità"* *"Il rapporto di amicizia che si è creato con il suo datore di lavoro gli ha dato sicurezza permettendogli di affrontare nuovi problemi"*

003	**TRASVERSALI**	
V	Riferimenti all'elaborato video o a momenti specifici dell'intervista	Lo studente cita/fa riferimento esplicito a passaggi dell'intervista riportati nei video, immagini riportate nel report, elementi inseriti con iVideo etc. Questa categoria va attribuita quando lo studente cita un particolare momento dell'intervista o del video, indicando il momento a cui fa riferimento. *<u>Esempi:</u>* *"Quando Giulia afferma che dei clienti sono diventati per lei amici…"* *"Quando Giulia parla di pratica si riferisce dapprima alle conoscenze tecniche ma più avanti nel video si può notare come si rifletta con molta più importanza il sapere implicito che ha imparato nell'esperienza concreta di formazione professionale."*
Z	Riferimenti ai contenuti del corso	Lo studente cita o fa riferimento esplicito ai contenuti del corso (testi e lezioni*)* *<u>Esempi:</u>* *"Ritengo che quest'esperienza sia di fondamentale importanza perché mi ha permesso di applicare anche da un punto di vista pratico quanto appreso durante il corso e dai libri in forma teorica."* *"Tutto ciò mi ha fatto pensare e mi ha presto richiamato alla mente un concetto che spesso è stato ripetuto in classe alle lezioni di Didattica della Formazione, ovvero quello riguardante il "pregiudizio antico" nei confronti degli istituti di formazione professionale ma anche verso il lavoro in generale, considerato meramente come attività di tipo manuale e che non arricchisce l'essere umano. Infatti al giorno d'oggi il termine "lavoro" viene spesso inteso con accezione negativa, come fatica, impegno, dovere oppure semplicemente come mestiere, ma raramente viene visto come una nuova esperienza o come possibilità di crescita e miglioramento"*

Appendix B – Bivariate Correlation matrix between groups, sub-groups and categories

	1	2	3	4	5	6	7	8	9	10	11	12
1. Technology used (Group A / Group B)	1	0,000	0,000	,183	,157	-,406**	,220	,096	-,100	-,019	,101	,304*
2. Work capacity (Individual / team)	0,000	1	0,000	-,092	-,157	,069	-,164	-,058	-,164	-,141	-,101	,038
3. Student marks (Lowest / Highest)	0,000	0,000	1	,078	,148	,270*	,459**	,194	,345**	-,170	,037	,091
4. A%	,183	-,092	,078	1	-,030	-,107	,151	,827**	,057	,131	,276*	,413**
5. B%	,157	-,157	,148	-,030	1	,018	,064	-,038	-,044	-,059	,218	,198
6. C	-,406**	,069	,270*	-,107	,018	1	,108	-,060	,049	,114	-,020	-,114
7. D	,220	-,164	,459**	,151	,064	,108	1	,157	,386**	-,063	-,022	,078
8. E	,096	-,058	,194	,827**	-,038	-,060	,157	1	,174	,043	,190	,294*
9. F	-,100	-,164	,345**	,057	-,044	,049	,386**	,174	1	,139	-,091	-,106
10. G	-,019	-,141	-,170	,131	-,059	,114	-,063	,043	,139	1	,226	,032
11. H	,101	-,101	,037	,276*	,218	-,020	-,022	,190	-,091	,226	1	,232
12. I	,304*	,038	,091	,413**	,198	-,114	,078	,294*	-,106	,032	,232	1
13. L	,180	,068	,180	-,037	-,032	-,143	,053	,175	,311*	-,098	-,046	-,088
14. M	,125	-,035	,222	-,050	-,043	,236	-,147	-,080	-,089	,034	-,063	,161
15. N	,090	,187	,159	-,099	-,085	,214	,206	-,143	-,071	,001	-,124	,142
16. O	-,079	-,181	,269*	-,064	-,055	,157	-,100	-,110	-,127	-,009	-,080	-,076
17. P	,072	,099	,011	-,064	-,055	-,047	,089	,010	-,189	-,021	-,080	-,019
18 Q	-,138	-,136	,212	-,178	-,116	,298*	,081	-,179	,046	-,091	,016	,114
19. S	,095	-,197	,003	,290*	,025	-,008	,067	,230	,055	,464**	,642**	,031
20. T	-,001	,176	,092	,012	-,081	,104	,122	-,042	,006	,105	,081	,120
21. U	-,135	,135	,135	,057	-,024	,219	,042	,143	-,027	-,074	-,035	-,066
22. V	,130	-,196	,383**	-,008	,256	,238	,548**	,044	,454**	-,026	,092	,074
23. Z	-,076	,043	,360**	,213	-,036	,179	,456**	,263	,604**	,064	,145	,142

