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Editorial: Cultural historical theory & VET – A contribution to broadening the theoretical grounds of research in VET

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During the last three decades we have seen a remarkable increase of interest in the use of different variations or lines of cultural historical theory in educational research. Research within Vocational Education and Training (VET), a field that deals with problems at different levels and in different contexts (i.e., school and workplace), has not been an exception (c.f., Rauner & Maclean, 2008). One of the arguments for this growth of interest has to do with the theoretical and methodological advantages that cultural historical theory brings to research. These include aspects such as the object-subject relationship, the role of mediation, and the cultural historical context of human interactions.

Yrjö Engeström, one of the most influential researchers in this field, summarises developments and describes three generations of activity theory (Engeström, 1999, pp. 377–406). The first generation was heavily influenced by the works done by Lev S. Vygotsky, and in particular the concept of mediation. Vygotsky essentially brought together cultural artefacts with human actions in order to deal with the individual/social dualism. During this period studies tended to focus on individuals. The second generation moves beyond Vygotsky's individually-focused to Aleksei N. Leontiev's collective model. According to Engeström's interpretation the unit of analysis is then expanded to include collective motivated activity towards an object, making room for understanding how collective action by social groups mediates activity. A distinction is made between what Engeström calls classic Vygotskian psychology, emphasising the way in which semiotic and cultural systems mediate human *action*, and Leon-

tiev's second-generation focused on the meditational effects of the systemic organization of human *activity*. The expansion of Vygotsky´s contribution includes the addition of elements such as community, rules, and division of labour. The importance of analysing the interactions between these elements is particularly highlighted. Engeström credits Evald Ilyenkov with stressing the significance of contradictions within activity systems. The third generation of activity theory includes researchers like Engeström himself and Michael Cole, to mention most prominent examples. Engeström draws on ideas on dialogicality and multivoicedness in order to expand the framework of the second generation. The idea of networks of activity within which contradictions and struggles take place in the definition of the motives and object of the activity calls for an analysis of power and control within developing activity systems. Development of the theory continues and, according to Engeström (2009), the rapid rise of new forms of activities and the dominance of knowledge work, encourages a rethinking of the third generation model, leading to what he calls a new, fourth generation activity system model.

The articles in this special issue exemplify the diversity of cultural historical inspired research of relevance for VET. Some of the articles are theoretically oriented while others illustrate well different uses of cultural historical theory in empirical research.

In the article *Contribution to the study of personality by 'pioneers' of the cultural historical school: Revisiting earlier research in search for learning*, I analyse the development of the theory of personality in the cultural historical school focusing on the contributions of different so called research 'pioneers' within this school. The presentation and analysis in the article attempts to contribute to VET research through systematising and drawing attention to some of the most relevant contributions of these pioneers. I do stress that the analysis is made with awareness of the complexities and the risks involved in any attempt to summarise a remarkable creative production in research extended through decades. The article expects to contribute to better understanding studies of personality within the cultural historical school henceforth serving to the advance of research within VET. This becomes particularly relevant in times when VET faces challenges from a variety of research problems, which calls for deepening into different theoretical and empirical sources.

The article by Marianne Teräs *Transforming vocational education and training in Finland: Uses of developmental work research* explores uses of developmental work research (DWR) in reforming and transforming practices of VET. According to Teräs DWR was initiated in Finland in the 1980s to enhance understanding about learning in organizations. The aim of her contribution is to elaborate further the approach by examining studies made in the field of professional and vocational education and training. This, consequently, attempts to examine potentials and shortcomings of the approach. In the article by Teräs eight DWR

studies in the field of professional and vocational education and training are summarized, and three of them are elaborated. New tools, conceptualizations and methods for VET are relevant parts of the contribution of this article. Teräs concludes that DWR offers rich and solid theoretical and methodological tools for VET researchers, but likewise warns that they need to develop concepts combining different dimensions of research, and stresses the importance to elaborate outcomes from societal and individual perspectives.

In *Methodological challenges of investigating intellectual cooperation, relational expertise and transformative agency*, Ines Langemeyer highlights that different methodological issues arise with the research of societal practices of 'knowing'. According to Langemeyer the object of study is understood as concrete human activity that always integrates mental, communicative, and practical behaviour in interaction and cooperation with others. This is particularly with regard to contemporary forms of labour in the high-tech-world. Langemeyer argues that this implies investigation of people communicating and reasoning while developing concrete forms of activity. In specific, the methodological issues concern the social and psychodynamic quality of this practice. Accordingly Langemeyer focuses on complexities and considers that cultural-historical concepts like the 'motive' of an activity as well as the 'emotions' that bias the 'experience' of 'transformative engagements' with the world show that their theoretical and methodological understanding are useful to approach complex relations of cooperation. The article discusses critically whether 'double stimulation', a concept coined by Vygotsky, adequates with the system theoretical understanding of activities and transformative agency as it might be found in Engeström's works. Langemeyer concludes by underlining core requirements for a VET-research methodology for intellectualized collaboration.

In the article *VET as transformative, collaborative research: Cross self-confrontation, dialogical artefacts, and the development of organizational dialogue in a Swiss factory*, Laure Kloetzer discusses VET-related collaborative research as a potential transformative experience for workers/work collectives/work organizations. Three main ideas in the creation of dialogical frameworks for collaborative research are followed: (a) Vygotsky's research focus on provoking development in order to study it, (b) Ivar Oddone's ideas on close collaboration with professionals in 'associated research groups' to understand and develop work experience, and (c) Yves Clot's psychological concept of activity that includes both 'realised activity' and 'real activity'. Kloetzer argues that the methodology of cross self-confrontation, elaborated in her research, is based on collective work analysis, thanks to the interplay of two activities – observation and dialogue – within various contexts and for different addressees.

Edited video recordings, which Kloetzer calls 'dialogical artefacts', are used to support analysis and transformations. The methodology is aimed at triggering individual thinking, collective elaboration, and rich institutional discus-

sions, oriented to transforming everyday work organisation. Kloetzer presents outcomes of a research project conducted in a Swiss factory. The project focussed on knowledge transmission and the training of expert workers. The production of films as dialogical artefacts and their effects on the various settings organized by the researchers are discussed. Findings of her study show a transformation of the objects and style of dialogue across hierarchical levels. This is according to Kloetzer a consequence of the discussion in specific organizational settings of the dialogical artefacts produced by the researchers and the expert workers from the associated research group.

In *Enhancing learning as theoretical thinking in robotic surgery*, Laura Seppänen, Marika Schaupp, and Mikael Wahlström, take as starting point that professionals in many domains need to deal with increasingly complex, technology-mediated and uncertain work. Accordingly the ways of learning that continuously and flexibly create new knowledge are needed at work. The article contributes to the aims of this special issue by intending to describe the logic of theoretical-genetic generalisation, and to use this, in addition to other methodological resources from pragmatism and cultural-historical psychology, for developing a learning method for robotic surgery.

Seppännen and co-authors argue that in theoretical generalisation, or theoretical thinking as they call it, the learner orientates him-/herself in two directions: towards producing general, abstract understanding of dynamic interrelations within a phenomenon, and towards flexibly tailoring good solutions for each particular situation. Based on study of robotic surgery, the article presents three different designs for learning based on video-supported joint reflection of real robotic surgical operations. The potential of the outlined method for learning are further discussed in the study presented in this special issue.

Concluding the contributions in this special issue in the article *'Hinged' activity systems: Expanding the utility of activity theory*, Lewis Hughes presents an approach to initiating and structuring activity system guided conversation intended to strengthen stakeholder empathy and partnership in action. The article, as stressed by Hughes, is not, in-itself, an outcome of so-focused research, but it rather shares insights accruing from ethnographic research largely in the VET arena and, in particular, on-going exploration of the circumstances aiding and inhibiting Australian VET teachers including researching and drawing upon the research of others as part of their professional practice. Hughes argues in the article that activity system – as derived from Cultural Historical Activity Theory (CHAT) has much utility in achieving empathetic partnerships between stakeholders in an activity where their respective interests might otherwise be in conflict. Consequently, the notion of the 'Hinge' is offered as a device to expand the utility of Activity Theory.

I very much hope that the contributions presented in this special issue will contribute to inspired research in VET with cultural historical grounds!

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Contribution to the study of personality by 'pioneers' of the cultural historical school: Revisiting earlier research in search for learning

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Abstract

In times when vocational education and training (VET) faces challenges from a variety of research problems, for example, dropouts and motivation for vocational oriented studies, it becomes important deepening into different theoretical and empirical sources. The development of a comprehensive theory of personality in cultural historical school is the result of the works of what we could well consider as research 'pioneers' within this school. The presentation and analysis presented in this article tries to contribute to VET research through systematising and drawing attention to some of the most relevant contributions of these pioneers. Critical remarks are presented though a critical review is not within the scope of the article. The analysis presented here is made with awareness of the complexities and the risks involved in all attempts to summarise what was a remarkable creative production in research that extended for decades. The reader should also observe that the scope of the presentation and focus of attention here is limited to the specific contribution of these leading scholars to the development of a theory of personality. Been this limitation highlighted the article expects to contribute to better understanding studies of personality within the cultural historical school henceforth serving to the advance of research within VET.

Keywords: personality, individual, cultural historical theory, learning, cognition

Introduction

One of the many challenges when conducting research in the intricate field of vocational education and training (VET) is choosing the most convenient theoretical ground. Based on earlier research there is explicit claim in this article about the value and advantages of using cultural historical theory. This is of relevance for investigating a variety of research problems that include, for example, study of motivation, vocational identity and even in search for explanations and solutions to the problem of drop-outs. Under the umbrella of cultural historical theory, we find contributions in a great variety of areas concerned with the development of personality. If we take as example the development of a comprehensive theory of personality in cultural historical school this is a result from different contributions of so called research 'pioneers' within this school. This article tries to contribute to VET research by systematising and drawing attention to some of the most relevant contributions of these pioneers. Critical remarks are presented indistinctly in different parts of the analysis though a critical review is not within the scope of the article. It is worth stressing that the analysis that is presented in the context of this article fully acknowledges the complexities and the risks involved in all attempts to summarise a remarkable creative production extended for decades. The author will feel that the aims of the article are fulfilled if it contributes to better understanding studies of personality within the cultural historical school, serving in this way to the advance of research within VET.

The higher mental functions – Vygotsky's influence in research on personality

Doing research about personality within the so-called cultural historical school places the researchers on the track of the works of Lev Semenovich Vygotsky (1896–1934). This is the path I followed in an earlier study (Moreno Herrera, 2007) and consequently I am following here.

Vygotsky´s works had a great significance for all later development of cultural historical theory. He transformed contemporaneous psychological thinking with a new conception of the development of the higher psychological *processes* (c.f., Vygotsky, 1960[1]). The influences of his works in educational research are also far reaching and very much at the centre of debate even beyond the frames of cultural historical theory (cf. Daniels, 2001). A review of the extensive production of Vygotsky available in recent collection of his works (e.g. Rieber & Wollock, 1997; Rieber, 1998) gives indeed sounded arguments to support those calling him 'the Mozart of psychology' (cf. Schedrovitsky, 1982). In a short but intensive and academically productive life Vygotsky set up considerable new lines of research.

> All his energy was concentrated on opening up new lines of investigation rather than pursuing any particular line to the fullest. That task remained for Vygotsky´s students and their successors, who adopted his views in varying ways, incorporating them into new lines of research. (Cole & Scribner, 1978, p. 11)

Vygotsky's works focused on uncovering the regularities of the cognitive functions to demonstrate in this way the distinctive character of the human psyche. Influential scholars within the cultural historical school have acknowledged his ground contribution to the development of cultural psychology and the investigation of activity and learning process (e.g. Cole, 1996, 1988; Cole, Engeström & Vasquez, 1997; Wertsch, 1991, 2000). Although affective aspects of human psyches or personality were not fully developed in his research, they were neither neglected (Gonzalez Rey, 1985). Referring to contemporary psychological science, he wrote: '… up to now the main problem and the most important one of Psychology remains closed – the problem of personality and its development' (Vygotsky, 1960, p. 14).

Particular attention is given to the field of emotions and feelings already in one of his major works *The Psychology of Art* first published in 1925 (see, Vygotsky, 1971). It is here where he first indicates the role of the affective aspects in psychology and at the same time stresses the limitation that the poor development in this area has had for psychological knowledge.

Vygotsky's interest in the study of more complex synthesis of the psychic, which would take into account the affective aspects of psychological regulation, is presented in different works (e.g., Vygotsky, 1960, 1986, 1997). This could well be illustrated with his approach to the relationship between emotions and intellectual processes.

> Our realistic thinking provokes more intensive and meaningful emotions than autistic thinking. The researcher who is eagerly seeking for something in the process of his thinking will be relating emotional experiences and ways into autistic ideas in such a degree, that probably a schizophrenic person cannot reach. The difference between autistic and realistic thinking is that in this last one emotional process play a more important role, despite of the fact that in both a clear synthesis of intellectual and emotional processes is obtained. (Vygotsky, 1960, p. 124)

Thinking is considered according to Vygotsky as a synthesis of emotional and intellectual aspects highlighting the unity between the affective and the cognitive; in this context, the role of experience in the child's psychic development is considered also from an affective point of view. The concept 'social situation of development' is to comprise both dimensions (cf. Vygotsky, 1978). In Vygotsky's view, experiences (practical social experiences) demonstrate a 'psychological unity' between what the child experiences him/herself and his/her contribution to that experience. This contribution is determined by the level of development he/she has previously reached. Vygotsky considers that the transformation of the influences of the environment leads to the expansion of the subject's psychological world. This expansion would permit external influences

that could be received at a given moment to be transformed into the subject's experiences. To Vygotsky development was linked to the mobilization of the affective potential of the individual (Vygotsky, 1960). The importance that Vygotsky attributed to human's affective aspects is equal to his concern with reaching a more complex synthesis of explanation of other psychological aspects that could develop a theory of personality (Gonzalez Rey, 1985). Some general principles 'drafted' by Vygotsky while examining the development of higher psychological processes, which he used to explain personality, are analyzed in the following.

Vygotsky considers the higher psychological processes as a distinctive aspect that functions based on integrated systemic units that has own qualitative specificity.

> The introduction to the psychology of behaviour and the concepts of system and function represent a step forward in relation with the mechanical conception of behaviour. The atomistic attitude of empirical and objective Psychology makes it impossible to investigate on the higher psychic processes and their true psychological nature. (Vygotsky, 1960, p. 27)

In a critic to predominating atomism in psychology Vygotsky points out that the psychic cannot be studied by isolated functions, something that he applies consequently when studying the cognitive functions (cf. Vygotsky, 1978). The search for an explanatory synthesis of human psychology was a driving force in Vygotsky's works (see, e.g., Vygotsky, 1960, 1971, 1997). Authors such as Fernando Gonzalez Rey (1985) and Ivan Ivic (2000) consider that this remained an unfinished task in his works. Vygotsky himself admits this limitation in the following terms: 'The attempt of infant psychology to study of embryonic development of the higher psychological processes proves the fact that the same psychology of superior functions is in an embryonic stage' (1960, p. 26).

Another important principle presented by Vygotsky (1960) in his study of the higher psychological processes is the mediation of these processes by the subject's consciousness. Vygotsky conceives mediation of consciousness as the system of symbols and signs that represents reality in consciousness – language, arithmetical symbols, etc. This principle, although somehow examined by classics in Marxist Philosophy (cf., Engels, 1993) needed further development to be applied in the study of personality; here lies an important contribution of Vygotsky to the study of personality.

According to Vygotsky (cf. 1960, 1978) the conscious level is expressed in personality by means of complicated reflections and elaborations, which are highly compromised affectively and determine its most complex forms of behavioural expression. The conscious level is not just an expression of the symbols and signs by which the subject learns about his/her surrounding reality. It is also an expression of the complex operations that humans, as historic-social subjects, perform by means of the contents integrated in their accumulation of

experiences. Consciousness is not an exact reproduction of the external, but the group of processes and forms by which the external appears with a proper sense to the subject. The external is historically and socially conditioned by the very development of the subject.

A crucial contribution of Vygotsky to the study of personality is the concept of internalization defined as the process by which operations that were initially performed in an external level become internal psychological operations (1960, 1978). Criticisms to the influence of this relevant contribution in other research works have also been reported (see, e.g., Gonzalez Rey, 1985; Tarazov, 1981). In relation to the study of the cognitive processes in the field of personality this problem can be illustrated with the following approach:

> The process of formation of personality as a process of internalization of historic-social experience creates in the individual an executive, operational type of creativity, an operational repeatability, and a complete number of corresponding psychic qualities. (Tarazov, 1981, p. 239)

The limitations of this approach, which somehow dichotomises the process of internationalization and misses its complex 'holistic' character, are that:

> Internalization is in this case understood one-sidedly as an immediate mechanism of transformation from the external to internal. Meanwhile, Vygotsky's conception demonstrates that for him socialization does not act as a system of external pressure – of stimulus and pressure of driving reactions – but as a structural moment of the psychic. (Chudnovski, 1982, p. 155)

Gonzalez Rey (1982, 1985) calls this limitation a 'mechanist' application of one of Vygotsky´s major contributions to the study of personality. The social character of the process of internalization has often been reduced to the resulting expression of the passing from external operations to the internal level. Leontiev is cited to illustrate this limitation:

> As it is known, internalization is the transition in which processes that are external due to their nature, processes with objects that are also external, are transformed into processes which carried out at mental level, at the level of consciousness. They suffer a specific transformation, are generalized, verbalized, reduced, and most important they become capable to continue a development which transcends the possibilities of the external activity. (Leontiev, cited in Gonzalez Rey, 1985, p. 48)

Leontiev emphasizes the object, material moment of the operations that passes on to an internal level (see also, Leontiev, 1978). According to other studies within the cultural historical school this is considered a one–sided understanding of the process (Chudnovski, 1976, 1982). The fact that Vygotsky, due to his short life, did not managed to fully develop the relation of internalization with the general development of personality lead to these different interpretations (Gonzalez Rey, 1985).

In a following section we analyse further the contribution of Leontiev to research on personality, it is however relevant to bring his work in this context for

the connection it has with Vygotsky's specific contribution particularly in relation to the internalization process. This process has importance relevance in the system of psychological categories later presented by Leontiev (1978). According to Leontiev the external object has a paramount importance in the transformation of the external into the psychological, internal, level. The study of personality requires, however, investigating structures that will allow explaining the psychological aspects from the social point of view, not only in the operational level as Leontiev mentions, but within wider frames including the subject's active role not limited to object manipulation (cf. Chudnovski, 1981, 1982; Gonzalez Rey, 1985). Summing up it is of relevance to also notice that internal processes develop beyond the possibilities of external activity.

Vygotsky´s works had a remarkable relevance from both theoretical and methodological points of view for all the subsequent research on personality within the cultural historical school. This strong influence, which goes beyond the relevance of the internalization process here highlight is widely acknowledge in most of the writings on research on personality (see, e.g., Antsiferova, 1981; Asiev, 1976; Bozhovich, 1976, 1977; Petrovski, 1981a, b).

