

## Accompanying professional teachers to transfer knowledge in Higher Vocational Education: the contributions of Professional Didactics and Cultural Historical Activity Theory

### Accompagnare i docenti professionisti a trasmettere la propria conoscenza nell'Istruzione Tecnica Superiore (ITS): i contributi della Didattica Pro-fessionale e della Cultural Historical Activity Theory

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OPEN ACCESS

Double blind peer review

**Citation:** Pacquola, M., Migliore, M. C. (2022). Accompanying professional teachers to transfer knowledge in Higher Vocational Education: the contributions of Professional Didactics and Cultural Historical Activity Theory. *Italian Journal of Educational Research*, 28, 28-38.

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**Received:** February 18, 2022

**Accepted:** May 20, 2022

**Published:** June 23, 2022

Pensa MultiMedia / ISSN 2038-9744  
<https://doi.org/10.7346/sird-012022-p28>

#### Abstract

The aim of this article is to contribute to strengthening the relationship between training and work, in particular by rethinking training and didactic design in the Italian Higher Vocational Education system (ITS). For the purposes of a training and didactic design capable of responding effectively to the actual skill requirements of work contexts, a space for dialogue is highlighted between two theoretical approaches, both oriented towards activity analysis: Professional Didactics (DP) and Cultural Historical Activity Theory (CHAT). If the former is oriented towards eliciting the tacit knowledge possessed by professionals at work, considering socio-technical and ergonomic aspects in the analysis of the work situation, the perspective of the latter approach focuses on the relevance of production strategies and motives/reasons in shaping collective activities and tacit knowledge at work. Both can contribute, therefore, to highlighting not only the importance that the contents of the professional knowledge to be taught are developed from the effective knowledge of work, but also that the didactic transposition of this knowledge considers the ways and contexts in which it was learned and will be used. In conclusion, it emerges that the collaboration between higher vocational education centres and enterprises is crucial in order to create the conditions for professionals to become do-centers through the elicitation of their tacit knowledge.

**Keywords:** professional didactics; activity theory; higher vocational education; cultural-historical approach; tacit knowledge.

#### Riassunto

Lo scopo del presente articolo è quello di contribuire a rafforzare il rapporto tra formazione e lavoro, in particolare ripensando la progettazione formativa e didattica nel sistema di Istruzione professionale superiore (ITS). Ai fini di una progettazione formativa e didattica capace di rispondere efficacemente ai fabbisogni di competenze effettive dei contesti lavorativi, si evidenzia uno spazio di dialogo tra due approcci teorici, entrambi orientati all'analisi dell'attività: la Didattica Professionale (DP) e la Teoria dell'Attività Storica Culturale (CHAT, Cultural Historical Activity Theory).

Se il primo è orientato a elicitare la conoscenza tacita posseduta dai professionisti sul lavoro, considerando gli aspetti socio-tecnici ed ergonomici nell'analisi della situazione di lavoro, la prospettiva del secondo approccio focalizza l'attenzione sulla rilevanza delle strategie di produzione e dei motivi /ragioni nel plasmare le attività collettive e la conoscenza tacita sul lavoro. Entrambi possono concorrere, quindi, a mettere in luce non solo l'importanza che i contenuti della conoscenza professionale da insegnare vengano sviluppati a partire dai saperi efficaci del lavoro, ma anche che la trasposizione didattica di tali saperi consideri le modalità e i contesti in cui essi sono stati appresi e verranno utilizzati. In conclusione, emerge che la collaborazione tra centri di istruzione professionale superiore e imprese è fondamentale per creare le condizioni in grado di far diventare i professionisti dei docenti grazie all'elicitazione della loro conoscenza tacita.

**Parole chiave:** didattica professionale; teoria dell'attività; istruzione tecnica superiore; approccio storico-culturale; saperi taciti.

#### Credit author statement

Sebbene il presente paper sia frutto di un lavoro condiviso si attribuiscono i paragrafi 2.1; 2.2.; 2.3.; 3.1 a Mariachiara Pacquola e i paragrafi 1; 3.2; 4 a Maria Cristina Migliore.