	13	14	15	16	17	18	19	20	21	22	23
1. Technology used (Group A / Group B)	,180	,125	,090	-,079	,072	-,138	,095	-,001	-,135	,130	-,076
2. Work capacity (Individual / team)	,068	-,035	,187	-,181	,099	-,136	-,197	,176	,135	-,196	,043
3. Student marks (Lowest / Highest)	,180	,222	,159	,269*	,011	,212	,003	,092	,135	,383**	,360**
4. A	-,037	-,050	-,099	-,064	-,064	-,178	,290*	,012	,057	-,008	,213
5. B	-,032	-,043	-,085	-,055	-,055	-,116	,025	-,081	-,024	,256	-,036
6. C	-,143	,236	,214	,157	-,047	,298*	-,008	,104	,219	,238	,179
7. D	,053	-,147	,206	-,100	,089	,081	,067	,122	,042	,548**	,456**
8. E	,175	-,080	-,143	-,110	,010	-,179	,230	-,042	,143	,044	,263
9. F	,311*	-,089	-,071	-,127	-,189	,046	,055	,006	-,027	,454**	,604**
10. G	-,098	,034	,001	-,009	-,021	-,091	,464**	,105	-,074	-,026	,064
11. H	-,046	-,063	-,124	-,080	-,080	,016	,642**	,081	-,035	,092	,145
12. I	-,088	,161	,142	-,076	-,019	,114	,031	,120	-,066	,074	,142
13. L	1	-,044	-,025	-,056	-,056	-,027	-,042	,052	-,024	,222	-,037
14. M	-,044	1	,207	,284*	-,076	,121	-,091	-,134	-,033	,030	-,132
15. N	-,025	,207	1	-,010	,025	,244	-,090	,227	-,065	,164	,074
16. O	-,056	,284*	-,010	1	,025	,245	,098	-,035	-,042	,049	-,178
17. P	-,056	-,076	,025	,025	1	,126	-,039	-,140	-,042	-,055	-,108
18 Q	-,027	,121	,244	,245	,126	1	-,034	-,127	,084	,294*	,015
19. S	-,042	-,091	-,090	,098	-,039	-,034	1	,083	,171	,194	,086
20. T	,052	-,134	,227	-,035	-,140	-,127	,083	1	-,086	-,005	,078
21. U	-,024	-,033	-,065	-,042	-,042	,084	,171	-,086	1	,156	,123
22. V	,222	,030	,164	,049	-,055	,294*	,194	-,005	,156	1	,264*
23. Z	-,037	-,132	,074	-,178	-,108	,015	,086	,078	,123	,264*	1

**. Correlation is significant at the 0.01 level.

*. Correlation is significant at the 0.05 level.

Conclusions

In summary, the following set of information emerged from the whole study.

Firstly, the process of educational innovation involves people (teachers, students, parents, and principals) who are willing to put themselves out there to change their practices and routines on the basis of an efficient technological and organizational infrastructure. The foremost results of this study, which are represented by the theoretical model developed in the analysis, should be regarded as a set of suggestions to be taken into consideration by the CNOS-FAP federation to better manage the inclusion of new actors in the currently ongoing implementation process of the experiment results. Moreover, these same elements can be used in other educational contexts as useful information towards the introduction of systematic action plans providing for the use of ICT in support of teaching activities. The experiment has shown that a bottom-up approach is useful, in the sense that incremental changes for the better ought to be situated in conjunction with infrastructural, educational, and consulting resources to favour such development. The national federation is in a position to promote autonomous decision-making and activate local resources. Now that the experimental phase is complete, the federation is still consistently investing in education and research, and this represents an essential prerequisite for the spreading of the achieved innovations to different contexts. The analysis of the interviews brought to light a repertoire of best practices actuated by the teachers involved in the project, which is however beyond the scope of this paper, but nonetheless to be reassessed and provided to the participants together with the other outcomes of the research.

Secondly, this study provides three main outputs. The first one which represent a set of suggestions for VET teachers, both those who teach in vocational area and those who teach in cultural axis. The second output consists in a theoretical-model' canvas of WB-oriented instructional practices. These two outputs try to answer the first research question, outlying several suggestions. The third output outline a provisional definition of *bridging technologies* accompanied by a set of recommendations for their use. This kind of technologies, which can be useful to close the gap between school and work context, could be very useful both for cultural axis and vocational area. Moreover, they could be employed in general education.

In the third main study, the results of the statistical analysis highlighted two sets of information. The first set answers the research question about the use of HV and video annotation, while the second provides new elements concerning the use of reflective activities and video technologies regardless of their specific characteristics - to better articulate the gap between education and work context. Furthermore, the category system

emerged from the first macro-step is composed of a hierarchy of categories and sub-categories inductively based on data with 21 coding possibilities. This coding system could be considered one of the study outcomes because it could be employed in different contexts (in research or teaching filed) to analyze the content of work practices reflexive-reports. In summary, the use of HV and video annotation seems to allow students to better center their focus on reflection instead description and the efficacy of the use of video as educational technology, already outlined by the Hattie (2009) meta-analysis results, have been confirmed. Furthermore, in line with the Efrahrraum model (Schwendimann et al., 2015b), the effectiveness of the technology and reflexive activity combination effectiveness in VET-related learning contexts have been highlighted: the use of video associated with a reflective activity allows students to improve pedagogical skills, approaching at the same time specific vocational skills, going beyond the boundaries of the classroom learning context. So, ultimately, the HV and video annotation could be considered an appropriate tool for supporting instructional activities in higher education courses concerning the VET field.

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