Activity, consciousness and personality – Leontiev's contribution to research on personality

The relevance of the contribution of Alexei Nikolaivitch Leontiev (1904–1979) to the shaping of the cultural historical school and the specific value of his works for studies on activity and personality has been highlighted by influential scholars in the fields such as Jim Wertsch (1981). In an earlier study I gave considerable space to highlighting core aspects of Leontiev´s valuable contribution to the advance of research on personality within the cultural historical school (Moreno Herrera, 2007). Leontiev's explicit contribution to studies of personality has been controversial because of the focus on activity. Research on human activity could well be considered his major contribution to the development of the cultural historical school (cf. Nardi, 1996). *Activity, Consciousness and Personality* (Leontiev, 1978) is a core part of his far-reaching contribution and is an essential reading to understand his approach to the relation of activity with the development of personality. Rather than reviewing his contribution as presented in this major work we found more interesting to analyse the various criticisms that has been presented to his approach within the frames of the cultural historical theory itself. The criticisms serve us to argue that research on personality is far from being a completed endeavour within the cultural historical school.

The focus on cognition and the principle activity in the works of Leontiev (e.g., 1978) can be mentioned to argue that the relation of personality and emo-

tional processes were not totally developed in his work. The development of the category activity represents a turning point in research within the cultural historical school but still the role of activity as part of a coherent theory of personality remained controversial until the middle 1980s (cf. Gonzalez Rey, 1985).

In *Activity, consciousness and personality*, Leontiev writes that:

> Before explaining the basic moments that integrate the process of activity, the subject seems to remain on the edge of the focus of research. It appears only as prerequisites of activity, as a condition of it. But the subsequent analysis of the activity and the forms of psychic reflex that it creates makes it necessary to incorporate the concept of concrete subject of personality as internal moment of activity. (Leontiev, 1978, p. 125)

Analysing this approach Gonzalez Rey (1985) concludes that the subject appears with no specificity inside the process of activity and is somehow reduced to the internal expression of the activity he/she developed in the object world. The category subject has taken a secondary and subordinated position. Leontiev, according to Gonzalez Rey, seems to have transferred the subject's secondary character in the theory of knowledge to the psychological theory. In the theory of knowledge the image in the subject has secondary character in relation to the object. As for general psychological theory the main aim is to discover the psychological mechanisms of the subject's active and creative role.

The above mentioned is one of the few works where Leontiev gives specific attention to the category personality. From his perspective 'the structure of personality is a relatively stable configuration of the elementary motivational lines hierarchically arranged' (1978, p. 172). Leontiev presents here, in a nutshell, one of the essential aspects of the theory of personality, i.e., the stable character of the structure of personality and its determination by means of the motivational lines. Leontiev recognizes the complex aspect of the subject-regulating role in activity but his analysis of the role of the affective area is still incomplete (cf. Gonzalez Rey, 1985; Nepomnichaia, 1977).

One of the most far-reaching contributions from Leontiev to the theory of personality is category personal sense. Leontiev searched for explanation to psychological categories in the structure of activity; from this context comes also the category personal sense as 'the reflex of the relation of the motive of activity with the end of the action in the consciousness of personality' (1978, p. 172).

According to Gonzalez Rey (1985) and Nepomnichaia (1977) several of Leontiev's disciples focused their research works in widening the psychological potential of the category personal sense and introduced the formation of sense as a new category in studies of personality. Summarising, the characteristics that these researchers endorsed to the formations of sense are the following. Senses are created from the subject's existence, they have a so-called 'object character', i.e., they are oriented towards the object of activity; sense is always the sense for

something. They are independent from the process of consciousness appropriation; from the system of meanings. According to Gonzalez Rey and Nepomichina most of these works disconnect the formation of sense from the world of meanings. The separation does not necessarily imply independence between this category and the process of consciousness appropriation. The study of this relationship is considered by both authors as the most important and urgent demands for the use of the category personal sense, as presented by Leontiev, in the development of the theory of personality.

From Leontiev´s contribution (cf. 1978) comes also the assumption that in its functions, consciousness goes beyond the formation of meanings. Meanings are seen as something 'supra-individual' that includes the attributes of external objects in consciousness since humans form complex conceptions and reflections from the world of their sense and experiences. These experiences are a source for humans' attitude towards their world, and at the same time, a form of reflex of their surrounding world. The accuracy of the reflex in this case is not conditioned by the identity with the external but by the qualitative nature of internal expression of the external. This regularity is essential in the humans' intellectual approximation to their world.

Another important aspect to highlight in relation to the introduction of the category formation of sense in studies of personality is Leontiev´s interest in the search of internal systematic units that will make possible to explain the complex phenomena of personality by means of subjective categories (cf. 1978). Still, until the middle 1980s research literature within the cultural historical school reported that the knowledge about the forms and mechanisms that determine the psychological signification of activity in personality are not yet fully explored (Gonzalez Rey, 1985; Nepomnichaia, 1977). Just like the case of Vygotsky, the great merit of Leontiev in relation to research on personality lays in the path for research that he opened with the introduction of the categories activity and personal sense.

Qualitative changes of the structure of the personality of the child – Bozhovich's contribution to research on personality

The works of Ludmila Ivanovna Bozhovich (1908–1981) are one of the most important attempts to systemize the development of a child's personality through the qualitative changes of its structure in the different moments of ontogenesis (see, Bozhovich, 1966, 1976, 1978). Bozhovich and her collaborators did a great amount of empirical research in education. The results of this research were influential in educational practices in the 'soviet bloc'. Bozhovich, a Vygotsky's disciple, worked on the complex task of developing Vygotsky's principles applied to the study of personality. She tried to apply consequently the concept

social situation of development to the study of the different qualitative stages that characterize the evolution of personality.

> Vygotsky made another valuable contribution to the problem of psychic development when trying to discover not only its inner logic, but also the relationship between the child's psychic development and the influences of the environment. He started from the position that life conditions are spontaneous, not able to determine the child's psychic development and under the same conditions different particularities of the psyches can be formed. All this will depend upon the child's relation with the environment. (Bozhovich, 1976, p. 98)

Bozhovich, following Vygotsky's ideas, moves away from the consideration of the role of the 'instantaneous' in the social determination of personality. The instantaneous, the direct contact with reality, acquires a psychological sense only through the human being as subject of his/her social relations and activity (Bozhovich, 1976). Bozhovich gives priority to the study of the psychic internal aspects of personality in relation with the external influences. When dealing with Vygotsky's concept of social situation of development, Bozhovich refers to social situation of development as:

> That special combination of the internal processes of development and the external conditions typical in each stage. This combination conditions the dynamics of psychic development during the corresponding evolutional period and the new qualitatively peculiar psychological formations that appear in this period. (Bozhovich, 1976, p. 99)

When Bozhovich (1976) refers to the importance of the internal in the new acquisitions of each period of development, she sees the internal not as a sum of processes or isolated psychic attributes, but as a complex system where different formations and elements of personality are integrated, determining in its integration the qualitative specificity of each stage of development.

The concept social situation of development is an essential theoretical and methodological principle in educational psychology within the frames of cultural historical theory (cf. Petrovski, 1981b; Talizina, 1988). Bozhovich's works is the first attempt to explain each stage of the development of personality through the principle social situation of development (see, Bozhovich, 1966, 1976). The analysis that Bozhovich makes about the different stages of the development of personality permits the understanding of the type of essential formation that characterizes personality in its different stages. It also helps to understand the progressive liberation of personality from the immediate influences of the environment, until it becomes a 'true system' of self-determination. The conception of personality implicitly presented in the analysis of the stages of development made by Bozhovich became an operative model widely use in empirical research (e.g., Gonzalez Rey, 1982; Talizina, 1988).

Bozhovich doesn't make a periodization of development but rather presents a frame supported by empirical research about the distinctive psychological

formation of personality in each moment of its development (see, Bozhovich, 1976). This became a valuable source for subsequent works in this area (e.g., Talizina, 1988). Bozhovich had a formation in the field of general psychology and worked with Vygotsky and Leontiev. As a consequence of her activity in educational psychology, Bozhovich problematized one of the most relevant concepts in general psychology within the cultural school, i.e., the concept motivation.

Leontiev considers the object that represents a specific necessity as a motive taking into account the material and ideal levels, where the ideal level is the last sensory reflex of the material object (Leontiev, 1978). This definition of motive is, according to Bozhovich (1977) too short to allow an explanation of the complex levels of motivation that emerges in the diversity of activities and relations between the human and the environment. It does not explain either, the psychological essence of human motivational regulation.

> Either in Leontiev's conceptions, as in many other psychologists, the analysis of the proper psychological process of the development of necessities, the process of transformation in new qualitative forms has been omitted. Leontiev tries solving the problem in a theoretical-abstract level and basing on historical materialism, precisely where he is lacking concrete, psychological information. (Bozhovich, 1977, p. 20)

According to Bozhovich (1977) the study of the motivational area of personality cannot focus only in determining the relationships between necessities and objects. This may be important to emphasize the socio-historic character of necessity; however, it does not permit to explain psychologically how necessities are related in the regulation of behaviour. The same happens with those complex formations that could not be defined as motives in what she calls a 'the narrow limits' of Leontiev's definition, as for example, self-valuation, ideals and others. The meeting with more complex forms of human motivation in empirical research makes Bozhovich to reflect upon the limitations of the concept motive as presented by Leontiev. The use of this concept represented more a position of principle than a necessity to explain what had been studied.

> At the beginning we just kept to the opinions that Leontiev held concerning necessities and motives. But since the first moment, we were forced to slightly change the definition of 'motive' since it was impossible to operate with this term that always presupposed an object from objective reality. When we were trying to find out what necessities were 'crystallized' in a given 'motive', that is, what was behind a child's fondness for a specific object, we found a very complex combination of necessities, desires and child's intentions. In this combination it was hardly possible to understand the final intention and proper motive of activity. (Bozhovich, 1977, pp. 29–30)

This internal motivational complex that leads to specific behaviour of the individual needs more clarification in research. One of Bozhovich's major contribution in the study of children and adolescents' motivation was the extension of

the concept motive. Self-valuation, ideals and other aspects came into discussion as motives of human behaviour (cf. Bozhovich, 1977). Bozhovich also makes a relevant finding when presenting the specificity of human motivation as part of the unity between the affective and the cognitive which she studied having as a reference the principles developed by Vygotsky in the explanation of the higher psychological processes.

> The lack of a true solution to the psychological problem of the development of necessities in Leontiev's work did not allow him to find the solution to another psychological key problem: the problem of interrelation between affection and consciousness. (Bozhovich, 1977, p. 20)

The psychological formations such as, ideals and self-valuation, studied by Bozhovich (1966, 1976) in the development of personality in the adolescent and youngsters are important evidences of the unity between the affective and cognitive. These formations express their active role in the regulation of behaviour by means of the adolescent/youngster conscious reflection and elaboration. This unity between the affective and cognitive is considered as a 'functional cell' of the regulating potential of personality.

Bozhovich gave attention to the problem of the unity of the cognitive and the affective but went further to study motivation in its most complex expressions (cf, Bozhovich, 1976). She did not manage to develop a complete conceptual system but her works largely paved the path to studies of motivation within the cultural historical school (Talizina, 1988).

Based upon her empirical findings on motivation Bozhovich focused in her last works on systemizing and developing theoretical constructs on motivation (see, Bozhovich, 1977, 1978). Bozhovich did a remarkable attempt to explain the most complex forms of motivation by means of Vygotsky's work. This could well be illustrated when she argues that 'in the research done in the affective-emotional sphere, we shared the postulate that necessities, emotions and feelings are developed by the same general laws by means of which all other processes and psychic functions are also developed' (Bozhovich, 1977, p. 168).

The works of Bozhovich here referred are in different ways continuous a call and a reminder of the need to give the affective-emotional sphere equal attention as the sphere of cognitive processes. In the study of personality, Bozhovich considers of mayor relevance to analyse the complex syntheses of the cognitive and the affective, this study is, in her view, essential not only to educational psychology but to the advance of studies of personality in general.

Holistic approach of the study of the psychic functioning – Rubinstein's contribution to research on personality

The works of Sergej Leonidovich Rubinstein (1889–1960) are among the most influential in cultural historical theory and had also important relevance for the specific area of personality. Rubinstein gave particular attention to the holistic knowledge of humans' psychological world. He considered this to be possible only by means of the integral/holistic knowledge of human through psychological research (cf. Rubinstein, 1949, 1962, 1967). Rubinstein gives great importance to human activity in the development of personality. From his perspective activity allows linking the psychic with the social being and is therefore the most essential form of objective expression of the psychic. Rubinstein does not analyse the objectivity of the psychic by its identity of structural superposition related to activity, but through the specific task the psychic performs with regard to the activity (Rubinstein, 1967). According to him, consciousness does not repeat the structure of activity, but is inserted into activity. He emphasizes on the subject's active character in relation with the world and insists on the conditioning character of the psychic in the different activities humans carry out. 'The psychic phenomena intervene in human life not only as conditioned, but also, as conditioning phenomena […] The psychic is determined by humans' life conditions and influence their behaviour and activity' (Rubinstein, cited in Gonzalez Rey, 1985, p. 59).

A later study of the contributions of Rubinstein highlights that in his approach to psychological research 'the psychic is no longer derived from the social, or simply depending on it; the psychic component is on the contrary inserted in the individual's activity fulfilling a specific function' (Abuljanova, 1973, p. 142). Rubinstein (cf. 1962) gives particular relevance to the subject's independence and capacity to set tasks and goals independently and consciously as well as the capacity to give an orientation to his/her own activities. His emphasis on the conditioning character of the psychic had important methodological impact on research within the cultural historical school since it encouraged the search for mechanisms and ways through which the psychic can play an active and conditioning role. This had important implications for the study of how the psychic is formed avoiding that social determination will be reduced to the child's manipulating action in the world of objects.

The subsequent development of the active character of the subject as essential principle of the cultural historical school leads to the analysis of the social determination based on the active and reactive participation of the subject. In this specific aspect the works of Rubinstein are of remarkable value (see, Rubinstein, 1962). Rubinstein analyses the different ways the social aspects work on humans and presents it as follows.

> The social dimension does not remain as an external fact with regard to the human being: it penetrates inside and from there it determines its consciousness. By means of: a) language, speech, this social form of knowledge; b) the knowledge system, that is, the theoretically consciously formalized product of the social practice; c) ideology, which in a class society reflects class interests and finally, d) the corresponding organization of the individual practice; where society configures both content and form of the individual consciousness of each person. (Rubinstein, 1949, p. 19)

The above suggests that the social character of the psychic should not be searched for in immediate and constant correspondence with the human being's external environment. On the contrary this is shown in the subject and has a creative and individualized expression in the subject's historical doing (Rubinstein, 1962). The social character of a process such as communication in which each subject transmits an individualized and synthesized expression of his/her own personal experience is determined by its social nature. These elaborations by no means can be reduced to any form of the individual present objectal relation with his/her world (Rubinstein, 1962).

In different works Rubinstein provided arguments to support the basic principle of the social character of the subject in the most complex forms of sociohistorical existence of personality and in the most elementary reflecting relations of humans with the objective reality (cf. Rubinstein, 1962, 1967). When analysing the pre-Marxist materialistic conception of reflex, which separated the relation of image and object from the subject's reflecting activity, Rubinstein argues:

> This interpretation makes unavoidable to deal with the dangers of the dual contrast of the ideal versus the material aspect and the framing of the first beyond the limits of the second. In fact, the initial components of the basic knowledge relations are not the image and the object, but the knowing and reflecting subject of the objective reality and reality itself with which the subject interacts. (Cited in Abuljanova, 1973, p. 113)

Rubinstein acknowledged the subject's role in the reflecting relation with the object even in its most elementary levels (see, Rubinstein, 1962). Rubinstein also presents the integral character of the subject of activity in his understanding of the necessary unit between the cognitive and the affective.

> In the study of psychical processes first attention is usually given to the 'law' specifying how perception, thinking, etc. occurs. However, perception and the human though, considered as a certain concrete experience and as a content of a person's life, commonly, includes in themselves not only the reflex of specific phenomena or given relations among objects, but also the meaning or sense that such phenomena and relations have for the individual. (Rubinstein, 1967, p. 172)

Rubinstein (1967) searches the meaning that the psychic processes has for humans through the unity between the affective and the cognitive in the functional manifestation of these processes. This manifestation does not have an abstract character, but is expressed in their integration in personality. The level of de-

velopment of personality is the one determining the form in which the unity of the cognitive and the affective is presented. Rubinstein considers that the unity of the psychic processes in the personality as a qualitatively superior level is expressed by means of the self-consciousness which acts as integrating aspect of different processes and qualities of personality. In summary 'the problem of the psychological study of personality does not end with the study of its psychic properties like capacity, temperament and character but with the discovery of the self-consciousness of the personality' (Rubinstein, 1949, p. 667).

For Rubinstein (cf. 1962) personality was not a sum of features or properties; his works gave special attention to the uncovering and analysis of the mechanisms and ways to explain its psychological functioning. In some of his latest work he claims that personality have reached the 'status quo' as research area in psychology (cf. 1967). Other studies of his works draw attention to the importance of his contribution in the opening of 'a whole new path' in research that does away earlier 'atomistic' approaches to the study of personality (cf. Abuljanova, 1980, 1981). Rubinstein's works are a valuable legacy in the attempts to define a comprehensive holistic approach to the difference process integrated in personality.

The relationship activity & ontogenetic development of personality – Ananiev's contribution to research on personality

Boris Gerasimovich Ananiev (1907–1972) shares credits with Rubinstein in the elaboration of a holistic understanding of personality. His works are of particular relevance for understanding the relationship personality-activity in studies within the cultural historical school (see, e.g., Ananiev, 1977, 1980). Activity, according to Ananiev (1980) could not be analysed in an abstract way, as a group of acts, goals and motives, but through its relationship with the subject. Ananiev studied activity in relation to the development the human being experiences from an ontogenetic perspective. His conceptualization of activity is somehow wider than Leontiev's (cf. Leontiev, 1978). Ananiev did not limit activity to the subject-object relationship; he opposed to the characterization of the stages of the development of personality based on the concrete form of activity that has the condition of fundamental activity.

> The hypothesis that a form of activity arises from the other due to the internal laws of individual development can not be proven neither in the relationship study-work, nor in the relation game-activity. The activity of study should be combined with games since very early stages of development, the same happens with work. Children already in day-care centers and kindergarten should practice simple operations in an activity with a defined social purpose. We can say that it is not so simple to make game into a specific form of the child's object activity from his first year until the period in which he starts formal studies as many experts in child psychology tell us. Game as a particular from of activity has its own history of development comprising all periods of human life. (Ananiev, 1980, p. 20).

According to Ananiev (1980) sports in later stage of development of the individual is also part of games. In the same category it is possible to include different types of hobbies which could be considered manifestations of ludic activity, for instance collectionists of different kinds. What Ananiev considers game activity of the adult is an important part of life closely related to the so-called free time. There are often so complex transitions from work to game and study, that it is difficult to make any kind of unilateral characterization of human activity.