## 1. Introduction

The debate on workplace learning is at least three decades old (Billett, 2001; Boud & Middleton, 2003; Eraut et al., 2000; Evans et al., 2006; Forssberg et al., 2020; Fuller & Unwin, 2011; Garrick, 1998; Hager, 2011; Hodkinson & Macleod, 2010; Marsick & Watkins, 1990; Munro, 2002; Rainbird, 2000; Rainbird et al., 2004). It has been playing the role of drawing the attention of scholars, educators and policy makers to the baggage of knowledge distributed in the working practices in the workplaces, accessible through informal and incidental learning. Of course, workplace learning represents one opportunity for personal and collective growth, and educational systems keep retaining their function of preparing new generations to become responsible and active citizens and to prepare them to the world of work.

The transformation of work, driven by the technological development and the growing global competition, requires nowadays continuous learning in workplaces, and in training and educational centers. The connection between the enterprises and the educational centers varies across European countries and the most recognized model of connection is often represented by what is called “dual system”, that is, learning based both on classrooms and workplaces.

In Italy the introduction of the dual system is recent. One of the most significant step toward this educational model is the creation of the ITS (Istituto tecnico superiore) in the higher education in 2010. ITSs are foundations supported by both educational institutions such as universities and polytechnics and enterprises, referring to a specific sector, for instance the agrifood or the automation or clothing&fashion. Teachers have to be professionals – coming from the production sectors – in a percentage of 50% at least in the ITSs, but Parliament is discussing to increase this proportion. A move which could indicate the willingness to strengthen the link between the two worlds, enterprises and educational centers. This goal of increasing the connection between education and work is also present in the recent PNRR (Piano Nazionale di Ripresa e Resilienza), the Italian program to take part to the European Union fund called “EU Next Generation”. This represents the relevance of the issue. The Italian PNRR highlights the role of research centers in conducting investigations aimed to reduce the skills mismatch and to strengthen synergy between businesses and training.

However little space is devoted in the Italian policy makers’ and practitioners’ discourses to discuss how to guarantee the flow of knowledge and learning from the workplaces to the classrooms. It is usually taken for granted that being a professional is enough to transmit the professionalism.

In the international scholar debate, as far as we know, this latter issue receives attention, but limited to the one of pedagogists and social psychologists. The aim of this paper is to put into dialogue the pedagogical works on how to transmit professionalism developed in and out the workplaces with the sociological works on issues linked to workplace learning. The interest on this dialogue has its origin in the recent encounter between the two authors and researchers: a work psychologist and trainer (Chiara), and a sociologist (Cristina).

We engage in this dialogue focusing on the ITSs’ task to support the professionals willing to become teachers to transmit their own vocational knowledge.

This ITSs’ task includes the verification of the possession of training skills about pedagogical-didactic design, educational conduct and evaluation, and then the development of the insufficient training skills. This is what often ITSs focus on. However, that task also requires to identify what is the relevant professional knowledge to transmit, which is mainly a tacit knowledge, acquired in experience and within the enterprises (Magnoler & Pacquola, 2016; Magnoler et al., 2014; Pacquola, 2017). Therefore, it is necessary a methodological path to elicit the professionals’ tacit knowledge so that it is possible to identify what knowledge to transmit and how to transmit it. The last steps are to transform the elicited knowledge into knowledge to be taught (Altet, 2003) and to develop tools for the didactic transposition (Develay, 1995).

While the ITSs aim at forming their teachers-professionals, these latter cope with the difficulties of working in two activities and with different positioning: in the professional activity they are considered experts, in the schooling they are novices. But there are also other organizational tensions and emerging contradictions among the two activities, as it surfaces in conclusive remarks of this paper.

This framework on ITSs implies psychological, pedagogical and organizational issues and requires to discuss theoretical models to both guide the research and the practices in this field.

This paper presents two theoretical perspectives, Professional Didactics (PD) (Pastré, 2011; Pastré et

al., 2006) and Cultural Historical Activity Theory (CHAT) (Engeström, 1987, 2007, 2011, 2016; Leontiev, 1978, 1981; Minick, 1985), which both find their roots in the Leontiev's activity theory (Leontiev, 1978, 1981; Pastré, 2011), but focus on different issues. As said, the aim is to put them in dialogue to develop theoretical ideas to support practices in the ITSs' task mentioned above, taking into account the wider context in which the teachers-professionals are involved, but also their students.