Ananiev (1980) goes beyond the objectal understanding of activity in which the psychological significance is specified by the role played by the elements involved in the appearance of an internal logic; these elements are, e.g., acts, goals and motives. This perspective widens the category activity to more complex forms of relationship between human beings and the environment. A considerable part of Ananiev's work was focused in understanding the role of activity in each period of development of the individual. This was done by analysing the system of meaningful activities within each period, rather than by focusing on a leading activity.

The contributions early mentioned in relation to activity had a great important for the study of personality. They are useful for looking at different psychological constructions beyond Leontiev's conception about the structure of activity. Ananiev (1977, 1980) considers activity as systemic integration of 'three forms' that he regards as essential in the relations that the individual establishes with the reality; these forms are: communication, knowledge, and concrete activity. Each form of activity has a structural specificity and own way to influence the psychic development of the individual. Other psychologists following Ananiev's path call this category 'vital activity', to differentiate it from the 'traditional' concept of activity developed by Leontiev (cf. Gonzalez Rey, 1985).

Ananiev (cf. 1977, 1980) shares with Rubinstein the interest in searching a system which will allow explaining the factors that are involved in the social determination of personality. He worked intensively in setting up dynamic, more dialectics like, principles for research on personality. In this search he analyse the dialectics of the internal and external conditions of development considering both the history and present expression of these conditions. His works remarkably add to the explanation of social determination of the psychic.

The relevance of the affective area of personality is also in focus in the contributions by Ananiev (cf. 1980). In his opinion the different affective states of the individual cannot be explained following the standardized pattern of the study of the relationship existing between a specific external objective and the kind of affective response that this objective requires.

> Frustration, like other affective states, comes into existence in critical situations. However, the dynamics of the emotional state is significantly determined by personality itself. Frustration could develop into an aggressive state in subjects with

> little self-control. On the contrary in individuals lacking self-confidence, who are susceptible or introverted, frustration could develop in the form of depression. (Ananiev, 1980, p. 150)

According to Ananiev (1980) the affective states and emotions cannot be analysed outside their complicated determination by the personality. Affective states and emotions are not a direct or pre-established consequence of the objective aspects that emerge in the situation that the subject faces, but a consequence of the psychological significance the subject gives to them by means of his/her personality. The differences in the reactions to success and failure shown by youngsters with an appropriate self-valuation, in comparison to that of other with overvaluation or undervaluation of themselves, illustrate this regularity.

Studying further the inner complexity of the determination of different behaviours, moods, and reflections by means of the different mechanisms and internal formations of personality could well be considered the starting point in the elaboration of a psychological theory about personality (Ananiev, 1980). The relationship between motives and behaviour is essential and equally important, in Ananiev´s perspective, as the relationship between the cognitive and the affective in personality.

> It is necessary to insist that in the theory of personality the relevance of the intellect in the structure of personality is frequently underestimated. On the other hand, in the theory of intellect the social and the psychological features of personality that mediate the intellectual functions are insufficiently taken into account. This gap between personality and intellect opposes to the human being's real development. It is in this development where the social functions, social behaviour and motivation are always related to the process of reflex of the surrounding world by the humans. (Ananiev, 1980, p. 152)

Like Rubinstein does, Ananiev (1980) also considers reflex as a product of the subject that interacts with the object. The subject puts on the object all his/her potentialities and the characteristics of his/her psychic world; on this foundation, he/she builds the reflex of the surrounding world. Ananiev's work presents a conception of personality as a subject of behaviour, which is regulated by internal psychological mechanisms. It also presents a wider conception of the subject's links with the environment. The specificity given in his work to the categories communication, knowledge, and work made possible the study of the role that these categories have in the development of personality.

Concluding remarks – Common principles in the early works within the cultural historical tradition

I have attempted, in the earlier sections, to make comprehensive presentations of the contributions to research on personality by a group of the most relevant researchers in the cultural historical school. In the analysis presented above

main contributions to the study of personality are presented. Still, critical studies about research on personality within the cultural historical school refer to the various gaps and areas in need of further research (see, Gonzalez Rey, 1985; Shorojova, 1980).

After presenting the contributions and standpoints of some of the most relevant researchers within the cultural historical school it is now possible to draw attention to a number of communalities in their work. These common aspects are important principles for the study of personality and for a better understanding of the overall contribution of the cultural historical school in this area.

The first aspect to underline is the common acknowledgment in these contributions of the social determination of personality. They all consider personality as a historic-social product in the development of the human being. Personality is formed by means of the different forms of relationship of humans with the surrounding reality. Concerning these different forms of relationship it is possible to find differences among the mentioned researchers. Leontiev (1978), for instance, elaborated a conception basically oriented to explain the structural elements within the subject's relation with the world of objects, which he explains through the transformation from the external objective to the internal subjective in personality.

To Rubinstein and Ananiev, activity is a much wider category whose psychological relevance is not defined just by means of its operations or specific structure, but revealed by an active form of interchange between humans and their reality (cf. Rubinstein, 1962; Ananiev, 1980). According to this perspective, the psychological relevance of the category activity might be limited, but, on the contrary, the theoretical and methodological potentialities to use this category in the study of the personality are greater than what the study by Leontiev could suggest. The broadening of this category in the works of Rubinstein and Ananiev, and the level of coherence in the presentation of the category communication in Ananiev's conception of activity, were significant advances in research on personality.

The role of self-consciousness in the study of personality is another central aspect common to the contributions of these psychologists. The specificity of self-consciousness in the functional manifestation of all processes and formations of personality is analysed as an active moment of integration of the psychic under conscious elaborations and reflections (cf. Shorojova, 1980). The attention given by these authors to the mediateness of self-consciousness in cognition and in the motivational sphere largely facilitated the development of the principle of the unity between the cognitive and the affective in personality. This finding also allowed an active conception of personality in which the human being acts as subject in a broader sense and not just as a possessor of features and properties.

The principle of unity between the affective and the cognitive is essential in research on personality and is acknowledged by all the mentioned authors. The integral character attributed to the higher psychological processes is also a common feature in these contributions. This is also the case when it comes to the search for levels of synthesis in the explanation of the psychological that help to overcome the different functionalist positions in psychology. In the contributions of these researchers it is also possible to identify important principles of Marxist Philosophy such as the reflex of reality as main character of the psychic, the socio-historic nature of the subject, and the active role of the subject.

The presentation in this article also shows the various contradictions between relevant contributors to the development of a theory of personality within the cultural historical school. Assuming a dialectic point of view and considering contradictions as a source of development it is possible to conclude that the path to further and meaningful research was substantially paved by these contributions. Research within VET, in particular concerning problems such as motivation and dropouts, will benefit greatly from revisiting with critical eye many of what we call here original contributions from cultural historical research.

Endnote

[1] In this article and a previous study (Moreno Herrera, 2007) I had a very valuable help from Professor Nikolai Vasilievich Kohtriakhov, Moscow State Industrial University. He consulted the edition from 1960 in Russian language of Vygotsky's work *The History of the Development of Higher Psychological Functions*. We discussed my knowledge of this work from its presentation in the edition of Vygotsky's work by a group of scholars lead by Michael Cole published in 1978 with the title *Mind and Society*: *The Development of Higher Psychological Processes,* and the translation in Spanish language. Again, in our discussion the question of accuracy of the translations of Vygotsky´s works was a major subject, I finally decided to present quotations that Professor Nikolai Vasilievich Kohtriakhov translated from the edition of 1960. This decision was inspired by reading the acknowledgment made by Michael Cole in the preface to the edition of 1978: 'In putting separated essays together we have taken significant liberties. The reader will encounter here not literal translation of Vygotsky but rather our edited translation of Vygotsky' (Vygotsky, 1978, p. X).

Notes on contributor

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Transforming vocational education and training in Finland: Uses of developmental work research approach

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Abstract

Vocational education and training (VET) is under reform in many Nordic countries. This article explores uses of developmental work research (DWR) approach in reforming and transforming practices of VET. DWR was initiated in Finland in the 1980s to enhance understanding about learning in organizations. The aim of this article is to elaborate the approach by examining studies made in the field of professional and vocational education and training, and thus to examine potentials and shortcomings of the approach. Eight DWR studies in the field of professional and vocational education and training are summarized, and three of them are elaborated. Contributions of the studies cover new tools, conceptualizations and methods for VET. Shortcomings bring forth researcher's dual role and lack of evidence on sustainable development after study processes. In conclusion I state that DWR offers rich and solid theoretical and methodological tools for VET researchers. However, they need to develop concepts that combine different dimensions of research, and not to forget to elaborate their study results from societal and individual perspectives.

Keywords: developmental work research, cultural-historical activity theory, vocational education and training

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Introduction

A recent research project compared vocational education and training (VET) systems in the four Nordic countries (NordVet, n.d.). The researchers aptly pointed out that vocational education systems differ in the Nordic countries, for example, the history of the labour market in each country has effected the development of the VET system; Finland and Sweden has more school-based VET than Denmark and Norway (cf. Stenström & Virolainen, 2014). The VET focuses on improvement of skills and knowledge needed in working life, and the Nordic countries have a rich research agenda for improving and developing VET (cf. Helms Jørgensen, 2015; Persson Thunqvist, 2015). My focus is on a specific approach developed in Finland: developmental work research, and how it has been used to study and develop practices in the VET field.

DWR was initiated by Yrjö Engeström (1998) and his colleagues (Engeström, 2005) when tackling with research and development work in organizations in Finland in the 1980s. They wanted to explore learning in organizations and argued that traditional theories of learning did not cover future-oriented learning. Traditional theories of learning assumed that things that needed to be learned existed somewhere such as in textbooks or in practices of experienced colleagues. Engeström (1987/2015) called the new theory of learning *expansive learning* trying to grasp something that was not yet there. From very early on, DWR was connected to historical forms of work and transformation of work (Engeström, 1998). Since its start, DWR has been implemented in several organizational change efforts in Finland and also internationally[1]. In the field of VET, several transformations have occurred and DWR has been employed to capture those transformations.

Today, initial VET in Finland takes three years of full-time study. Prior learning can shorten the study time. Each qualification includes also on-the-job-learning and gives eligibility for higher education (universities and universities of applied sciences). VET is placed in the ISCED classification system on level 3–4. The VET system is currently under reform, which aims at strengthening interaction between educational institutions and working life by putting heavy emphasis on a competence-based approach. Furthermore, government's budget cuts form a big challenge to VET (OKM, n.d; OPH, 2012). Three of the DWR-studies introduced here (Tuomi-Gröhn, 2003; Härkäpää, 2005; Lukkarinen, 2005; in Table 1) were conducted in upper secondary vocational education institutions: the focus was on the concept of developmental transfer and on co-operation between working life and education.

Universities of applied sciences (UAS) are part of the Finnish higher-education system. They are on level 6–7 in the ISCED classification system. A bachelor degree takes 3.5–4.5 years of full-time studies. A master degree takes 1.5–2 years (OKM, n.d.; OPH, 2012). Three studies presented here (Konkola,

2002; Hyrkkänen, 2007; Ahokallio-Leppälä, 2016; in table 1) used the DWR approach to develop practices of higher education focusing on: collaboration between school and work, evolvement of research and development concept, and development of human resources management. Vocational teacher education, in the Finnish system, is mostly organized at universities of applied sciences. Pedagogical training takes one-year full-time study. The Swedish language vocational teacher education is organized at the Åbo Akademi University. Lambert's (1999) study focused on vocational teacher education.

Developmental Work Research approach

DWR bases on cultural-historical activity theory (CHAT) and scholarly works of Vygotsky (1978), Leontiev (1978) and their followers (e.g. Cole & Engeström, 2011). Concepts of mediation, activity and activity-system model, object, contradictions, historicity, and multivoicedness are frequently employed in DWR studies (Engeström, 2001). Concepts interrelate general principles of CHAT into the specific context and local situation of the studies. I will give some examples of how these concepts are employed in relation to DWR studies.

Mediation of activity, such as learning activity, means that learning is not a direct reflection to some stimulus, but is mediated through cultural tools and signs (Vygostky, 1978). For example, in the area of professional and vocational education, the study by Teräs (2012) examined how the immigrant students faced a new mediating tool of learning, namely 'paper' in their education. Different types of papers such as assignments and textbooks were read and written, carried and copied in the activities of learning and studying in the vocational college. For immigrant students the activity of learning involved new tools and methods, which needed to be learned.

Contradictions are perceived as driving forces of development and learning (Ilyenkov, 1977). In DWR studies, it means that contradictions are manifested as disturbances, ruptures, tensions, and innovations in activities, therefore it is important that researchers identify them (Engeström, 1998). Lukkarinen (2001) identified and analysed disturbances in vocational teachers' work during a developmental project when on-the-job-learning was included in trainings. She identified disturbances such as student groups being smaller than before, resistance to research work and non-participation in trainings. As the result of her analysis, interventions were organized to overcome disturbances and to find new solutions to the training.

Hyrkkänen (2007, p. 81) identified the new object for teachers in universities of applied sciences when looking at new demands in teachers' work: teachers work involved also research and development, not only teaching tasks. Konkola (2000) organized an intervention called 'collective remembering' to make visible the history of occupational-therapist education. She used various artefacts such

as photos, things, and a memory-map to focus discussion on developmental phases and changes of the training. Heikinheimo (2009) examined different voices of instrumental music lessons and focused especially on intensity of interaction between the teacher and the student. He identified, for example, voices of musical ideal and musicianship in communication of teachers and students.

DWR is perceived as an interventionist approach, which combines scientific inquiry, practical development work, and expansive learning (Engeström, 1998). Phases of DWR are often depicted as a methodological cycle with five steps, following the seven epistemic actions of expansive-learning cycle (Figure 1). 1) Starting from charting the present situation, 2) analysing contradictions between development history and present, 3) supporting and analysing the planning of the new activity model, 4) supporting and analysing the implementation of the new activity model, and 5) reflecting on, spreading, and consolidating the new activity model (Engeström, 1998).

Figure 1. Seven actions of the expansive learning cycle (modified from Engeström, 1999, p. 384).

Results of DWR are typically presented in three ways: practical tools for development such as manuals or new methods, intermediate concepts to conceptually manage work practices and situations, and new methods and scientific ideas for science. (Engeström, 1998). For example, the teachers of the oral-hygienist training used DWR to develop their practices within the training (Keto, Nuutinen & Teräs, 2010). It had been a longitudinal process covering several years from the beginning of 2000. In the first phase, the teachers identified the challenge of the present situation: how to integrate working life and teaching

practices of oral-hygienist training. In the second phase, they dwelled into the history of oral-hygienist training. In the third phase, the teachers produced a new model called 'collective expertise' illuminating co-operation between dentists and oral-hygienists in working life. The new model acted as a future-oriented vision for development of the training. The challenge was to find out how these two professional groups could work together already during education. In the fourth phase, the model was further developed and called 'a health-oriented teamwork-model', and put into practice. Dental students and oral-hygienist students started to take care of periodontal patients together during their internships. In the last phase, the model was consolidated, and it was found that in co-operation between several actors and institutions (oral-hygienist training, dentist training, and health-care centre) consolidation actions and tools were needed on different levels, in and between organizations, such as agreements, curricula, handbooks and timetables (Keto et al., 2010).

Many studies using DWR approach have been conducted in working life contexts (cf. the collection of different studies in Engeström, 2005). But there are few studies connected to comprehensive school or general upper secondary education. Kärkkäinen (1999) studied teachers' collaboration and teamwork in Finland and in the USA. Rainio (2003) analysed teachers' argumentation when talking about school change and development. Käyhkö (2015) examined partnership between school and local community focusing on entrepreneurship education. Rajala (2016) explored teachers' development focusing on transformative agency and agency-centred pedagogy.

However, my focus is on secondary and tertiary level professional and vocational education and studies implemented in this area in Finland. Even focusing on studies conducted in Finland, there are many to choose from; I have collected into table 1 an overview of the studies, and elaborate three of them specifically.

Table 1 shows the summary of the eight studies including study aims, main material collected in the study, method and concepts used in the study as well as main findings of the studies.

Table 1. Summary of the studies in the field of VET using DWR.

Author, year and type of study[1]	Aim	Main material and method	Main concepts	Main findings	What new was produced
Konkola 2002 LT[2]	To examine collaboration between education and working life	Tutorial discussions Documents Interventions	Developmental transfer Boundary zone Boundary object	Reorganizing traditional tutorial discussions into boundary-zone activity promoted developmental transfer	Boundary-zone activity as new activity for collaboration between working life and education
Hyrkkänen 2007 DD	To describe formation of a new R&D concept	Interviews Change laboratory intervention	Cognitive trails ASM[3] Expansive cycle	Concept of thesis work expanded and a new conceptual model was developed	Research arena – model
Ahokallio-Leppälä 2016 DD	To examine human resources development and its challenges	Documents Interviews Questionnaires Interventions	ASM Expansive learning Competence management	Trajectory of a longitudinal development work Tools for competence management	New competence management and development system
Tuomi-Gröhn 2003 O	To evaluate 3 developmental projects	Field-notes from observations, Audio recordings of meetings	Zone of proximal development Developmental transfer Boundary crossing	Collaborative team is important for a successful project Dialogue between theoretical knowledge and everyday experiences enhance development	New understanding of successful development projects: how the project is anchored into larger institutional setting
Lukkarinen 2005 LT	To examine collaboration between VET and working life in ambulance service	Tutorial discussion Interview	ASM Developmental Transfer Expansive learning	New tools for documentation Expansion of networks	Instructions for documentation New documentation rapport
Härkäpää 2005 LT	To analyse initiatives for co-operation	Workplace meetings	Trading zone Developmental transfer ASM Boundary crossing	Trading zone gives opportunity for developmental transfer but it requires skills of negotiation from all parties	Trading zone can promote change agency
Teräs 2007 DD	To analyse challenges of immigrant training	Discussion Intervention	ASM Interculturality	Culture laboratory offered a solid background for intercultural learning	Culture laboratory
Lambert 1999 DD	To analyse potentials of new activity model	Discussion Intervention	ASM Contradiction Perspective	Learning studio enabled boundary crossing and collaboration between educational institutions an working life	Learning studio

[1] DD=Doctoral dissertation, LT=Licentiate thesis, O=other, [2] Each publication's reference details are found in the references, [3] ASM=activity-system model.

The eight studies covered secondary and tertiary level VET and vocational teacher education. The impetus for the studies was change in the vocational/professional education system, organization or society. Especially important was co-operation between school and working life. Changes emphasized need for new types of competences for teachers and students. The aims of the studies were to examine and analyse development, produce new tools for practices, and conceptually and theoretically manage everyday practices. Most of the studies were either licentiate theses or doctoral dissertations; only one study by Tuomi-Gröhn (2003) was not. All of them were embedded within larger development and research projects. In most studies, the researcher had a dual-role as a teacher/researcher, and the study was conducted in the researcher's own workplace. Research materials were many and diverse; intervention was implemented in five of the studies. New tools, models or concepts were created and in some studies also tested. All studies produced new knowledge in form of concepts, tools, methods or models for vocational and professional education.

New conceptualization, interventions, and boundary crossing

I chose to look closer at three studies, because they presented three contexts of professional and vocational education. The impetus for Hyrkkänen's (2007) study arose when universities of applied sciences were formed during the 1990s in Finland. The task of research and development (R&D) was added to responsibilities of UASs. Hyrkkänen examined how this new task was perceived and how the concept of R&D, nowadays called research, development and innovation, emerged and was developed. The study was part of a larger research and development project. Here the societal change can be seen, forming a new school level, which affected practices of the school. Thus, she examined the concept-formation process for R&D activity in a university of applied sciences. She also analysed challenges and obstacles of the formation process. The researcher's role was to act as a researcher-interventionist in her organization. (Hyrkkänen, 2007)

From the DWR point of view the first phase was charting the present situation. Hyrkkänen (2007) interviewed 22 persons who were part of the school management to form understanding of how they perceived R&D work at the university of applied sciences. In the second phase, she analysed the historical phases of universities of applied sciences and the history of the concept of R&D within them. She described how the object of teachers' work expanded from teaching to include R&D work. She applied Cussins's theory of cognitive trails (1992), Toulmin's (1972) evolution of concepts, and Engeström's and his colleagues' (Engeström, Pasanen, Toiviainen & Haavisto, 2005) complex concepts

as well as theory of expansive learning (Engeström, 1987/2015). For example, she identified contradictions in teachers' work: if you focus on teaching, you neglect R& D, and if you focus on R&D you neglect teaching (Hyrkkänen, 2007, p. 31). In the third phase of the DWR process, supporting and planning the new model, in this case the new concept for R&D, she organized the change laboratory[2] intervention for the teachers of a social and health care program. During this phase, the teachers discussed and elaborated how the new concept would be put into practice. In the fourth phase, as the result of the new R&D concept, the teachers started to experiment with a new type of thesis work with the students. The teachers wanted to develop the thesis work from narrow, school-inside work to larger R&D projects together with working life. For the purposes of the new type of thesis work a 'research arena- model' was formed. The last DWR phase, spreading and consolidating the new concept, was outside the scope of the dissertation. Hyrkkänen's (2007) main results highlighted how the concept of thesis expanded from a narrow school-based thesis to an integrative work-life based thesis. DWR formed a solid methodology for her work offering methods and theoretical tools for analysing the developmental process. However, it remained open how sustainable this development work was.

In my dissertation work (Teräs, 2007) I developed an intervention method called a culture laboratory. It was based on a generic change laboratory methodology, in which vocational teachers and immigrant students together examined challenges of preparatory immigrant training. The study was embedded in a research and development project. The impetus for the work was the changing situation of immigration in Finland. More migrants moved to Finland and a new training called a preparatory training for immigrant students orienting toward VET started in the end of the 1990s. Thus, my research and development project focused on the new immigrant training and challenges encountered within the training, such as lack of materials and methods to teach second language speakers. The aim of the study was to examine challenges of the new immigrant training and to develop a method and a tool for evolvement of the training, in which all parties were present: immigrant students, teachers, and other personnel of the college. The culture laboratory intervention was conducted and it formed the main material for the study. My role was to act as a project researcher during the study in my workplace. Theoretical bases came from CHAT such as the concepts of culture and contradiction, and the activity-system model. The main findings were that the culture laboratory offered a solid background for intercultural learning and development. The study also recognized that intercultural space was a tension-rich area, and that the process of observing and comparing different cultural practices offered potential for creating something new. In other words, cultural practices of the previous and present school needed to be identified and reflected on to be able to start new practices.

From a DWR point of view my dissertation focused on the first and second phase of the DWR cycle: charting and analysing the present immigrants' training situation, and analysing contradictions between students' previous school practices and the current ones. The subsequent phases of the DWR cycle were not described in my dissertation.

The third study by Lambert (1999; 2003) focused on challenges of crossing boundaries between vocational teacher education, vocational schools, and workplaces. Also her study was embedded in a larger research and development project and an experimental programme based on an expansive learning cycle within vocational teacher education. The impetus for her development work was that the teacher students did a development project during their studies, but findings of the projects did not spread to their educational institutions or to working life. Lambert created a boundary-crossing space and invited participants from three parties to discuss about the current state of training. She called the space 'a learning studio', in which the participants were able to cross boundaries of their institutions and examine learning and expertise needed in their professions. The learning-studio intervention can also be regarded as a formative intervention for boundary-crossing purposes for those who were interested in development work. The main research material consisted of the meetings in the learning studio, all meetings were video recorded, and in addition interviews were made. The researcher acted in the role of a teacher educator/researcher. The main findings suggested that in the learning studio meetings, new solutions, concepts or models for collaboration were created by the participants. Thus, the learning studio enabled boundary crossing and collaboration between educational institutions, teacher education, and workplaces. The theoretical bases of the study came from CHAT and expansive learning such as the concepts of object, activity-system model, and zone of proximal development.

From the DWR point of view, she started her dissertation from the third and the fourth phase: the new model of 'the learning studio' had been formed and she wanted to experiment and analyse its uses and functions. The previous phases had been described in Lambert's licentiate thesis (1994), and the last phase of the DWR cycle was outside the scope of her dissertation.

Discussion

The aim of this article was to elaborate the DWR approach by examining different studies made in the field of professional and vocational education to reveal potentials and shortcomings of the approach and to identify future challenges. DWR has attracted co-operation between researchers and practitioners to develop practices in a scientifically way and has provided theoretical and methodological tools for research and development work. Impetus for studies were

changes in the Finnish VET system (e.g. Tuomi-Gröhn, 2003; Lukkarinen, 2005; Hyrkkänen, 2007) or in the Finnish society (e.g. Teräs, 2007). Thus, the researchers and the practitioners were the front liners of experiencing change and were looking for tools to map and manage these changes.

I identified three types of contributions to vocational and professional education. First, the DWR approach offered theoretical and methodological tools for understanding and managing change such as the activity-system model, theory of expansive learning, the concept of boundary crossing and formative intervention methodology. Second, with the help of DWR new understanding, knowledge and methods were produced such as the research-arena model, new concept of R&D, instructions for ambulance service, and the culture laboratory. Third, with the help of the DWR approach the researchers and the practitioners were able to be engaged in research and development work. Engeström (1998) wrote that typically DWR produces three types of results. First were those focusing on development of practices such as new tools; in this case, for example, Lukkarinen's (2005) study produced an instruction for documentation in an ambulance service. Second, new types of, what Engeström (1998) called, intermediate concepts are produced to help participants to understand and manage the activity in question in a qualitatively new way. In this case, for example, Konkola's (2002) boundary-zone activity for co-operation between working life and school within the occupational-therapist education. Co-operation between education and working life seems to be a recurrent and frequent topic of research even today in VET. The third type of contributions are those focusing on science; in this case, for example, the concept of developmental transfer by Tuomi-Gröhn (2003) and new intervention methods such as the learning studio by Lambert (1999).

However, I also found four types of shortcomings, which may cause setbacks. First, researchers' dual roles may be problematic. Being a researcher in one's workplace can give you access to knowledge that is not shared with outsiders, but this position can also make you blind to something that is visible to outsiders. This can cause ethical dilemmas, especially if the researcher is on managerial position in the organization. Second, in interventions, and especially in a change situation, participants typically want to develop and are keen to find new solutions. One can argue that any change is good and participants push towards solutions, and thus want to satisfy need of mapping and managing the change. Third, there are not many post-doctoral studies in the area of vocational and professional education using the DWR approach. Forth, studies did not fully cover the phases of the DWR cycle and as a result of this there are no evidence of how sustainable new tools, concepts or methods produced in the projects have been.

Table 2. Level and focus of DWR studies in the field of VET.

Level of development work	**Focus**	**Study**
Macro: society	VET systems	–
Meso: collective community	School, work place	All introduced
Micro: individual	Teacher, student	–

The DWR approach has been criticized by Langemayer and Roth (2006) that it focuses on the collective instead of the subjective. This tendency is visible also in the field of VET studies (see table 2). All studies introduced here focused on development of meso-level practices, in other words practices of VET in schools or practices developing co-operation between schools and work places. None of the studies focused on societal level, which is a tad paradoxical, because the impetus for many studies came from changes on the societal level (e.g. Hyrkkänen, 2007; Teräs, 2007). And none of them focused on individual development of a teacher or a student. However, one can argue that distinguishing different levels is artificial, and when a group of people is collaborating in development work, individual development occurs as well, and the agency of the researcher, or researcher-interventionist, is crucial to the research processes. For example, Virkkunen and Schaupp (2011) has presented a sophisticated learning path and role of an individual in-house developer in the development process. But the focus of the presented studies has been on practices of collective level.

Another critic against the DWR approach by Avis (2009) is that DWR is focussing on locally situated practices and their progressive potentialities and thus forgetting the wider societal context and relations within it such as socio-economic structures. To reflect this on the presented studies in the field of VET, I formed the following figure 2.

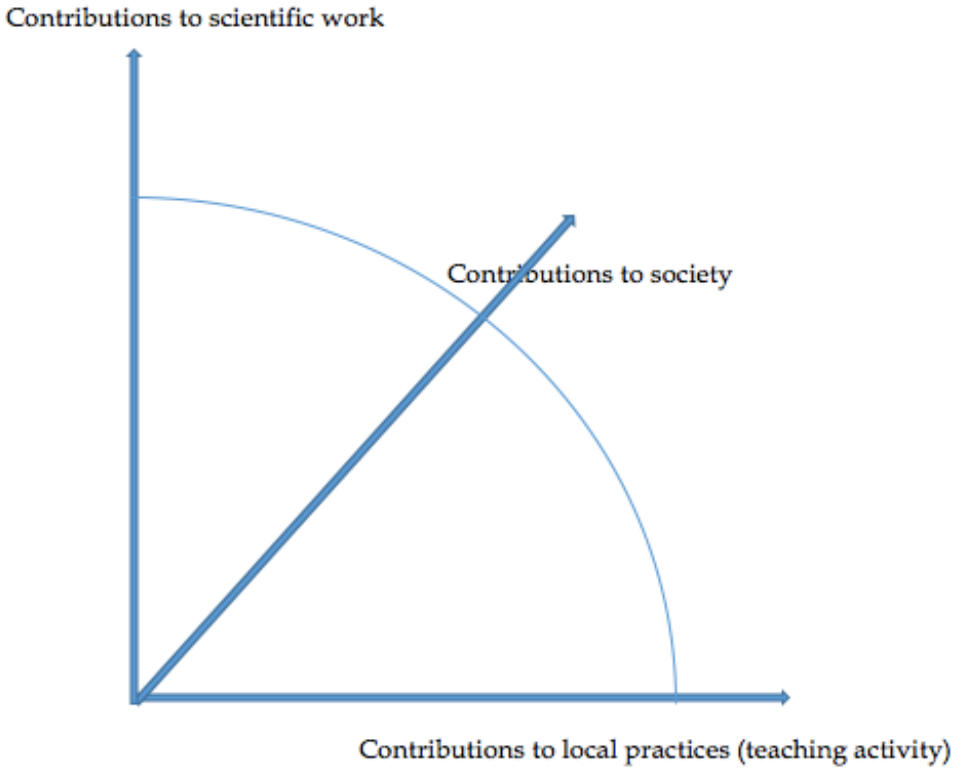

Figure 2. Contributions of the DWR approach in the field of VET.

In the horizontal axis, there are contributions to local practices, in this case mostly contributions to teaching activity such as new tools and spaces for collaboration between school and work (e.g. Härkäpää, 2005; Lukkarinen, 2005). The vertical axis describes contributions to scientific work such as the concept of developmental transfer (e.g. Tuomi-Gröhn, 2003). The diagonal axis describes contributions to the wider society. I placed this contribution horizon in the middle, even though, none of studies presented here explicitly made a direct contribution to a wider socio-economic or political level. However, one can argue that results of scientific work are also contributions to the society. They increase the knowledge base of the society and thus capabilities of all involved individuals of the society. This has a wider impact on quality of education and the competence level of people in the society. The arc in the figure 2 describes potentiality of the DWR approach, which takes into consideration and combines different areas of contributions in the field of VET. In other words, researchers using the DWR approach need to create concepts, tools and practices that highlight this multi-dimensionality of contributions. In conclusion, I state that the DWR approach offers rich and solid theoretical and methodological instruments for VET researchers to study and develop practices in the field. However,

researchers should not forget the individual nor societal contributions and dimensions of all research activity.

Endnotes

[1] See www.helsinki.fi/cradle for more information.
[2] Change Laboratory is a formative intervention method within DWR (for more information, see Virkkunen & Newnham, 2013).

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In her doctoral dissertation she developed an intervention method called a culture laboratory for intercultural learning and immigrant education. Her first post-doctoral research focused on co-operation and new types of educational methods of dental and oral-hygienist students in patient care. Her second post-doctoral research project was part of the Finnish Academy funded OPCE-project (Opening Pathways to Competence and Employment for Immigrants), in which she explored critical school transitions of immigrant youth.

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Methodological challenges of investigating intellectual cooperation, relational expertise, and transformative agency

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Abstract

Methodological issues arise with the research of societal practices of 'knowing'. This object of study is understood as *concrete human activity* that always integrates mental, communicative and practical behaviour in interaction and cooperation with others. Especially with regard to contemporary forms of labour in the high-tech-world, this issue has become a salient task. As it is explained, it implies investigation of people communicating and reasoning while *developing* concrete forms of activity. In particular, the methodological issues concern the *social* and *psychodynamic* quality of this practice. Within the tradition of cultural-historical research and activity theory, milestones of this matter have already been reached. Cultural-historical concepts like the 'motive' of an activity as well as the 'emotions' that bias the 'experience' of 'transformative engagements' with the world show that their theoretical and methodological understanding are adept to approach the dialectics between the social and the individual quality of practice and agency in general, but also with regard to contemporary challenges of intellectualized cooperation in particular. 'Double stimulation', a concept coined by Vygotsky, is relevant in this context as well. However, the paper discusses critically whether it fits with the system theoretical understanding of activities and transformative agency as it can be found in Engeström's writings. Finally, the core requirements for a VET-research methodology for intellectualized collaboration are resumed.

Keywords: activity theory, critical psychology, transformative agency, relational expertise, scientification of work, dialectics, double stimulation

Knowing as an integral part of work activities

Within the last decades, the insight has become more and more striking that many work activities today undergo an 'intellectualization', i.e. working with the body and with its muscles becomes less important in the world of digital automation technologies. Although there might be exceptions from this tendency, at large, robots and automation technologies replace manual manpower while working with the mind becomes more and more salient (cf. Langemeyer, 2005). It is vigorously discussed these days, how this development goes even further. Various work activities that concern the intellect and the creativity of human beings seem to be replaceable as well (Frey & Osborne, 2013). Thus, jobs that formerly were considered as secure to rationalisation may vanish due to digitalisation. Nevertheless, or rather therefore, we should reflect thoroughly the shifts towards work activities like research and development and along with it, communication and cooperation. This paper argues that, within the digitalisation process, intellectualized work activities develop through 'scientification' in the sense that scientific reasoning and expertise have become a force to render cognitive work activities (especially in relation to digitalisation and software development) more productive and effective (cf. Langemeyer, 2015a; Nerland & Jensen, 2010).

These shifts pose a challenge to VET-research to understand work activities as intellectualized, but not as a process in the individual mind only. The power of cognitive work is not an achievement of atomized individuals. Constructive forms of cooperation and communication, among others, are essential for it (Langemeyer, 2015a, b). And here is the problem to put in the centre of this paper: How can we define the theoretical and methodological problems of investigating 'collective knowing' then as part of new emerging forms of agency, especially 'collective agency'? If we assume that this phenomenon does not exist naturally, but societally and politically, as an essential dimension of the societal basis of human labour and practice, its understanding requires profound theorizing. More clearly, this objective aims at dialectical theorizing in social sciences (cf. Langemeyer & Roth, 2006) to not reduce mind and thinking to traits and human activity to an individual-psychological phenomenon, but to see both within the broader context of societal ways of making people's lives.

In VET-research on software developers and similar forms of labour in digitalisation processes, the relevant basic concepts are often not reflected methodologically. Advancements towards a social and practical understanding of knowing were however made in the research on 'situated cognition', 'situated learning', and 'situated action' by Jean Lave, Etienne Wenger, Lucy Suchman and others. Furthermore, the approach of Lev S. Vygotsky stresses the interdependencies between societal and individual development with regard to human consciousness and thinking. Following his track of theorizing, this paper discusses

concepts like 'transformative agency' introduced by Yrjö Engeström and collaborators and cognate approaches like Anne Edwards' 'relational expertise'; as both are highly recognised for their expertise on Vygotsky's work and both introduce innovative ideas to VET-research.

The paper starts with a summary of the latter which can be found in Edwards' article 'The role of common knowledge in achieving collaboration across practices' (2012). Following her main arguments, it deepens the discussion with regard to issues like the 'motive' in Cultural-historical Activity Theory (CHAT). It shows how interdependencies between individual and societal development are conceptualized. Next, it is resumed why the investigation of collective agency needs to drive away from static to psychodynamic concepts – e.g. from knowledge to *knowing*, away from states of the individual mind or individual feelings to the societal *activities* that encompass mental, emotional, communicative and practical behaviour. Furthermore, it is argued that the broader context of theorizing needs to become entangled with the creative and productive ways of making one's life. Its interdependencies are ultimately a societal and political question. Finally, concepts like 'transformative agency' and 'double stimulation' as presented in the work of Yrjö Engeström et al. (Engeström, Kajamaa, Lahtinen & Sannino, 2015; Engeström & Sannino, 2010, 2012; Engeström, Sannino & Virkkunen, 2014) are discussed critically. The question is raised whether this work could help to discern the essential relations of intellectual cooperation under particular societal conditions.

Collective knowing as relational expertise

Anne Edwards (2012, p. 26) introduced the term 'relational expertise' to understand 'interprofessional collaborations' which would emerge in general 'in a two stage process within a constant dynamic as people engage together in activities'. More precisely, this would imply:

> (i) working with others to expand the object of activity so that its complexity is revealed, by recognising the motives and the resources that others bring to bear as they too interpret it.
>
> (ii) aligning one's own responses to the newly enhanced interpretations, with the responses being made by the other professionals as they act on the expanded object. (ibid.)

Edwards thereby highlights essential dimensions of what I termed the 'intellectualization' and 'scientification' of work although her paper does not refer to these concepts explicitly. However, the argument can be clarified: Edwards seizes the collaboration between experts as a particular form of practice insofar as it does not deal with given or ready-made objects of work (like e.g. raw material and prefabricated components). The objects need 'enhanced interpretations' which is, in other words, the challenge to make correct, precise and relevant judgments about the issues at stake.

Seen from a philosophical and conceptual point of view, this essentially implies that these objects of work escape the positivist paradigm and contradict to it insofar positivism neglects the cultural-historical, interpretative and socio-practical relationship between subject(s) and their world. Positivism (before its self-criticism) regards the 'objective' world as immediately observable through 'facts' and assumes that these 'empirical' facts are 'speaking' to the researcher subject. Thus, the world appears as an assemblage of 'objective objects' that would not need any interpretation; the 'objects' are considered as immediately evident. Especially when we think of work objects like software architectures or societal transformations like changing the energy supply to sustainable energies, a positivistic understanding seems highly problematic.