## 2. Materials and Methods: the theoretical perspectives in dialogues

### 2.1 Understanding the job in the work activity

In doing expert work, there are different layers of knowledge related to the job, linked to individual and collective memories and recollections, to intimate and professional awareness, but also to routines and automatisms consolidated over the years and linked to different ways of acting, reacting and interacting in the work. Transmitting expert work therefore leads the professional-teachers to bring back memories of emblematic, exemplary experiences, of significant professional cases to show a specific professional posture, to guide the learning of gestures, actions, thoughts, effective, convenient rules, and to articulate a discourse around professional development. These memories and experiences are intimately connected to the contexts in which they have been elaborated. Therefore, the elicitation of the professional knowledge should also elicit the activity features in which it has taken shape.

In approaching the analysis, we start with a brief presentation of the founding elements of Leontiev's activity theory; the main concepts of the two approaches, CHAT and PD, will then be described: by making them dialogue, we intend to bring out the complexity of the components involved in the issue of the transmission of professional teachers' knowledge from an informal work system to a formal vocational training system, taking into account aspects of the wider productive and organizational context.

Leontiev's work developed the theory of activity, and, with that, how development of the activity and development of the subjects are connected (Leontiev, 1978, 1981). Vygotsky's and Leontiev's work derives from the Marxian Hegelian idea that the self is constituted in the activity, that is, in the social practice as labor is (Tolman, 2001).

According to Leontiev, any activity has a three-level structure: the object, the actions, the operations. Any action (practice) is part of an activity, because it is always linked - in one way or another - to other actions carried out by other subjects (e.g. workers). This interrelation is very clear in the workplace, with its division of labor.

Yet, according to Leontiev, what coordinates the actions is the object of the activity, not the division of labor. The object is what legitimates the activity: the object is its cultural-historical reason to be, it is what motivates the activity. Actions are aroused by the object/motive of the activity, but they are directed towards goals. Actions reveal their meaning only when they are related to the object of the activity. Actions become operations when – repetition after repetition – they become automatic. The participation of the subjects (e.g., workers) in collective activities is formative, for they internalize artifacts, that is, signs and symbols, which have an historical origin and mediate the human actions. However internalization of signs and symbols (knowledge) modifies these latter, for the subjects personalize them (making them – for example – coherent with personal past experiences) (Stetsenko, 2005). The knowledge internalized is then used to mediate actions and operations (externalization).

As Leontiev argues, the subjects also internalize motives through the participation in activities all along their lives, and give a personal sense to each motive. Let's stress that, in Leontiev's cultural-historical view, motives are objects of activities, and motives/objects drive activities. Therefore, the participation in activities contribute to the formation of personal motives. Throughout participation, the subjects built their own personal hierarchy of motives which helps them to choose on which activity to invest more energy, emotions, commitments, competence, passion, and so on. The hierarchy of personal senses of motives is not fixed in time. Changes in personality and activities occur in the attempt of dealing with and solving contradictions, which are elements in any activity.

As Migliore argues, CHAT – with contributions from other disciplines such as political economy, sociology, organizational studies – allows to analyze the enterprises in term of their objects. Migliore puts

forward the idea of referring to the production strategy as the object of an activity. The production strategies – discussed and analyzed in the aforementioned disciplines – are usually depicted through their correlates of labor process and work organization (Migliore, 2013).

Engeström's work, who expanded CHAT to work settings for the first time, can help the analysis of professionalism transmission with the concept of activity system (Engeström, 1987): Engeström revisits Leontiev's activity theory by adding other elements in the analysis of the activity: rules, communities, and division of labour. He also considers the functions of production, distribution, exchange and consumption. Among all the components of an activity system a continuous construction goes on. The Engeström's approach allows analyzing the complex interactions among the constitutive elements of the system seeing the internal tensions and contradictions as the driving force for change and development of the system. The primary contradiction is the one between the exchange value and the use value of commodities, which then creates other types of contradictions (Engeström, 1987). Simplifying it, this principal contradiction refers to the capitalistic mode of production, in which the aim of creating surplus produces a tension between what should be produced to respond to human needs and what is convenient to do to be able to sell the product in the market at a good price to create profit and to be competitive. Dilemmas, tensions and conflicts in collective activities originate from contradictions. The attempts to solve activity difficulties through "expansive learning" (e.g., Change Laboratory) produce change and transformation of the object of the activity and other elements in the activity (Engeström, 2016). Expansive learning, a concept put forward by Engeström, based on Bateson's "Learning III", is a collective learning process in which it is necessary to identify, not only the solution, but also the problem, and could lead to radical transformation of the activity (1987).