However, within collaboration, as Edwards emphasizes, objects become interdependent to the subjects' activities when those involved start to 'reveal', 'expand', 'enhance', and 'interpret' them. Thus, they escape from the status of being merely an 'objective object'. They align with the subjects in practice and become societal, cultural, historical dimensions. Since the context of work is always social, collaboration is prevailing from the beginning. Like Edwards highlights, cooperation – like communication – is dependent on 'interpretations' as well as on 'aligning one's own responses' to other professionals. This can be identified as a determination of *knowing* as collective activity.

Following Edwards, we derive from this argument also the insight that social relationships like those in intellectual collaboration are not directly observable. The argument with Edwards (2012, p. 24) is however more general. According to her, cultural-historical research:

> … reminds us that the relationship between subject and object is never direct, but is always mediated by the knowledge and values that matter in a practice.

With regard to Engeström's 'activity system' as the unity of analysis, she argues that the 'analytic challenge for studies of interprofessional work' can be met by understanding 'what mediates collaboration across the boundaries of practices' (Edwards, 2012, p. 22).

It is in this context that Edwards makes it clear that we should think of knowledge and objects of practice (or work) as something unfolding rather than stable and inert. Related to this is the discussion of motives. Edwards follows Engeström's argument that motives would be objectified in the object of activity. We can underscore this argument by emphasizing the psychological insight that the subjective and simultaneously cultural nature of knowledge and objects of practice (cf. Schraube, 2009) is always connected to people's motivational and emotional way of experiencing the world. This is also true for the two modes of knowing: The knowing subject brings about imagination and anticipation on the one hand, and reflection and judgments on the other, both understandable only in relation to a particular situation. Thus, mediation is therefore not only a

connecting/transforming process 'across boundaries' and across different objects of practice, but also a psychodynamic change of a situation as to how it is perceived and addressed by several knowing subjects.

More systematically, this can be displayed as changes in (a) the subjective self-relation (concerning feelings, motives, cognitions and world views), (b) the social or collective relationships (concerning interactions between people involved, even though they might be absent in a situation), and (c) the societal relations (concerning the societal possibilities to act as well as the societal constraints, power structures, limitations, histories etc.) (Langemeyer, 2005; 2006). Methodically, these changes can be scrutinized by analysing shifts in the modes of participation, the forms of cooperation and the aspects of situatedness (ibid.; cf. Schraube & Højholt, 2016).

VET-research studying for example *workers*' knowledge and skill in software development and the like therefore cannot merely focus on individual capacities. It needs to scrutinize more comprehensively where the concrete human practice of cooperation develops. Collective capacities of acting and knowing are not identical with the sum of individual capacities which are usually conceived of as stable and inner properties. Essential determinations of collective capacities cannot be reconstructed if we ascribe causes for collective agency and knowing to individual-psychological entities only, thereby excluding social entities. In addition, these social entities would be misunderstood as merely objective structures or systemic dimensions, directly observable like mechanics in physics. Dialectical social science would instead highlight that the societal powers in human practice do not exist outside or independent from subjective powers but interdependently and only available through each other.

Scientification of knowing

Against this backdrop, my idea that today's work practices develop through scientification builds on dialectical theorizing. This also includes tensions between the individual and the societal plane, since individuals can be members of a collective but sometimes may not want to be part of it or seek to become part of a different collective. Psychodynamics often unfold with individual responses to their modes of participation.

The main argument with regard to scientification is however that the concomitant expertise (in digitalisation processes and the like) needs cultivation and development of scientific ways of thinking and acting *by a work collective*. Thus, the mere fact that scientific disciplines are societally institutionalized is considered as insufficient for this expertise. Furthermore, it is highlighted that cognition of an individual cannot be scientific only in relation to itself. To establish a relation to certain *scientific concepts, methods* and *research results* means to participate in a certain domain in the practice of scientific thinking and knowledge production. This is also true for the economic sectors where produc-

tion practices build on scientific knowledge. Digitalisation brings about a new level of scientification because it enables a close connection between the technological regulation of numerous processes and their mathematical operationalization. This means that without science the new digital 'universe' of information and information processing e.g. would be disjointed, incoherent and as such useless. Digital data would be unusable for automated control if it did not incorporate science.

However, because scientification and technologization also increase the distance between the world of objects and the working subjects, their relationship becomes more indirect, more theoretical. The problems IT-workers deal with are in several ways opaque and complex (e.g. software systems) and become intelligible only with activities to 'interpret', 'reveal', 'expand', experiment, test, and re-interpret the object of work. Within these research activities, workers may however be thrown back on believing and relying blindly on interpretations, testing, calculations, and solutions produced elsewhere. A quite common phenomenon is therefore that particular work activities nowadays have become *similar-scientific* activities: In this mode, subjects who are *striving* for comprehension and agency in relation to unresolved problems are dependent on societal institutions that provide expertise (and sometimes pseudo-expertise) in testing, elaborating, and reconfiguring the matters to bring under control (cf. Langemeyer, 2015a, b, 2018). Usually, these similar-scientific activities are for sure conducted individually and sometimes collectively. In any case, their potential mainly unfolds by overcoming the limits of distorted comprehension. Similar-scientific activities can therefore be interpreted as a transitory form of practice that becomes more powerful through a scientification of human practice, i.e. by activities that critically test and theorize in depth why they are incomplete or imperfect and which strive to get the broader picture of interrelations (ibid.). This transition from similar-scientific to scientificated practices includes communication to ensure correct, precise and appropriate thinking and reasoning.

Methodologically, studies of scientificated work practices require therefore a different understanding of mind and reason and they reject like Donald Schön (1983) models of technicistic rationality and like Gilbert Ryle (1949) misconceptions of mentalist approaches. They need to recognize the dialectics between individual, social and cultural dimension of human development to understand human forms of agency and the particular power relations they are part of (cf. Langemeyer, 2014b; Stetsenko, 2008).

Transformative agency

In that sense, the deeper methodological problem connects also to research conducted by Yrjö Engeström et al. on 'transformative agency'. The topic of

agency is not exclusive to Engeström's activity theoretical framework. In what follows, I too refer to the work of Klaus Holzkamp who developed together with collaborators at the Free University of Berlin, at the University of Tübingen, and at the University of Copenhagen a subject-scientific approach of Critical Psychology.

Notions of agency and societal relations

This subject-scientific approach of Critical Psychology is concerned with attributing human subjectivity with dialectical concepts that seize the interdependencies between the societal and individual level. In what follows, subject-scientific notions of emotion, motivation, cognition, learning, and acting shall be outlined. As we can see in the following quote, Holzkamp acknowledges that

> … human beings are the producers of their life conditions at the overall societal level and that scientific theorizing needs to explain how people are able to participate in this process (Holzkamp, 2013, p. 23).

Moreover, he stresses the subjective reality as produced and maintained not within an 'abstract society, but rather under distinct historical conditions' which is why it is important to scrutinize not the relationship between humans and the world in an ahistorical generalized way, but more concretely 'the antagonistic class conditions of capitalist society' (Holzkamp, 2013, p. 23).

Furthermore, Holzkamp explains:

> … we are attempting to elaborate this two-sided relation as an interrelationship, i.e. to analyze human beings as producers of the life conditions to which they are simultaneously subject, and to conceptualize the mediation between the vital necessities of sustaining the societal system as a whole and these necessities on the subjective level of the discrete individuals. This is based on the idea that human beings not only live under conditions, but also need to control the conditions of their lives. (Holzkamp, 2013, pp. 19–20)

Against this backdrop, Critical Psychology (the 'subject-scientific' approach) emphasizes the way of making one's life under capitalist relations imply in particular ways a lack of control. One important dimension of this lack is discernible in relation to employees who are dependent on wage labour. The majority of employees is free of capital and only formally free to sign contracts. Therefore, workers dependent on wage labour are forced to subordinate themselves to employers who consume and exploit their subjective powers. Depending on the mode of production, the jurisdiction and societal standards, employers might contribute to developing the employee's skills and potentials. However, in any case the capitalist interest in employees' potentials is not their well-being, their autonomy *as an end in itself*, but (if at all) as a means to gains and surplus. This ambivalent relationship of belonging to a collective (the enterprise or the work collective) can serve as a model for many dominant forms of participating in society: The societal powers of control are simultaneously (or dialec-

tically) an empowerment of people as well as a loss of control on the individual level. The societal powers of producing the basis for people's lives are turned against the individual powers of making one's life. Of course, this contradiction can have different appearances and different historical backgrounds. Sometimes emancipatory aspects may come into the foreground, sometimes the ugly face of exploitation is salient. In any case, according to Holzkamp, the underlying contradiction of capitalist dependencies has an impact on forms of knowing – yet the impact is indirect and occurs in manifold ways. The way people tend to interpret the world is influenced by the motive to control one's life and to confirm or defend the illusion of being free. But since the affirmation of the real dependencies is a recurring motive in people's life, their worldview is characterized by fading-out or suppressing the contradiction and the side-effects of ambivalent societal relations they are part of. Thus, people are prone to affirm ideological practices or even false believes.

Let us compare these insights with Engeström's approach. Similarly, but in a slightly different way, Engeström primarily acknowledges effects of capitalism in relation to his concept of the 'activity system'. He assumes contradictions in relation to Marx's distinction between use value and exchange value that:

> In capitalism, the pervasive primary contradiction between use value and exchange value is inherent to every commodity, and all spheres of life are subject to commoditization. This pervasive primary contradiction takes its specific shape and acquires its particular contents differently in every historical phase and every activity system. (Engeström & Sannino, 2010, p. 4)

Here, Engeström derives theoretical insights from Marx's analysis of capitalism as an overall societal system or structure to become immediately entangled with the system-theoretical modelling of concrete human activity as a commodified way to act. The system quality seems to be influencing the quality of human activity on an individual level always and directly. Actors – or more precisely their actions – are seen as immediately determined by the contradiction between use- and exchange-value. However, the concrete subject's worldview is not considered closely.

What are the implications of this argument? It is unclear whether Engeström conveys that this contradiction between use- and exchange-value is conscious to (all) the subject/s and whether different and even opposite forms of consciousness (distorted or false) must be taken into account. It is furthermore not explained whether the subject/s necessarily experience/s that contradiction in every activity and whether they are confronted with reconciling the opposites all the time. I interpret these blank spaces as indicative for a certain system theoretical approach which neglects the dialectics between the individual and the societal level of development.

Different from Engeström, the 'subject-scientific' foundation of Critical Psychology works with the concept of 'agency' ('Handlungsfähigkeit' = also trans-

lated as 'power to act' or 'capacity to act') to analyse different mediating contradictory power relations of our societies as concrete experienced forms of agency. It thereby takes into account 'degrees of freedom' of human consciousness to imagine and to distance itself from sensual perception and immediateness. To do so, it analyses the concrete historical and material mediations between societal possibilities to act and the ways real subjects endorse, embrace, use, refuse or transform these possibilities. In this methodological conception, the power of societal structures or relations is not denied. However, it is not immediately seen in an imposing mechanical or systemic power over the individual. It is rather analysed – similar to Michel Foucault's work (Foucault, 1987) – as power relations that *go through* the subjects and subjectivities in different and situation-related moments of practice. That means by analysing the subject's standpoint in relation to his or her societally mediated way of life, the subject's concrete reality of societal power relations is discerned:

> Producing the conditions under which we live means that every single individual is, in one way or another, participating in the production, transformation, affirmation and reproduction of the circumstances under which we live. Our main task, then, is to psychologically concretize this interrelationship. (Holzkamp, 2013, p. 20)

In Critical Psychology, this analysis begins with concrete empirical descriptions of how someone attaches meaning to the concrete situation he/she is in. It then proceeds with analysing the relationship between the subject's standpoint and societal conditions entangled with someone's ways of acting. With a more profound understanding of this concrete human practice, the question is posed whether someone's agency is part of an affirmation of power relations and contradictions rather than a mode of overcoming them. This research strategy does not aim at classifying others but at developing a 'discourse of reason' for creating a concrete, self-critical relationship towards the world.

At first sight, Engeström seems to have established a quite similar methodological approach. However, the complex reciprocal effects between the individual and the societal level that Critical Psychology intends to excavate are interpreted in a different way. This becomes obvious when we look closer at the interpretation of the concept of motives as simultaneously subjective and societal or system-related 'drives' to human practice and its changes.

Engeström interprets the individual motive in the light of the material or objectified activity so that the concrete object of an activity can be seen as more or less *identical* with the individual motive. This argument refers back to Alexej N. Leont'ev's concept of object-oriented activity (Keiler, 1997, 2010). For example, Engeström and Sannino (2010, p. 4) write:

> … the object [of an activity, I.L.] is both resistant raw material and the future-oriented purpose of an activity. The object is the true carrier of the motive of the activity.

> Thus, in expansive learning activity, motives and motivation are not sought primarily inside individual subjects – they are in the object to be transformed and expanded. (ibid.)

A similar explanation is presented in Engeström et al. (2015, p. 93):

> A human activity is a collective and systemic formation oriented at an object (Leont'ev, 1978). The object is an entity out there, with its own life, that human beings encounter and struggle within their activity—such as illness for medical practitioners or crime for law enforcement professionals. The object carries in itself the purpose and motive of the activity. The object is internally contradictory and constantly shaped by the activity. Different participants of the activity take different partial perspectives on the object. It is reinstantiated and reconstructed in every specific encounter and every particular manifestation. Historically different forms of the object are typically simultaneously available to the participants of an activity. Yet the object is robust and durable; it gives longevity to the activity.

The argument can be regarded as strong and convincing insofar as it rejects an individualistic and positivist interpretation of the object of activity. The object is more than just a thing at hand: It is a crystallization of a socio-historical relationship and societal contradiction; it is in some ways resistant and powerful through perseverance, but it is also a moment of joint efforts, a purpose that becomes visible in the future. Engeström also acknowledges that the object of activity needs to be interpreted from the subjective point of view as a potentially comprehended purpose (motive) of an activity, thus as a meaningful way to participate as an individual in the societal reproduction of life. This is very much in line with the methodological approach of Critical Psychology. Simultaneously, it is essential for VET-research in general.

However, seen from a subject-scientific (i.e. Critical-psychological) point of view, the problem is that the argument invites the researcher-subject to conflate the particular First person perspective with the overall system or societal perspective which is always a Third person perspective. The societal purpose of a practice (as well as the contradiction) is thus *projected* onto the motive-meaning of the concrete material object (as an element of the activity system). This interpretation reminds us of the determination of an organisation of its own purpose – a perspective which neglects the tensions of disidentification (i.e. a rejection of identifying with being a member) or mistrust etc. that the purpose might evoke in the organisation's members.

On an individual level, the concrete subject usually has manifold motives and might accent or stress changing motives (purposes) and interpretation of the object throughout his or her particular worldview. In relation to this, it is important to reconstruct in the analysis, how someone's worldview also depends on the more general experience of societal participation (cf. Nissen, 2012). Given that each person develops her-/himself in different forms of participation, worldviews can be bizarre and individual engagements with the practices might contradict the purpose of an organisation's practice. Conflicts in terms of

inner conflicts as well as social tensions are likely and contribute to psychodynamics within groups and their members.

Consequently, also the collective knowing to which subjects contribute by participating actively in practice are in a flow. It is influenced by their worldview (or consciousness in general) as well, especially when it undergoes a deeper change. According to Critical Psychology, this change is obstructed on a motivational level by forms of suppressing and obscuring the broader societal context of power relations and fostered by quest for knowledge and emancipatory forms of knowing (cf. Langemeyer, 2015a). A profound analysis of the situation where awareness is raised is therefore essential.

This problem that I have addressed already in two former critiques (Langemeyer, 2006; Langemeyer & Roth, 2006) shall now be discussed with respect to the idea of 'transformative agency'.

Historical-critical analysis of agency

'Transformative agency' is defined by Engeström and his collaborators in opposition to other notions of agency:

> [It] differs from conventional notions of agency in that it stems from encounters with and examinations of disturbances, conflicts, and contradictions in the collective activity. Transformative agency develops the participants' joint activity by explicating and envisioning new possibilities. Transformative agency goes beyond the individual as it seeks possibilities for collective change efforts. (Engeström et al., 2014, p. 124)

Moreover it

> … is not limited to the relations of an individual expert in that it underlines the crucial importance of expansive transitions from individual initiatives toward collective actions to accomplish systemic change. Transformative agency also goes beyond situational here-and-now actions as it emerges and evolves over time, often through complex debates and stepwise crystallizations of a vision to be implemented. (Ibid.)

This definition of 'transformative agency' has many parallels with the Critical psychological concept of 'agency' as Klaus Holzkamp (2013, p. 20) defines it in relation to emancipatory projects (the quote has been presented earlier but is now expanded):

> A basic principle of Critical Psychology is that we cannot assume human beings are the producers of their life conditions at the overall societal level […]. Producing the conditions under which we live means that every individual is, in one way or another, participating in the production, transformation, affirmation, and reproduction of the circumstances under which we live. Our main task, then, is to psychologically concretize this interrelationship. The basic category in our efforts to develop this concretization is agency (*Handlungsfähigkeit*). Here, it is not confined to the individual, but is defined as mediating between individual and societal life-sustaining activities. It refers to the human capacity to gain, in cooperation with others, control over each individual's own life conditions.

Considering these two explanations, we see that the basic critical-psychological concept of 'agency' implies most aspects that Engeström and Sannino ascribe to 'transformative agency'. First, it rejects static in favour of developmental features determining the societal-subjective quality of agency. Second, the development of agency is derived from individual experiences within societal (or collective) practices. Therefore, the possibility for someone to act upon a situation is thirdly not inferred from a pure individual capacity mainly. Neither are action possibilities and the endeavour to realize them confined to an inner state of mind. Both are seen in relation to the mediating collective practices, in the socio-material world in which someone participates and communicates with others, develops ideas, visions and longings of how one's life could be.

But Holzkamp illuminates more clearly that the societal and the individual level of (re-)producing life is not immediately entangled. The individual subject is not directly facing in practice the overall societal level. In fact, consciousness of this overall societal level is according to Critical Psychology a fundamental problem of what I termed earlier as 'knowing'. This is why Holzkamp highlights the political aspect of emancipation, i.e. the need of collectively gaining *control* or *power* over the life-conditions and therefore also on understanding the inherent necessities which refer back to the overall societal context. This is, according to Holzkamp, the main characteristic of emancipatory agency and knowing to reach out for a reasonable society. The lack of this control however unravels anxieties and suffering and affects someone's ways of comprehending reality (Holzkamp, 1983). Distorted understanding of how life is reproduced at the overall societal level is often functional on a subjective level and part of the common sense of everyday life, while questioning this way of understanding often unravels conflicts with colleagues, employers, friends, neighbours etc.

However, Critical Psychology differentiates between two qualities of human agency: 'generalized' and 'restricted human agency' and connects to it an analysis of distorted, limited or suppressing forms of knowing. The distinction between generalized and restricted agency is explained by the following argument:

> Each individual's existential orientation is a subjective aspect of the type and degree of her/his agency – that is, opportunities to act and constraints on those opportunities. Human suffering or, generally, any injury, including anxiety, has the quality of being exposed to and dependent upon other-directed circumstances, dissociated from possibilities of controlling essential, long-term conditions, i.e. constraints on possibilities to act. Correspondingly, overcoming suffering and anxiety, and the human quality of satisfaction is not obtainable merely by actual satisfaction and protection, but only by achieving control over the resources of satisfaction – that is, the conditions upon which one's possibilities for living and developing depend. […] My existential orientation is the experienced quality of my opportunities to act, or their restrictions. Accordingly, it cannot primarily be changed on the psychic level; a real improvement in the subjective quality of my life is synonymous with enhanced influence over my objective life conditions – that is, with my opportunities for forming alliances, i.e. uniting with others. (Holzkamp, 2013, p. 20–21)

Struggling for 'generalized humans agency' is accordingly a quality of practice directed towards gaining influence over my objective life conditions by associating or uniting with others, while 'restricted human agency' points at 'the central contradiction' in life

> that by attempting to obtain some discretion to act through participating in power and utilizing the allowed leeway, one concurrently confirms and reinforces the conditions of one's own dependency. If I attempt to gain some freedom of action within given power relations, in a certain sense I negate this freedom myself, since it is vouchsafed by the particular authorities and can be rescinded at any time. In such a situation, for the sake of short-term security and satisfaction, I violate my general long-term life interest. […] This restrictive alternative of agency, pointing to the contradictoriness of acting, is a central concept in our psychological analyses." (ibid., p. 24)

Here, like in my outline of the 'Contradictions in Expansive Learning' (Langemeyer, 2005, 2006, 2012), it is made clear that Holzkamp tackles societal contradictions as a challenge to self-determination. Since this affects someone's ways of knowing, someone's consciousness in practice, contradictions cannot serve straight out as a starting point for innovations, transformation, and expansive learning. Therefore, we would mistake an analytical challenge if we would identify motives with the purpose of an activity. First, the restrictions to agency must become in some ways conscious and stir a quest to (deeper, better) knowledge about one's relationships to the world. And accordingly, the subject/s need/s to reflect self-critically in what ways their own perception and worldview is influenced by and part and parcel of their restricted agency.

The insight of this argument is essentially political. Intervention is to be envisaged as a change of societal conditions but simultaneously as a creation of concrete societal options of acting and knowing. Thus, the question of the interplay between individual and collective agency is important as an intervention into the interdependence between to societal and the individual level of agency (Langemeyer, 2015a).

Seen from a subject-scientific point of view, the comprehension of 'transformative agency' would however be superficial by merely switching in research between the subjective and the systemic perspectives. This method is suggested by Engeström and Sannino in the following argument:

> But for the theory [of Engeström, I.L.] itself, switching between the perspective of the subject and systemic perspective is foundational. […] The switching is aimed at transcending the dichotomy between the subject and the system. This means that an individual subject's ideas and aspirations are not only taken as idiosyncratic expressions of the subject's particular life history; they always also draw upon and interact with generalized cultural models and motives, or social representations. Correspondingly, when for example in a Change Laboratory subjects jointly construct a vision for their own future, or a 'where-to' artifact, they generate a tentative, imaginative systems view rooted in their subjective experience, desire, and will. (Engeström & Sannino, 2010, p. 18)

This conclusion is partially approved. However, the central question of the entire complex of creating possibilities to increase the availability of *long-term* control and of collaborative knowing, is how to appropriate the societal means and competences of this control and how to create a *long-term* motivation to the resilience needed when obstructions, power relations and forms of domination afflict with the subjects' efforts, engagements, and forms of knowing. In my eyes, this theoretical and political challenge essentially calls for investigating not only forms of ideologies but also the ambivalent role of science in the societal developments. How can it really foster the integral development of human capacities to act and to think so that long-term control emerges and ensures self-determination? A critique on particular ways of doing science is essential.

Vygotsky pursued throughout his life-project the question how the challenge of a free human development is simultaneously a matter of the socio-historical realization of 'higher mental functions' and how this is intimately bound to the cultural advancement of scientific thinking. He is therefore an important inspiration for researching the scientification of work and its emancipatory potential.

The research on the societal role of science (nor ideology) has not been a primary concern of Engeström and collaborators (exceptions are e.g. Lehenkari & Miettinen, 2002; Miettinen, Tuunainen & Esko, 2015). In what ways does this affect the concept of 'transformative agency' and why should we contradict to some of his system theoretical arguments? The next section explains the problematic by highlighting the connection between Vygotsky's indirect method (Vygotskij, 2003c), the concept of 'double stimulation' and its reference to Engeström's idea of 'transformative agency' which he adopted from Virkkunen. The final section afterwards resumes the discussion of VET-research on intellectual cooperative work.

Vygotsky's indirect method, double stimulation, and transformative agency

> Within the activity-theoretical framework, Virkkunen (2006) defines transformative agency as 'breaking away from the given frame of action and taking the initiative to transform it' (p. 49) (Engeström et al., 2014, p. 124)

The concept of 'agency', the authors convey, would have been indirectly derived from Vygotsky's insights to 'higher psychic functions' gained by using things or stimuli that help to control behaviour (Vygotskij, 2003a).

> In other words, the subject's agency, his or her capacity to change the world and his or her own behaviour, becomes a central focus. Vygotsky built his interventionist methodology of double stimulation on this insight. Instead of merely giving the subject a task to solve, Vygotsky gave the subject both a demanding task (first stimulus) and a 'neutral' or ambiguous external artefact (second stimulus) the subject could fill with meaning and turn into a new mediating sign that would enhance his or her actions and potentially lead to reframing of the task. Expansive

> learning typically calls for formative interventions based of the principle of double stimulation. (Engeström & Sannino, 2010, p. 5)

In Vygotsky's work, 'double stimulation' served as an intervention against reflex-theory which he criticised for taking the stimulus-response-relation as a direct one only, as a mechanistic relationship so to speak. Consequently, human development could only be grasped as a process imposed on the subject not as something over which the conscious subject could possibly gain control, especially long-term control. Therefore, Vygotsky argued, for human beings, we would need to conceptualize a more indirect relationship due to 'mediating activities' by which symbolic or more generally cultural means (including scientific concepts) come into play. To memorize an appointment people often use a knot in their handkerchief. The knot is not a 'direct' representation for the appointment but only an auxiliary means (an arbitrary sign) to memorization. It is not that kind of stimulus that simply causes the meeting of an appointment, nor is it a direct form of control over this event. Rather the indirect, mediating activity of associating the knot with the memory content ('appointment to meet') is responsible for remembering consciously. Vygotsky's argument was not that memorizing would not take place without the knot as an auxiliary means or without the mediating activity symbolizing the memory task. Yet the use of symbols and cultural techniques enables the person to memorize and recall more deliberately. From this, Vygotsky infers that all human 'higher psychological functions' like logical thinking, deliberate memory, intentional action, advanced motoric behaviour, reflection, intellectual communication etc. depend on cultural innovations of mediating activities with artefacts (tools as well as symbols and signs) (Vygotskij, 2002).

Consequently, Vygotsky's understanding of science differs from positivist, empiricist and functionalistic notions. If symbols and signs do not capture, mirror or discern reality but serve only as auxiliaries of mediating activities to develop higher forms of knowing, they have no self-reliant form of power. Consequently, all scientific knowledge can only be a power as an integral part of collective forms of knowing and agency (Langemeyer, 2011, 2015a; cf. Vygotskij, 2003b).

Research on this kind of development can however not rely on direct observations. To investigate it, Vygotsky assumes that an indirect method would be imperative. Methodologically, the double stimulus is therefore a means to this indirect way of studying higher mental functions as well as the internalisation of different culturally invented 'mediating activities' which transform someone's entire behaviour. One example for the methodological use of double stimulation can thus be discussed with respect to the following:

> Humboldt relates an anecdote about a peasant who was listening to student astronomers as they were discussing the stars. At one point, the peasant turned to the students and said: 'I understand that people have measured the distance from the

> Earth to the most distant stars with these instruments, that they have identified their distribution and movement. What I want to know is how they learned their names.' Here, the peasant has assumed that the names of the stars can only be learned from the stars themselves. (Vygotskij, 2002, p. 407)

This diagnosis gains significance by the theory-related observation of distorted logical thinking. By stimulating the peasant to verbalise not only stored pieces of his knowledge of astronomy, but also his reasoning about it, it is possible to detect in his reflections a clash of arguments. This clash is revealed in his wondering about their names. It discerns that the peasant attaches objective truth not only to the ontological being of an object, but also to names. Thus, he is inclined to infer that also these signs would capture the stars' ontological essence. The constructivist insight that the significant is not predetermined by the significate is not integrated in his worldview (cf. Vygotskij, 2003b). And we may add, the peasant's worldview also indicates a blind belief in the superior societal position of scientists to discover truth.

This methodological approach to higher mental functions is obviously interesting with regard to collaborative intellectualized work activities as previously depicted. We return to this later and scrutinize the adaptation of this approach by Engeström, first.

Not only in relation to the concept of double stimulation, but also by means of his triangular model Engeström invokes parallels to Vygotsky's idea of emphasising the role of cultural artefacts. But when we look closely at his theory, we must realise that he misunderstands several theoretical implications the latter addressed.

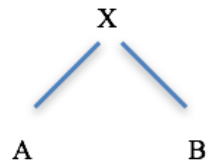

Figure 1. The mediating activity. (Vygotskij, 2003c, p. 311)

With the model presented in figure 1, Vygotsky expanded the behaviourist concept of the stimulus-response relation. The 'X' stands for an artefact which contributes to developing a mediating activity. A and B represent two different stimuli interconnected by a mediating activity.

By contrast, Engeström's triangle is however well known with this interpretation of Vygotsky's figure:

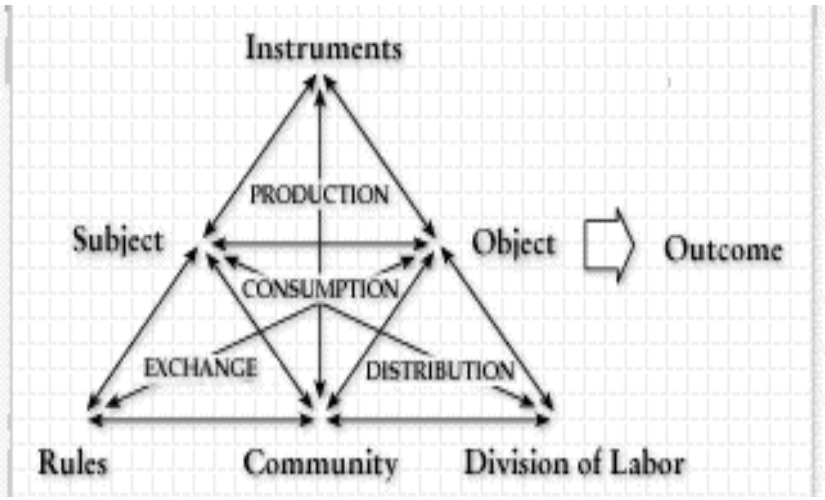

Figure 2. The activity system. (Engeström, 1987, p. 78)

In Engeström's framework, on top of the triangle (figure 2) the instrument should remind us of the artefact in Vygotsky's 'mediating activity' (figure 1), but in fact, it represents a 'mediated activity' (cf. Friedrich, 1993; Veresov, 2010). The latter signifies the subject's acting upon an object by using a tool (e.g. the axe to chop a tree). The former, the mediating activity however refers to the 'ruse' (Hegel) to use some properties of an object to transform the activity in itself (e.g. by memorizing something with the help of a knot in the handkerchief, the activity of remembering becomes a deliberate act) (Vygotskij, 1992).

Other variants of Engeström's triangular model also have 'artefact' or 'tool' or 'sign' or 'concept' at the top (Engeström, 2005, p. 61). Engeström did this on purpose. He conveys that Vygotsky would have developed only the upper part of this triangle and that he would have expanded this triangle by the three other dimensions below – integrating insights from Marx's 'Grundrisse' on the interdependence of production, consumption, exchange, and distribution (ibid.).

However, Engeström drives away from the problematic raised by Vygotsky's figure. It is designed to understand the important role of cultural development as it takes place on the psychological plane of internalised mediating activities which are integrated into culturally developed forms of behaviour. To be precise: Engeström does not neglect this as an aspect of Vygotsky's theory but in the act of conflating Vygotsky's figure with his systemic view, Engeström ascribes to the activity as a *system* to act independently from the concrete human subjects and their consciousness. This becomes obvious when activity systems are confused with a real acting subject:

> Activity systems realise and reproduce themselves by generating actions and operations. (Engeström, 2005, p. 63)

This opportune reification due to a systemic view necessarily includes neglecting the standpoint of the concrete subjects, its concrete psychological development and worldview in favour of a more functionalistic and organisational view on human practice and its overall goal. It ignores the complex cognitive work which is necessary to gain insight into the societal conditions of one's own existence and one's particular ways of developing a conscious relationship towards them. The view of the subjects is strongly conflated with a Third person perspective (the system perspective) and the object recedes into a positivist framework. Thus, the indirect method loses its meaning and is no longer a methodological means to criticise and develop collective forms of knowing. As I showed (Langemeyer & Roth, 2006), in research, Engeström does not prevent positivist and empiricist tendencies; he rather invites and embraces them by providing a tool (the triangle) to apply to practices without further methodological consideration. The study by Haapasaari, Engeström and Kerusuo (2016, p. 241) is an example of how his approach remains on the surface of the deeper problematic by merely interpreting each individual expression ('speaking turn') as 'one' and 'in some exceptional cases' as 'two types of expressions of agency' so that the 'movement from individual initiatives to more collective forms of transformative agency' can be tracked in statistics over 'speaking turns'.

In what ways is the concept of double stimulation then adapted in his work? Engeström et al. merely read it as a *means* to help participants in 'change laboratories' when they develop a new activity (system). Its function is subsidiary (see above, Engeström & Sannino, 2010, p. 5). However, in this simplification, researchers are persuaded to abstract from the different societal structures entangled with people's way of life. This abstraction needs to be overcome from a Critical psychological point of view. 'Means' in human development are never neutral. They always relate to the 'mediatedness' of the subjectively experienced control over one's life on an overall societal level (Holzkamp, 2013, p. 35). This insight is essential for VET-research.

Engeström's argument to the double stimulation in the context of 'transformative agency' is therefore highly problematic. The following quotes may show this:

> Double stimulation explains how volitional action emerges out of a conflict of motives with the help of an auxiliary stimulus, an artifact filled with meaning and turned into a sign. (Engeström et al., 2014, p. 124)

> The formation of new solutions, concepts, and skills in double stimulation is much more than just a cognitive learning achievement. It is a liberating achievement of agency formation, which gives expansive personal and collective meaning to the associated cognitive and cultural learning contents. (Engeström, 2007, p. 374)

Looking closely, we find ambivalence in these quotes. On the one hand agency is seen as evoked by individual volition which is why motivational conflicts are tackled as an impairment to transformative agency, on the other, an 'auxiliary

stimulus' (double stimulation) should be a sufficient precondition to the liberation of agency formation in its full meaning of societal change. In contrast to some system theoretical arguments, these assumptions seem to turn radically towards the subjectivity of agents in societal practice by recognizing the psychic plane of societal conflicts. In doing so, Engeström however fades out that ultimately the societal conflicts have to be considered as relevant to the change, not just the subjective experience of them of inner conflicts which only *appears as* the lack of volitional strength. The solution of the real societal conflicts on the labour market e.g. do not require an 'auxiliary stimulus' only but also the collective engagement with gaining control and developing people's conscious relationship with the world. Engeström's argument only makes sense if the 'auxiliary stimulus' would belong to the societal plane of activity – such as employee rights or the scientification of work – when powers are achieved that transcend the *societal* contradictions (not only volitional conflicts) at hand. Engeström's silence about this problematic indicates that his approach is simplifying and playing down the real power relations in society – including the ways they form people's consciousness as conscious forms of making one's life.

I therefore suggest rejecting the idea of double stimulation as a key to relevant change in practice, if a subject-scientific critique on power relations and the importance of scientification as the cultural basis of gaining powers of control is neglected. Nevertheless the concept by Vygotsky itself captures relevant methodological insights as this paper has shown.

Conclusion

The subject-scientific approach of Critical Psychology elaborates deeper insights into the contradictory nature of human practice. It is argued that this is essential for investigating transformative agency and forms of knowing in general and for intellectualized collaborative work in particular. Methodologically, the transformation of the societal relations needs to be understood not only as a coincidence of new artefacts and the volition of collaborators to use them for a change in their practice. Like Edwards (2012, p. 30) emphasizes, attention needs to be paid to the improvement and elaboration of 'common knowledge' which include 'comprising the different "whys" or purposes of potentially collaborating practices'. But right here the dialectics between the societal and individual level of control, between long term and short term control, including its implications on agency and knowing are salient. It is likely that the collaborators need to question, similarly to researcher-subjects when they are doubting and questioning deeply their own knowledge and experience, how they have come to their interpretations and knowing of their work objects and how they can develop these to more advanced forms of collective knowing. This kind of en-

gagement is theorized as possible only against the backdrop of scientificated ways of thinking (Langemeyer, 2012).

Without this kind of questioning, 'transformative agency' becomes here an empty phrase, a deception to emancipation because the complex societal level of control is neglected or simplified to some volitional aspects of individual control. For the societal level, system qualities of society need consideration. But it is important to reconstruct in what ways they are abstractions from the real concrete human practice. Thus, they should not be projected onto that concrete level as qualities collaborators experience immediately. In so doing, researchers would deflect from understanding how 'human beings are the producers of their life conditions at the overall societal level' and from analysing 'how people are able to participate in this process' and how they might generate more emancipated forms of this (Holzkamp, 2013, p. 23). Without this critical theorizing, the methodological basis of VET-research is insufficient and highly problematic.

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VET as transformative, collaborative research: Cross self-confrontation, dialogical artefacts, and the development of organizational dialogue in a Swiss factory

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Abstract

In this article, VET-related collaborative research is discussed as a potential transformative experience for workers/work collectives/work organizations. Three main ideas in the creation of dialogical frameworks for collaborative research are presented: (a) Vygotsky's research focus on provoking development in order to study it (Vygotsky, 1934/1986); (b) Oddone's ideas on close collaboration with professionals in 'associated research groups' to understand and develop work experience (Oddone et al., 1981); (c) Clot's psychological concept of activity (Clot, 1999), which includes both 'realised activity' and 'real activity.' The methodology of cross self-confrontation (Clot et al., 2001; Kloetzer et al., 2015) is based on collective work analysis, thanks to the interplay of two activities – observation and dialogue – within various contexts and for different addressees. Carefully edited video recordings, which we call here 'dialogical artefacts,' support this activity of analysis and transformation. This methodology aims at triggering individual thinking, collective elaboration, and rich institutional discussions, with the goal of transforming everyday work organisation. The paper presents a recently completed research project in a Swiss factory, on knowledge transmission and the training of expert workers. The production of films as dialogical artefacts, and their effects in the research and factory, are discussed. In particular, the collaborative research process shows a transformation of the topics and style of dialogue across hierarchical levels.