Being engaged in two activity systems – as our professional-teachers – means to cope with contradictions and tensions inside and between the two systems of work and education.

PD highlights other theoretical and methodological elements useful for understanding which knowledge (signs, symbols, tools) mediates the actions and operations of work activities, and how to make it explicit.

The PD approach combines the contribution of four disciplines: adult training methodology, ergonomic and work psychology, developmental psychology and discipline didactics. It provides a framework to elicit expert inner tacit work knowledge from the work practices with the aim to improve the training educational and training design, both in formal, no-formal and informal environments.

Among the various concepts taken up by Leontiev in the PD approach is that of activity: Leplat (1997), takes it up from an ergonomic perspective, proposing to distinguish and analyze the gap among the prescribed job, the redefined one and actual one. The aim is to answer the following questions: «what the person has to/does», what he «says he does», what he «actually does». In this way, the professional worker emerges as an active builder of his/her productive activity to respond to the prescribed task. Rabardel (2005) defines the subject as «capable», focused less on the acquisition of declarative knowledge and more on learning from activities in work situations. So, PD shows how the professional is at the same time an activity producer and constructor of a particular form of knowledge, the pragmatic concepts, which both organize operationally and functionally the individual activity and nourish the collective professional community knowledge heritage (Pastré, 2011).

Another concept, the work instrument, with its material and cognitive-symbolic aspects, is taken up to highlight how artefact becomes useful for the worker's activity through a series of cognitive schemes of use, i.e. organizing his/her action thanks to the construction of mental schemes that allow him/her to use that instrument. Among mental schemes there are classes of situations, and families and domains of activity.

The definition of work situation with learning potential (Mayen, 2012) leads to consider how the constraints of the context, the organizational processes, the colleagues' contributions, the tasks to be performed, the tools available can, in particular circumstances, represent a privileged space for development and learning of the worker, leading him to reflect, to act, to transform the situation, redefining it, modifying it or adjusting the conditions to achieve the expected tasks.

Having briefly presented the two approaches to analyze work activities, we can now begin to see how the dialogue between CHAT and PD provides conceptual tools which allow to consider individual activity as belonging to wider and situated collective activities, that need a socio-economic, historical, and cultural view. In fact, the production (business) strategy impacts on the organizational dimension in which the professional works, and the work organization affects the degree of perception, understanding and enga-

gement that the practitioner has about the object/motive of the activity (Migliore, 2018; Migliore, 2015). The awareness of the object gives meanings to the individual actions and operations and opportunities to develop personal senses, which – we can argue – are fundamental in the problem solving and in the expansive learning.

On the other hand, PD allows deepening the understanding of the construction of the professional knowledge which mediates the working actions and operations, which are one the focal points in CHAT. It shows how the professional, during his/her work, actively learns and conceptualizes in action: his/her knowledge, however, is often tacit, as we explain below. Therefore, the knowledge elicitation promoted through the PD methodology reveals what the professional knowledge is made of: it is constituted through a sharing of practices and a stratification of effective experiences that structure the subject's beliefs, the organizing concepts underlying his/her job, the system of rules of action that guides the perception, implementation and control of the action.

## 2.2 How to analyze and elicit “knowledge in action” and the tacit knowledge

The cognitive richness of these learnings that occur in the professional activities clashes with the difficulty of describing and explaining it: knowledge at work has an operational rather than an explanatory dimension. Indeed, it is based on the selection of information from the context in order to act effectively, as argued by Ochanine (1981), and not to form knowledge about that action apt to be transmitted.

Hence, methodologies and collaboration are needed to elicit and transform that operational knowledge. The activity of the subject in the situation thus becomes a relevant object of analysis, dialogue and mutual and collaborative exchange between the various institutions involved. The main actors in this operation are: research centers, training firms and production enterprises, (Pacquola, 2017, p. 167) with specifically the professional, the researcher and the expert in training methodologies engaged in the process. The aim is to bring out the knowledge still embedded in the action, recognize dignity to the status of professional teacher, and co-construct those knowledge-instruments (Altet, 2003) that allow to design training as not prescriptive.

It is possible to access the professional's knowledge, constructed during the completion of his/her job, by observing his/her activity and accompanying him/her in verbalizing it. This knowledge, characterized by laconism, is often tacit, (i.e., acquired not consciously), embedded (predominantly stored in automatic habits and routines), and situated (specific and specialized to the context and work situations in which it has been acquired and exploited) nor easily explained: it needs specific investigation methodology.

The tools and methodologies of clinical work analysis, to which the PD refers for the analysis of the job, can be effective in accompanying the professional-teacher to the development of a reflective consciousness for the elaboration and reconstruction of his/her own knowledge and progressively eliciting, verbalizing, his/her knowledge. This step can take place, for example, by reviewing one's own action on video, after having previously videotaped it, together with the trainer-observer (simple self-comparison) (Theureau, 2004), commenting on the same videotaped images not only with the trainer, but also with a colleague with the same experience (Cross-comparison) (Clot et al., 2000). By confronting with his/her interlocutors on their understanding of his/her activity, the worker can conduct an individual and collective reflective activity on his/her work, favoring the increase of the capacity to transform objectives, means and knowledge of his/her professional activity.

Another method, the Elicitation Interview (Vermersch, 2005), is based on the reconstruction of the memory of the experience and favors the verbalization of the way (the procedural dimension of the action) in which a task was carried out. This is useful for verbalizing, for example, the genesis of errors, habitual and automated performances, routines, trial and error experimentation.

The stage of awareness-raising and reflective work on one's own representations and putting one's own work into words is a real challenge for the professional: relearning his work is a costly task in terms of time and cognitive load, because it means restructuring one's own thought system, from an operative to a semantic knowledge, for a different activity (training) and objective.

CHAT can contribute to this analysis and elicitation process as it focuses on certain elements of situated professional knowledge.

First of all, it sheds some light on those elements connected with the cultural and historical conditions in which the exercise of the profession took place, and especially on the activity object/motive and its transformation, with its effects on the labor process, its organization and the contradictions inherent in the activity system.

Secondly, CHAT contribution could support a wider conceptualization of the professional's tacit knowledge. The analysis of the professional's specific job situation can reach a first generalization of the elicited situated knowledge to the same job situations in other similar enterprises. However, it is possible to reach a broader generalization to take into account other enterprises with different business strategies. This could be achieved through a cross-comparison of the elicited professional knowledge with that of other colleagues carrying out similar jobs in other enterprises with different business strategies.

Moreover, CHAT draws attention to the possible tensions that can arise in a practitioner who has to manage two different systems of activity: doing the work and transmitting the work. Not everyone is willing to get actively involved in the process of reconstructing and reorganizing their knowledge, because, although they wish to transmit their knowledge, they might not have (yet?) internalized the motive of teaching with a pedagogical design and suitable didactic tools.

The positive outcome of this phase of elicitation can therefore give indications on the criteria for the selection of professional-teachers, which can also be operated on the basis of the variety and types of professional and organizational experiences lived, such as to represent a representative and congruent panorama with the possibilities of professional development offered by the territory; also, it gives indications on the costs of the «elicitation» challenge: a stratified baggage of diversified experiences (by organizational context) requires from the professional an important work of reconstruction and relocation of his/her own knowledge, on the one hand of conceptualization, on the other of evaluation of the limits of generalization and abstraction of the contextual variables, constraints and conditions of exercise.

### 2.3 Translating knowledge in action in knowledge for training

Addressing the issue of knowledge transmission does not mean that knowledge is simply passed prescriptively from one subject to another, remaining unchanged. A professional teaching that refers to the analysis of the activity from a PD point of view, requires, at this stage, the formalization and representation of the knowledge that emerges from the action, which then becomes, from knowledge in action, knowledge for the training action. In order to model the regularities that guide his/her professional activity (Damiano, 2013), the professional has i) to develop «a knowing how to analyze» his/her own activities and experiences and ii) to build those knowledge-tools (Altet, 2003) that will be taught and subsequently learned by students.