Keywords: activity analysis, activity development, cross self-confrontation, collaborative research, dialogue

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Introduction

This paper discusses how a VET-related research in a Swiss factory company, based on a collaborative approach to work analysis through the methodology of Cross Self-Confrontations (CSS), may serve as a transformative experience, potentially triggering the development of individual thinking, collective elaboration, as well as organizational transformations. It will be argued that these transformations happen through the joint-exploration (by practitioners and researchers) of alternative dialogical spaces, which are created and animated for the needs of the research process, but which aim at supporting a multi-dimensional view on development.

In the first part of the article, I will introduce the context and the object of the research, as well as the CSS methodology on which it is based. I will provide a brief overview of the historical relationships of work analysis with vocational or professional training and work transformations, as well as introduce a sociocultural view on expertise.

The second part of the article will be dedicated to a reflection on the dialogical frames implemented in the research process, with a specific focus on the video artefacts that are constructed and used during the research process. This reflection will be drawn from empirical data collected during the research process. In particular, I will show how the collaborative research process aims at supporting a transformation of the topics, objects and style of dialogue across hierarchical levels.

In conclusion, I will come back to the construction and function of video films as dialogical artefacts materializing continuing controversies and multiple perspectives on key work issues, and discuss how transformative research may be facilitated by a more conscious use of the emotional as well as analytical power of these artefacts.

A VET-research in a files factory: transformative perspectives

Context of a collaborative project: *'a file, it's a long story'*

Visiting a factory manufacturing files with its Human Resources Director, I discovered with great interest (but no real surprise, as industrial processes are always extremely rich and fascinating, as my colleagues working on work analysis, VET training or learning in the workplace well know) how complex the manufacturing process of this object was. Even the smallest, expandable nail files required more than 30 production steps and numerous controls – not to mention both robust and sophisticated tools for blacksmithery, forestry, skiing, jewellery or surgery. The number of different file references was enormous, defying both imagination and the rationalization of the production process. These

perfect, distinct tools were manufactured by experienced, specialized and highly-engaged workers on home-made, historical, powerful machines and, according to the HR Director, with long-lasting concerns and difficulties related to knowledge transmission. The world-renowned quality was dependant on embodied skills, whose acquisition was also significantly exceeding the training attempts of HR. Discussing CSS methodology, of which the HR Director was already aware, we explored its potential for the current situation. The first idea of a joint research project was launched, called: *'a file, it's a long story'*[1], a title capturing both the complexity of the production process and its social meaning for the local industry. This research project was discussed with diverse stakeholders in different contexts (informal and formal discussions and presentations with the board of directors, with the managers and field workers from different units, and with staff representatives). These preliminary discussions also informed the research team of the internal background of the research at the factory, as well as of the usual dynamics of communication, decision-making and dialogue. We decided to focus our efforts on a specific category of workers, who exemplified expertise in the sense of mastery of complex, embodied skills: the 'setters'. These expert workers are in charge of preparing and setting the machines. They are also responsible for the quantity and quality of the production for a subset of machines. The research project was finally established at the crossroads of the diverse but joint interests and concerns of these different stakeholders with two joint research questions: How do expert setters maintain high quality production? How to innovate in the transmission of expertise in the factory? The research project was then funded by a grant for innovation from a local foundation, which did not interfere with the objectives or proposed methodology of the research.

From the beginning, this research project can be considered as collaborative, in the sense that its goal, object, and method, have been jointly defined by the researchers, management and the field workers. In French-speaking ergonomics[2], the concept of *command* designates how the problem is expressed from the perspective of management in the interaction with the researchers: this is the request for intervention, which is usually the entry point of the research project. The concept of *demand* refers to how the command might appear from the perspective of the field workers, or how the field workers themselves (re)define the problem/question with the help of the researchers (see for example Daniellou, 1995, 2005). Of course, these two perspectives on the definition of the problem might largely differ, therefore *the dialogue between command and demand* is one of the first tasks of the researchers. The expression of a demand considered as *true enough* (expressed by workers in their own terms without pressure from the management) is the necessary bedrock of any intervention in activity analysis, which could not proceed without it. Here, this dialogue included two parallel discussions: one was on the ethical engagement from the research and man-

agement team on how the data and results of the research process, especially video films, were to be used. We contractualized who would have access to them, how they would use them, and whose property the data was, at all steps of the research process (covering rushes, working films, final films, and other final products like scientific papers). The key concern of the researchers[3] was mostly to preserve the confidentiality of the data collected and to give the workers full rights to decide what to show and what not to show to their colleagues, managers, and directors, as well as to preserve their own freedom and independence as researchers. The second discussion was on the boundaries of the expertise, and explored which kinds of files were the most interesting for this limited analysis. It introduced the complexity of work experiences and processes into the construction of the research process. Following this discussion, a group of 6 volunteers (5 expert setters, 1 novice setter) was created. One of their first choices was to decide which types of files to analyse. The setters selected them according to the type of carving, as comparisons across types of files were considered confusing.

The larger organizational context leading to the possibility of a collaborative research project on the transmission of professional expertise deserves consideration. It is linked to the renewal of the Direction Board (new CEO, new HR director, new production director), which led to a renewed perspective on the strengths and weaknesses of the production process, and the critical importance of workers' expertise in product quality. The HR director in particular was sensitive to the risk of loosing expertise when some workers retired after 20 years of experience (or more). She acknowledged that expertise was mostly constituted by tacit, embodied knowledge, with few written descriptions of work procedures and workers supposedly 'ill at ease' with written instructions. The research project was therefore part of the strategic plan of the HR director, supported by the production director, with aims at highlighting the critical importance of the employees' knowledge in the factory, and creating a 'knowledge centre' for internal vocational training. The HR and production directors were therefore interested in our concrete, unconventional and collaborative methodology for reflecting on workers' knowledge. The workers themselves were eager to 'give back' to the company what they had received, discuss and share their knowledge, and willing to engage into the research project.

Understanding the next steps of the research process requires a detour to present the CSS methodology in the perspective of the French-speaking tradition of research and intervention in the workplace.

Work analysis as a training tool and transformative experience in the Francophone tradition

Work analysis (de Keyser, 1991; Leplat, 1997; Ombredane & Faverge, 1955; Wisner, 1972) is an influential tradition in French-speaking ergonomics and

work psychology, under the label of 'activity analysis', which highlights a 'holistic' approach to work (Guérin, Laville & Daniellou, 1997). Conceptualizations and models of human activity deeply inspired by the works of Vygotsky and Leontiev have been integrated into an intervention perspective (see for example Daniellou & Rabardel, 2005; also Filliettaz & Billett, 2015, for an introduction to contemporary perspectives). Francophone activity analysis has been historically developed in tension with the rationalization of work triggered by Taylor's scientific management of work, and this original tension continues in its relations to work organization. I would like to highlight briefly three dimensions of this tradition: first, its relations to what has been recently called the practice approach; secondly, to social transformation; and thirdly, to vocational or professional training. This overview of some key dimensions of the activity analysis perspective will allow us to specify how Activity Clinic pursues and develops this activity analysis tradition.

Firstly, compared with the practice turn in social sciences (Nicolini, 2012), the cultural-historical psychology on which activity analysis is based jointly analyses the subjective, intersubjective and institutional levels. It integrates the subjective work experience with its social, technical, legal and economical context, thanks to input by the concrete activity of the workers and managers. Models of activity link the internal and external (material, interpersonal, organizational) dimensions (see for example Leplat, 1997, and some discussions on models of human activity at work summarized in Kloetzer & Clot, 2016). It can therefore not be considered as a purely institutional nor a purely individual analysis of the work process.

Secondly, since its conception, activity analysis has been oriented towards work transformation, as recalled by the title of a famous French ergonomics manual, '*Comprendre le travail pour le transformer: La pratique de l'ergonomie*' – (*Understanding and transforming work: The practice of ergonomics)* (Guérin et al., 1997). Therefore, discussing activity analysis from a purely theoretical perspective is tackling the problem upside down, as ergonomics defines activity analysis as *an action method*: it is primarily an intervention method, which aims at understanding the complexity of the activity of the workers to face the constraints of the work situation and at adapting the work organization to promote health (see for example Wisner, 1997). Command and demand jointly define the field of the intervention, and the intervention contributes to the understanding of the real work activity, supporting a re-definition of the problems, re-conception of tools, decision-making processes related to work organization, or vocational and professional training. Activity analysis pursues two goals, a *pragmatic goal* and *a scientific goal (*Pastré, 1999). According to Pastré (1999), the pragmatic orientation tends to answer the practical problem – for example, designing a system, increasing safety or improving training, whereas the scientific orientation is dedicated to understanding how this solution can be useful for other cases.

The scientific goal requires a generalisation process from one case to a category of cases that are considered similar on some dimensions. How these pragmatic and scientific goals are connected, how the intervention process and the research process are related, are both practical and theoretical issues.

Thirdly, the relationship between activity analysis and occupational training is twofold: numerous papers report how activity analysis brings real workplace complexity into occupational training (see for example, Durand & Filliettaz, 2009; Pastré, 2009) and adds a fine-grained understanding of occupational expertise in context, discrepancies between work organisation and work demands, as well as first-person reports of the meaning of actions. Conversely, vocational training may similarly trigger activity analysis, becoming an incentive to conduct activity analysis, which has a potentially transformative dimension on the whole system. However, what gets transformed by activity analysis depends on who gets affected by the analysis: the scope of the actors who are engaged from the beginning into the research process is therefore critical for its potentially transformative effects.

With this background in mind, we can now consider how activity analysis is performed in the Activity Clinic tradition, in order to support the development of the subject's power to act (Clot, 2008).

CSS as a transformative method: theoretical and methodological introduction

The CSS methodology (Clot, Faïta, Fernandez & Scheller, 2001) is an intervention and research methodology extending the French-speaking tradition of activity analysis and continuying the transformative Vygotskian project implied by historico-cultural psychology (Stetsenko, 2016). It was created by Yves Clot and his colleagues within the Activity Clinic team at CNAM (Conservatoire National des Arts et Métiers), Paris. It bears some similarities to the Change Lab methodology and Developmental Work Research of Yrjö Engeström and colleagues, which cannot be presented here, but are discussed by Kloetzer, Clot, and Quillerou-Grivot (2015). The CSS methodology aims at developing the power to act (Clot, 1999) of all partners taking part in the intervention. The power to act, inspired by Spinoza's work, is defined as measuring: '*the radius of effective action of the subject or of subjects in their everyday professional milieu, what is called the radiance of activity, its power of re-creation*[4] ' (Clot, 2008, p. 13). The CSS methodology is therefore defined as a method for action, with a goal of transformation, and as a method of research, with a goal of production of scientific knowledge. Transformation is possible thanks to clinical and developmental methodologies, which associate a careful and detailed process of work analysis within a structured dialogical framework. In CSS, an intervention fuses two tracks:

> The first track is focused on conducting a clinical co-analysis of the work activities with a group of volunteers. The detailed analysis of actual work activities with

> volunteer subjects, who constitute the associated research group, is the vital first step required to question the organisational procedures and requirements in a documented and constructive way. On the second track, this detailed co-analysis, jointly performed with the workers within the steering committee formed for the intervention, triggers and constrains the discussions between managers, workers, and the experts who design the work organisation. The clinical co-analysis with workers becomes a tool to transform the conditions of the dialogue at all hierarchical levels in the company. (Kloetzer et al., 2015, p. 51).

The research process strongly engages two ad-hoc groups of participants: On the one hand, there is a homogenous group of fieldworkers, here setters, who volunteer to investigate their way of working, and reflect on it collectively. Following Ivar Oddone (Oddone, Re, Briante & Clot, 1981), we call them the 'associated research group.' On the other hand, there is also a heterogeneous Steering Committee, composed of mixed profiles (HR director, production director, two line managers, one staff representative, researchers, later joined by delegates of the associated research group). One important step of the research process to bring these two groups to life, and to organize meeting points between them, which are important alternative dialogical spaces to the everyday work organization. In this article, I will argue that videos produced in the research process constitute dialogical artefacts, inasmuch as they generate professional explorations and controversies, which are then integrated into the design of these videos in an iterative, reflexive process.

The CSS methodology owes its name to its core step, which is a process of confrontation with one's own activity and the activity of others, and to the perspective of the others on their own and one's own activity. Confrontation with the alternative perspective of the other begins within the initial phase of the research, when researchers come to the workplace to observe the activity and interact with the workers. In comparison to observations conducted in ergonomic interventions for example, here the researchers attempt to place the workers in a position to observe their own activity (Simonet, Caroly & Clot, 2011). The confrontation process continues during the phases of interviews in simple confrontation and cross confrontation. In simple confrontation, the workers discover their own way of working with a renewed perspective, thanks to video recordings and the active presence and questioning of the researcher, who does not primarily attempt to understand but to make the workers *think* about their activity. In cross self confrontation, this is intensified by the presence of a colleague, who engages in a peer discussion. Thanks to detailed, concrete, observable traces of the work activity, the puzzle of the realised activity can be worked on through dialogue. The French-speaking tradition of ergonomics focuses on the *realised activity* (what is done by the workers to answer the demands of the situation, in relation to their official *task* – or mandate, Leplat, 1997; Ombredane, 1955). Yves Clot (1999) suggests to expand its concept to the *real activity*. The *real activity* is defined as the psychological activity of the subject, including what is done, but also what is not done and why, what couldn't get done, what should

be done differently, what is to be done again, etc. Therefore, the *real activity*, with its partly unrealized possibilities, has some transformative potential. In the methodology of CSS, some aspects of the real activity enter the public scene for potential debate, therefore highlighting this transformative potential. Expanding the power to act of the participants relies on structured confrontation, based on embodied experience, and dedicated to '*transform[ing] past experience into an instrument for dealing with future experiences*' (Clot, 2008, p. 148).

In summary, I argue that the early steps of the research process create a partly shared/joint investigation object – *a boundary object*, in the original meaning of Star and Griesemer (1989), which is here the exploration and transmission of expertise (or exploration through transmission, but also transmission through exploration…). Around this research object, collaboration is organized as a 'multi-party' process interlinking two different working groups: collaboration between researchers/management/trade unions/other relevant stakeholders within the steering committee; collaboration between researchers/workers within the associated research group. The aim is to improve collaboration between workers/management and other key stakeholders through the mediation of the researchers and partly shared research objects. The analyses and discussions going on in the associated research group thanks to the CSS methodology may then become resources for collaborative work in the Steering Committee, and for larger collaboration within the company.

Video recordings of all the discussions constitute the raw data that the researchers work on to construct short video films, which will support the reflection and discussion process in the steering committee. Discussing the role of these video recordings in the different discussion spaces opened by the research process will be the focus of the second part of this article.

Dialogical frames and dialogical artefacts in a developmental intervention

Video-supported reflections in a dialogical frame: videos as dialogical artefacts

The research process produces a lot of videos. Focusing our attention on videos helps us analyse the interplay between observation, analysis, dialogue and transformation in the research process. I will call 'chronotopes' (Bakhtin, 1978) specific spaces and moments of the research process in which the activities of observation, analysis, dialogue and transformation interplay through video-supported joint reflection. I will use therefore use the Bakthinian concept of chronotopes in a weak sense, to refer to changes in the spatial, temporal and social dimensions of the research, without integrating its symbolic dimensions which are critical in Bakthin's chronotopes within literary critics. Here I will

highlight how these chronotopes differ from one another, despite their shared function for stimulating thinking and the development of the subjects' power to act.

The key chronotopes of the research process are the simple self-confrontation interview (chronotope 1); the cross self-confrontation interview (chronotope 2); the meetings of the associated research group (chronotope 3); the meetings of the steering committees (chronotope 4); and the final presentation to all factory workers of the units in which the research took place (chronotope 5). They differ in the participants involved, the material and temporal settings, the goals and instructions set by the researchers, and they also trigger different speech genres (Bakhtin, 1986).

From the beginning of the research project (just after the early steps in which the research goal, method and process are discussed and defined) to its end, these chronotopes are characterized by a mix of video films and dialogues. The researchers deliver instructions on how to watch the videos, and instructions on the kind of dialogues expected in these situations. Regarding the videos, participants are encouraged to watch the video films carefully, following specific instructions according to the moment of the research. In the chronotope 1 (Simple Self-Confrontation interview), the participants are instructed to watch the videorecording of their own activity and react to what they see by commenting for the researchers, for example, by stopping the videorecording and telling the researchers each time they see something that surprises them, is interesting for them, or that they wouldn't have expected to do that way. In the chronotope 2 (Cross Self Confrontation interview), the participants watch two videorecordings, one for each worker. The workers are instructed to react to what they see by commenting the video of their counterpart, for example by asking questions or suggesting differences. Therefore, the instructions which define orientations on how to watch the videorecordings are simultaneously defining orientations on how to dialogue. This combination of the joint observation of the video with the specific orientation of a collaborative project and a well-defined dialogic frame, creates the specific dynamics of exploration and discussion.

The social perimeter varies a lot from one chronotope to the other: 2 people in simple self-confrontations, 3 to 4 in cross self-confrontations, 8 in the associated research group meetings, 8 to 16 in the steering committee meetings, 80+ for the final presentation meeting.