In a perspective of collaboration between researcher and professional, a process of teacher training is activated with the aim of designing pedagogical-didactic devices able to collect the uniqueness of the knowledge emerging from the action in situation, but also to return a more generalized «knowledge» functional to be taught.

Once formalized, hence, they can finally become the basis for formative and didactic reflection. In this reflective stage, the professional-teacher, helped by researcher and training methodological expert, aims at realizing a didactical transposition. This purpose requires the following aspects (Iobbi & Magnoler, 2015): selecting the relevant work situations to be transformed into learning situations; setting the pedagogical progression and the sequence to develop them; choosing the Learning & Training activities consistent with the training objectives; choosing which kind of mediators to build and how to organize them; setting the typology of the questions to be asked; reflecting over the cognitive operations induced by the materials delivered; managing training time and space; defining the time required by students to be able to develop learning; problematizing the work activity and situation to transform them into learning situations; providing support to the student's devolution of tasks; designing formative assessment and self-assessment.

This pedagogical-didactic work is enriched with the attention of CHAT on the historical and cultural dimension, opening two possible reflections on the space-time of the professional activity to be taught. The first concerns the «territorial» validity and relevance of the knowledge to be taught, which has as borders the territory (or the production chain) and the productive organizations that share the same system

of meanings, activities, tools, rules, in which students will then have to carry out the internship and be hopefully subsequently hired. The territoriality and the knowledge rooting in it is an element that distinguishes the ITS, which establishes with companies and other stakeholders synergistic relationships and close exchange of practices and knowledge.

A second reflection concerns the temporal mutability of a work activity, and of its related vocational knowledge. Consequently, training planning needs to be cyclically reconsidered in order to update it to the transformation of the work activity.

### 3. Results of empirical studies

#### 3.1 Results of a Research intervention in the “Riviera del Brenta” Footwear District

Research-intervention conducted in the “Riviera del Brenta” Footwear District during the decade 2008-2018, commissioned by the district training body, the Footwear Polytechnic (the ITS “Politecnico della calzatura”), and by some companies in the area particularly attentive and sensitive to training issues, verified how the PD approach could bring training and work closer together. The main goal of the research was to understand, through the use of work and activity analysis, the ability of domain experts to conceptualize implicit knowledge and to make it communicable in formal, informal, and non-formal learning contexts. Another objective of the research was to develop the ability of expert workers to make their practice explicit. If the expert is able to communicate what s/he does, the problems s/he encounters and the strategies s/he uses to solve them, s/he can contribute to the capitalization and transfer of the vocational knowledge to the work and the training.

*A strand of the intervention-research covered how to bring work closer to professional training*, accompanying expert professionals to become teacher-trainers in formal learning contexts, represented by the training offer of the Politecnico della calzatura, for the design of an innovative training of expert workers, able to improve the efficiency of the training-work relationship in the luxury footwear industry (Magnoler et al., 2014). Here is how the PD methodology helped to improve the effectiveness of the training design in the ITS EQF 5 training program of the course «Footwear collection manager» 2014-16. The course aimed to train a highly specialized technician in the process of design and development of new footwear products. This requires having skills that allow to make the prototype, the industrialization and the production process of luxury products, more effective and efficient to assert the «Made Italy». The course, recognized in Europe, has had a duration of two years, characterized by four semester sessions in a mixed structure that alternates training hours (1200 hours) with other courses (1200 hours) with internships in companies (800 hours).

The experimentation raised a particular question: should the teaching be carried out by an expert who has a good knowledge of the work (and who has been involved in the analysis of the work with PD methodologies) but who does not have the skills to carry out a didactic and pedagogical transposition? The decision was made to entrust the expert, supported by a particular accompaniment in different spaces and times, with the technical and professional teaching of the module «Methodology and techniques for the development of classic footwear models».

First, before starting the teaching course, the professional expert footwear patternmaker was involved in the analysis of his own activities with the methodology of the PD methodology to give him the possibility to reflect, to put into words, to make explicit the meaning of the professional gestures and the indicators that guide his professional action. Afterwards, he was asked to validate and complete/integrate/modify the results of the research already capitalized in relation to the crucial specific work situations (schemas, rules of action, pragmatic concepts).

In parallel, analyses of the patternmaker’s work were carried out in two other SMEs with different business strategies and different internal organization and division of labor.

A subsequent phase saw the sharing of formalized knowledge by the senior with a group of professional teachers, involved in the ITS design and teaching activity. This phase was very formative for the expert and the collective of professional trainers because it gave them the possibility to transform their individual mental representations into words and concepts and to create a common representation about their work and about the significant activities and knowledge to transmit during training. A second accompaniment

was provided during the design and conduct of the alternating activity between classroom and workshop. In the first phase, the expert was assisted by the research team in planning the course and in evaluating the results of the learning outcomes. In particular, the team helped the expert to plan the construction of learning materials based on the results of the job analysis. The goal was to better communicate the learning materials by planning simulation situations in a pedagogical progression and experiential learning cycle management approach. This phase allowed the expert to completely redesign his pedagogical mode in the classroom with the students, less oriented to the transmission of his knowledge, and more centered on the construction and conceptualization of knowledge through the laboratory experience. He also reflected on the didactic tools at his disposal and he then constructed a new didactic tools congruent with the pedagogical and didactic progression of the training content to be transmitted.

### 3.2 Results of Case studies in manufacturing shop floors of Piedmont Region

We now report the findings of a case study based on a CHAT influenced perspective to give empirical evidence of the relevance of production strategy in shaping motives to learning of older workers (OWs) in manufacturing shop floors. The case study was carried out in 2007-2008 as part of the PhD of one of the authors (Migliore, 2013). The choice of the case study methodology is coherent with the CHAT theoretical perspective (Hodkinson & Macleod, 2010; Säljö, 2009) and the research aim to explore the processes connecting working and learning. Many authors point out that case study is particularly suitable when researchers look for investigating mechanisms and processes (Gerring, 2007, 43-45; Hodkinson & Macleod, 2010, 177), a position taken also by scholars more inclined to prefer survey strategy (Goldthorpe, 2000, 65-93). I mainly used free discursive interviews and observations, to collect the data with an ethnographic attitude (Cardano, 2001). The study understands objectivity as based on the methodological principle of “persuasive reasoning” instead of the one of “demonstrative reasoning” (Cardano, 2009). According to this stance, the study provides an extensive “reflexive account” (Migliore, 2013).

The focus of the research was older workers in industrial production and their motives for learning. On the basis of what explained in the previous section, the workers’ grasp of what is going on in their enterprises is relevant for their engagement at work and for the formation of their vocational learning motives. Indeed, the possibility of grasping what is going on in the enterprise in which one works is pivotal in the development of the workers’ professional knowledge for it provides the opportunity to give meanings to one’s own actions and operations in the collaborative network in the enterprise.

Subjectivity (motives) is conceptualized through the ideas developed by A. N. Leontiev and briefly presented above (hierarchy of personal senses of motives). The research design takes the form of multiple embedded case studies within two companies which approximate two types of production strategies, mass production (enterprise E1) and flexible specialization (enterprise E2) in the Turin area (Italian north-west). Mass production and flexible specialization are very different in applying the Taylorist principle of the separation between conception and execution, with the latter allowing more autonomy and discretion to the workers. The hypothesis is that more autonomy and discretion support a clearer image of the activity object. Older workers were interviewed about their professional lives to interpret their relationship with the activity object. The image of activity object emerged also through interviews to managers in both companies and the CEO in E2 (fifteen interviews in total). The transcription of the interviews used a notation system to distinguish verbal and extra-verbal communication (Cardano, 2007). Data were analyzed through the constant comparison method (CCM) to refine CHAT concepts and understand the connection between working and learning in the specific context described above.

The subjective side of workplace learning surfaces as differentiated by the two types of production strategies. These strategies, together with other life experiences, create different opportunities for the older workers’ subjective engagement. Motives for workplace learning are linked to the needs for learning in the workplace, and to the ideal image that older workers have of their workplace.

In E1, OWs have more difficulties to grasp which are the challenges of their enterprise and how those challenge shape the activity object, for their jobs are executive with little autonomy and discretion. Even if they feel frustrated by what they perceive as a bad work organization, they dream about the possibility of seeing some improvements in it and seem ready to welcome more training and learning.



In E2, OWs have larger autonomy and discretion, and receive more information about the object of their collective activity. This allows a higher level of engagement and has led to the development of their professionalism through their working lives. Thus, they think they don't need to learn more, but instead would like to be put in conditions to transmit what they have learned along their professional lives to the younger colleagues. Indeed, these older workers can be similar to senior and expert workers, the ones who hold vocational knowledge useful for the training centers, and could become teachers. Hence, some of them feel disappointed or sad about the idea that what they know is not valued enough by the management which does not always provide the conditions to facilitate collaboration with the younger colleagues.

The comparison between these two companies sheds some light on how different production strategies create different conditions for learning and developing professional knowledge. It also shows that professionalism could be not enough valued in the enterprises. This suggests that the PD approach could benefit from integrating its method of professional knowledge elicitation to enlarge the view on the working and organizing conditions in which that professional knowledge has been used and developed. As stressed by Leontiev, knowledge (artifacts) retains the features of the original activities through which it has been developing (Minick, 1985, p. 239). This opens up a discussion on whether the vocational education in the ITSs should include the construction of students' awareness of the existence of different organizational models they could meet in the world of work, and so different opportunities to use their competence. We come back to this point in the conclusive remarks.

#### 4. Discussions and conclusions

Accompanying professionals to become teachers of their own knowledge is a relevant factor in increasing the synergy between training and work and, consequently, in increasing the training effectiveness and quality expected from the Italian national recovery plan (PNRR) mentioned in the Introduction.

The dialogue between the two theoretical approaches, PD and CHAT, proposed in this paper to develop theoretical ideas to support the ITSs' process to train professionals to become teachers, leads to the following considerations.

First, this dialogue can strengthen the social dimension already present in the PD methodologies. PD methodologies look at the socio-technic dimension, but – by adopting a CHAT influenced perspective – they can widen the view to the production strategies of the enterprises, their organizational features, to improve the understanding of the knowledge developed by collectives of professionals. This (i) helps reflect on the situated nature of the knowledge of the professionals and (ii) invite to enrich the process of elicitation with other situated knowledge in order to cover a larger types of work situations.

Secondly, that theoretical dialogue, with its emphasis on the cultural-historical activity aspects, can help ponder that the vocational knowledge is keeping changing in the world of work, and therefore the process of elicitation need to include a way to consider this aspect. The elicited knowledge enriched with more cultural-historical elements could help the ITSs' students develop consciousness of the continuous transformation of the work collective and the community wealth, which occurs through the workplace learning - and possibly the expansive learning. This would lead students-future workers to see how they could play a role in the development of the working practices by adapting the internalized knowledge at the ITSs and actively constructs their own vocational knowledge to enrich the work community.

Third, the previous points are linked to the issue of how the elicited vocational knowledge has been shaped by the features of the production activities in which it has developed. That same vocational knowledge, transmitted to the learners, would need similar or compatible organizational conditions to produce the expected effects. The organizational conditions are the ones of the enterprises, linked to their production strategies, and can vary in allowing workers' engagement and their participation in the enterprise development. Those conditions could extend till to include some aspects of the production chain and of the territory.

This leads to discuss the potential of transformation of these theoretical perspectives put in dialogue – PD and CHAT – to bring closer the work and educational systems, but also to bring about changes in both of these systems. Indeed, we can see that there is a transformative potential in the dialogue between the educational centers and the enterprises.

Four, this dialogue between the educational centers and the enterprises is necessary to support the process of the professionals who become teachers for they are engaged in two activity systems. As noted earlier, this means to cope with contradictions and tensions inside and between the two systems of work and education. For instance, becoming teacher could need a certain length of time which could not be easily accepted by the work and educational organizations in which the professionals are working. This could lead to an impoverished effectiveness of the educational functioning of the educational centers, showing once more how work and education are linked.

Last conclusive remark is about the epistemological issue which this PD-CHAT dialogue raises. In fact, what has emerged from this dialogue calls for a better understanding on how the new theoretical ideas affect the methodology of the elicitation process and what methodological development is possibly required.

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