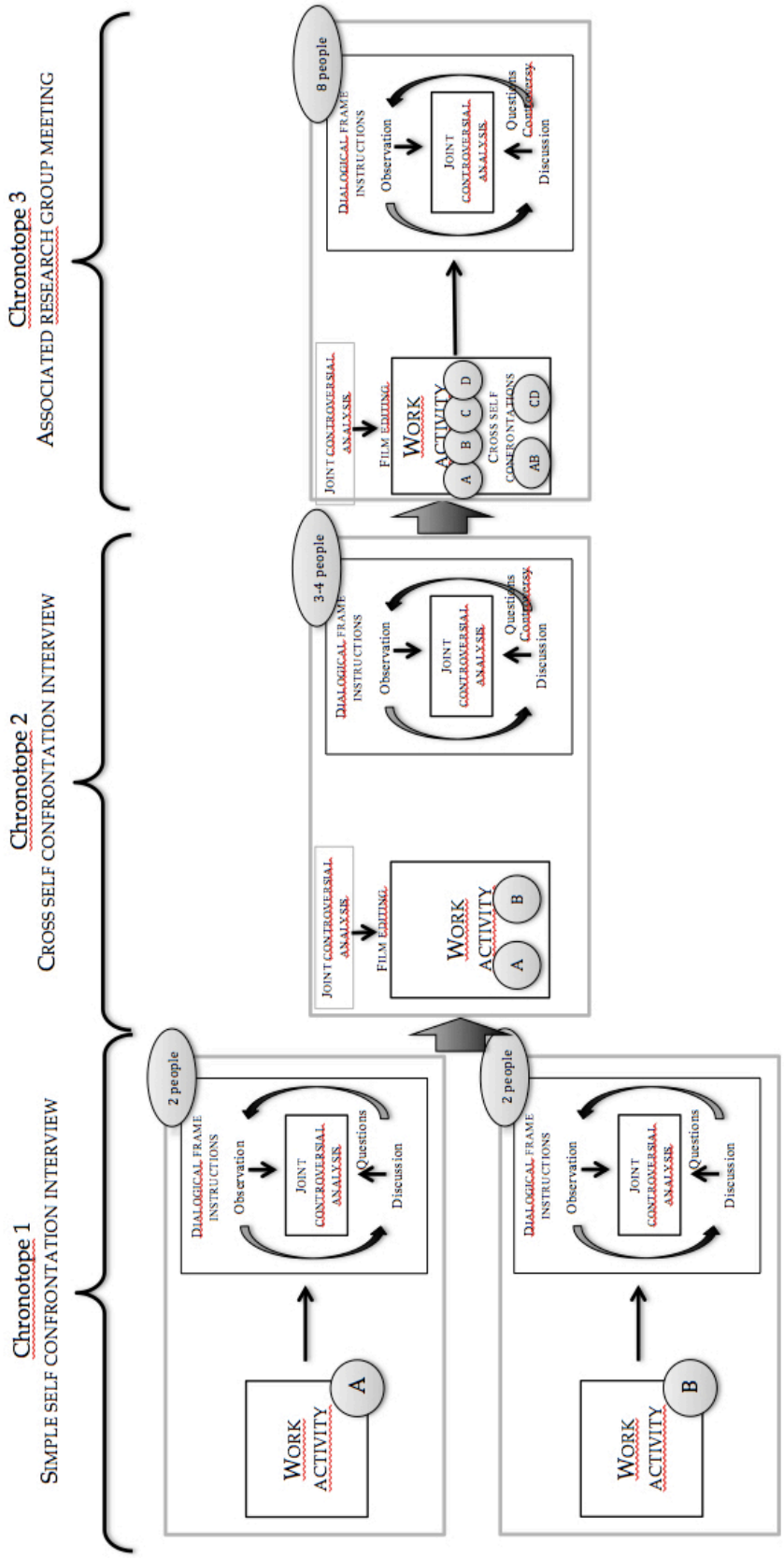
Of course, in this context, what is shown in the video films plays an important role in which kind of critical discussions the participants may engage. The video films are edited from the data collected in the research process: early on in the research process (for Simple Self-Confrontations), they represent only selected sequences of the work activity. The sequences are selected by the researchers, on the basis of the objects, goals and critical moments discussed within the associated research group, as well as on their own understanding of the

critical episodes in the field. Later in the process, they integrate sequences of work activity moments with sequences of dialogue in the simple and cross self-confrontation interviews. Together, they therefore present complex work situations and activities with perspectives on these activities expressed in dialogue. As the researchers do not look for immediate convergences, but encourage silent thinking and expressions of disagreement, alternative views, questioning, and even controversies, these perspectives may well appear multiple. Therefore, the video films present real work activities with dialogues commenting on these activities with a specific 'colour,' which is the colour of the joint efforts of investigation, exploration and analysis of the participants.

This process of edition, observation, analysis and discussion, is useful for the participants as it supports their individual and collective reflection on their work activity and organisation. It therefore serves action and transformation in the work situation. It also serves the scientific work. Conversely, the researchers gain an understanding of the work process – and of the nature of the expertise – through the direct explanations by the workers, but also indirectly through controversies emerging between experts, and between experts and their hierarchy, in these dialogical frames.

Looking at the nature of the video films shown in these situations, we can draw the following figure (Figure 1, p. 74–75). The carefully edited video films can be considered as 'dialogical artefacts', because they are designed with a strong focus, facilitated by the researchers, on supporting multiple and controversial perspectives on the same object. These videos, watched in a specifically and carefully designed dialogical frame, produce effects at the interpersonal level, as well as at the intrapersonal level: they 'fracture' established positions, by introducing other's perspectives within one's own; from a Vygotskian perspective, the dynamics follow the double law of development: from the interpersonal dialogue and controversy to the intrapersonal dialogue and controversy, in a repeated way, which might open new possibilities for interpersonal dialogue, collective understanding, and transformative action. Interestingly, the researchers insist on the 'working status' of the video films that are constructed and used in the research process: they are presented as 'movies for working with,' with little artistic ambition. This claim is important, as it gives these videos an open status: it is not something that can please or displease the participants, but a specific moment in the collective project of joint elaboration and innovation. However, these videos combine an analytic impact, which we have discussed above, and an emotional impact, which we haven't discussed yet. This emotional impact lies at the core of the entire analytical process by engaging the viewers. In the initial steps of the research, this emotional process is rather unrefined: it comes from the direct and usually critical engagement of the viewer with his own activity projected onto the screen. However, the more the videos have to be edited (in order to integrate a growing number of hours of

recordings in a limited format of around 15 to 30 minutes), the more they integrate multiple perspectives expressed in dialogue and display joint efforts of analysis, the more they reach people beyond protected circles, for example in steering committees and ultimately for the full audience of fellow workers, the more they combine an analytical impact and an aesthetic impact, for which the researchers are largely responsible.


Chronotope 1
SIMPLE SELF CONFRONTATION INTERVIEW
Chronotope 2
CROSS SELF CONFRONTATION INTERVIEW
Chronotope 3
ASSOCIATED RESEARCH GROUP MEETING
WORK ACTIVITY
A
B
2 people
DIALOGICAL FRAME INSTRUCTIONS
Observation
JOINT CONTROVERSIAL ANALYSIS
Questions
Discussion
JOINT CONTROVERSIAL ANALYSIS
FILM EDITING
3-4 people
C
D
CROSS SELF CONFRONTATIONS
AB
CD
8 people
Controversy

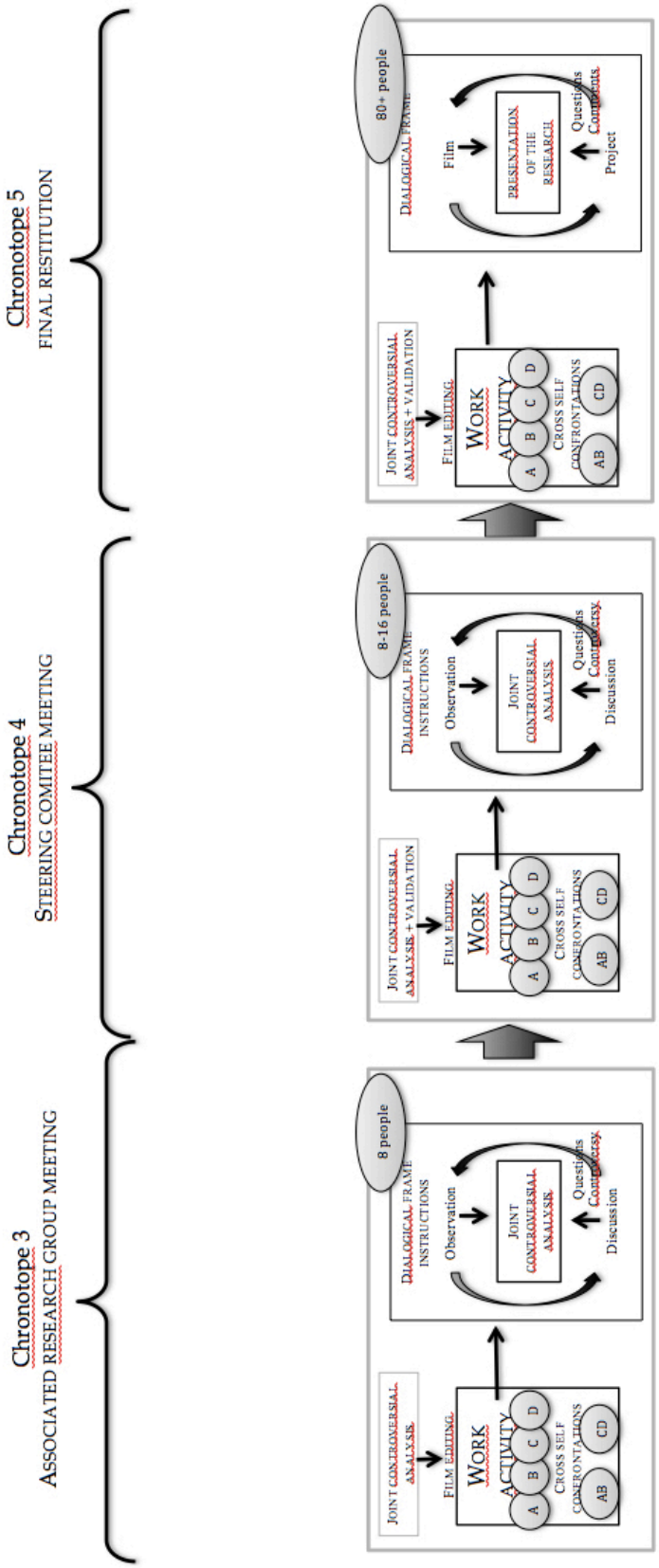


Figure 1. Chronotopes from the video films.

An example from our research data: multiple perspectives – and lost opportunities – on quality control

I will now introduce a short extract of our research data, to discuss what potentially gets transformed in the research process. After numerous hours of observations and analyses with the expert workers, the researchers finally decided to produce one final movie for each of the three big types of cutting (each of them being 20 minutes long), plus one transversal film dealing with recurrent organizational issues and the organizational competences of the workers to solve them (that one is 30 minutes). The discussion below happens after this film on 'organizational competence' has been shown in the final Steering Committee. This final Steering Committee was interesting, as all setters were invited to join. The goal of the researchers in inviting the whole associated research group to the Steering Committee was to expand the discussion across hierarchical levels. In this short sequence, we see that one expert setter takes the initiative of bringing back one issue that has been repeatedly discussed in the associated research group into this discussion space: the problem of coordination with the final quality control. His point is that the visual aspects of the intermediate product and of the final product are so different, that they cannot be compared. This implicitly means that his team cannot be expected to deliver products which will pass without default through the final quality control, because at that intermediate step, the workers cannot see the flaws that will become visible only later on, after the thermal treatment. His point is further developed in a complementary direction by another expert setter, who highlights the need for communication with the final control: what will finally be considered as a flaw is unclear, since the final margins of tolerances are not shared. We also see how the line manager supports the view of these two professionals, by using his personal experience of manager as an argumentative resource to confirm that the flaws cannot be visually detected before thermal treatment. At this point, the discussion could go in different directions: for example, (a) a challenging discussion could follow on how to detect these invisible flaws at an intermediary step; or (b) the expectations and tolerances of the final control could be made publically explicit and discussed. However, the production director engages in a partly consonant, partly dissonant talk. He firstly confirms that what the units do is the right thing to do, i.e. discuss with the final control, 'to know what is a flaw and what isn't a flaw', 'as well as the way in which to detect it as soon as possible'. However, he ignores the point put across by the expert setters and the line manager, according to whom there are different flaws that can be detected at different steps of the production process. The production director also explains the rationale of the current improvement projects to deal with this problem. Although his point is perfectly rational, according to a global analysis of the production, it doesn't address the issue introduced above: by saying that 'there's no point in continuing with the various operations, the thermal treat-

ment and everything, unless we repair it from the beginning' to avoid useless additional costs, his intervention does not address the problem of early recognition and treatment of flaws which are invisible at an early production stage. Sensing that the discussion does not fully address the main point, one of the researchers intervenes but also misses the opportunity to reframe the key question. Instead of discussing the invisible flaws, the researcher brings the discussion back to issues of communication. In this sequence, we finally see how the researchers intend to encourage the discussion on work organization, by defining the dialogical space as a protected and operational experimentation zone.

> Transcription of a short sequence of dialogue in the final steering committee:
>
> Setter 1: The final control has come back into discussion. The roughly carved lime and the finished lime have nothing to do with each other! There are always flaws.
>
> Setter 2: You also need to know about their tolerances regarding flaws.
>
> Line manager: Certainly, control testing at the end of the line, before and after thermal treatment, is not going to be the same. We realised this because if I need to do a test at the end of the line, and if I take someone doing the final control test, they won't see anything. It's two different control tests with two very different visions. Thermal treatment allows us to the see the flaws which aren't visible otherwise, undetectable at the end of the line. And that, those could be the scraps that are inevitable with this vision in mind.
>
> Production director: What needs to happen is what you're already doing, discuss the final control tests to know what is a flaw and what isn't a flaw, as well as the way in which to detect it as soon as possible.
>
> Line manager: Exactly.
>
> Production director: Maybe it's nonsense, what I'm about to say, but we include the defects in our final tally. We make allowances for these defects and it doesn't help the company much. It's better to catch the flaws from the very beginning, or to remove them. There's no point in continuing with the various operations, the thermal treatment and everything, unless we repair it from the beginning. But this is a big project to start working on, in my opinion it will need time but it will start falling into place.
>
> Researcher 1: What's interesting in the film is that you see different ways of discussing the final control test: there's a direct way, a meeting between the regulator and the final tester, there are discussions going on between the heads, the intermediaries in certain cases, the background checks which come into the discussion, it's not the final control test but it also has an impact on the quality. I find it interesting because it highlights different ways for thinking about this dialogue. Everyone knows that there's a discussion to be had, and feedback on the final control test to communicate upwards, and probably intermediary tests to do but how, it gives some direction as to how to start thinking about how best to do it. […]

This last intervention of one of the researchers opens a general debate, in which what to control and when gets discussed by the experts. They suggest controlling the pieces even before they enter their stage of production and discuss which flaws should be searched for in priority, and at which stage of production. The later discussion partly reconnects with the missed opportunity to discuss how to make invisible flaws detectable.

Despite its apparent inconclusiveness, the sequence displays the impressive engagement of all partners (expert workers, line manager, and production director) in a technical discussion on a problematic production issue. What gets transformed in this situation may be the way the different partners perceive each other's expertise on the production process; as well as the kind of dialogues that could happen in the company between different hierarchical levels, the objects of these dialogues, and the place of the partners in the dialogue.

This discussion was initially triggered by the film, which highlights various questionings of the experts on quality issues, through images of work activity, and discussions in simple and cross self-confrontations. The careful selection of the images which were finally presented to the Steering Committee reflects the discussions which happened earlier in the research process: in the field, during the observations and recordings; between expert setters during the meetings of the associated research group; within the Steering Committee. The editing process highlights some topics for collective reflection, discussion, and transformation. In this editing process, the researchers chose the sequences that best capture the questioning and controversies, in their analytic and emotional dimensions.

Discussion: on transformative and performative science

If the researchers intentionally assume the responsibility of conveying both analytical impulses and emotions, they are skirting the field of Performative Social Science, which is defined 'as the deployment of different forms of artistic performance in the execution of a scientific project' (Gergen & Gergen, 2011, p. 291). The questions underlying a performative approach are inseparable from a transformative stance: Who is the audience? What audiences are excluded? What responses do we hope to achieve? What skills are needed in the performance? (Gergen, 1982, p. 11).

The specific goal of displaying the 'spirit' and the main findings of the research to a large audience, which is unfamiliar with the details of its process and objectives, requires one to go one step further in the use of artistic forms. In this research, the photographs happened to play a critical role in this diffusion process. A selection of photographs of the members of the associated research group at work was displayed in an animated presentation, each of them being associated to one of the core professional values, or *virtues*, in the sense of Daston and Galison (2007), and Hay, Williams, Stahl and Wingate (2013), identified during the fieldwork. This presentation was accompanied by music. The entire presentation lasted 2 minutes 30 seconds. It was not planned to be an outcome of the research process, it just happened to become an essential and powerful part of its outreach, leading to applause by the fellow workers during the final presentation, and shown in parallel to the shareholders during the next Admin-

istration Board, to demonstrate the strategic orientations of the new HR and production directors.

Conclusion: transforming dialogue thanks to dialogical artefacts, to develop the subjects' power to act

This article intended to make three main points. Firstly, following a well-documented tradition of Francophone Activity Analysis, it shows how a research project dedicated to Vocational Education and Training may have a transformational potential for the organization, providing it adopts an activist stance and extends the boundary of the research project across hierarchical levels, involving both fieldworkers, managers and directors. Secondly, it discussed how these transformations, when they happen, depend on the transformation of the conditions, mediations and objects of dialogue among these partners. Thirdly, it discussed the place and role of video films within these dialogical transformations, showing how the process of film-editing, which is an intrinsic part of the research process, aims at improving its analytical value as well as its emotional value. This is particularly crucial when the research project is presented beyond the circle of the participants, who are familiar with its details. To keep its transformative power for an extended audience, the video films may need to loose their openly work-in-progress character, and display the research spirit and findings with a more conscious artistic ambition.

At the end of the research process, during the final presentation to their fellow workers, one of the experts introduced the final movies and presentation by reading a statement prepared by the associated research group to share their experience of the research. Here is the research process described in his own words:

> It wasn't easy for us to come up with acting. I hope that you will excuse our lack of knowledge in this field. You'll see that we present the basic settings of the different machines for the different shapes and sizes of steel files, as well as the quality control where we give instructions as to the making of the prongs as well as to the general quality of the files. Our work is not only to prepare the machines but also to keep in constant contact with the foreman, in order to get information about the priorities and organisation of the work. Also, with the other departments, internal accounting, the planning department, maintenance for the broken machines, the management of our fleet of machines and the staff who work with us, training new setters and operators. We need to have constant contact with our colleagues who execute these tasks upwards and downwards, setters, deburrers, in order to anticipate and manage our settings with the dippers, sanders and controllers during quality testing. Craftsmanship lies at the heart of all of these competencies. We hope to have met management's expectations in this film on our craft. We have tried to be clear and precise without going too much into technical detail. Above all, knowledge and craftsmanship is learnt on the job and needs time and patience.

These words capture the large sociocultural perspective on embodied, professional expertise in a beautiful manner.

Endnotes

[1] In French: 'Une lime, c'est toute une histoire', which is a word game with deux meanings of this sentence: it requires many complex steps; and it has a long, local history.
[2] The 'French-speaking ergonomics' is a tradition of intervention in workplaces based on close work analysis and aiming at organizational transformations (see for example Wisner, 1996). It has been developed mostly in France and Canada from World War II, and is used for example to design tools, spaces, or training programmes.
[3] The research team was formed by Laure Kloetzer, lead researcher, and Valérie Bauwens, research collaborator.
[4] Le pouvoir d'agir 'mesure le rayon d'action effectif du sujet ou des sujets dans leur milieu professionnel habituel, ce qu'on appelle le rayonnement de l'activité, son pouvoir de recréation' (Clot, 2008, p. 13).

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Enhancing learning as theoretical thinking in robotic surgery

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Abstract

Professionals in many domains need to deal with increasingly complex, technology-mediated and uncertain work. Thus ways of learning that continuously and flexibly create new knowledge are needed at work. The aim of this article is to describe the logic of theoretical-genetic generalisation, and to use this, in addition to other methodological resources from pragmatism and cultural-historical psychology, for developing a learning method for robotic surgery. In theoretical generalisation, or theoretical thinking, the learner orientates him-/herself in two directions: towards producing general, abstract understanding of dynamic interrelations within a phenomenon, and towards flexibly tailoring good solutions for each particular situation. Based on our ongoing study of robotic surgery, we sketch three different designs for learning which are all based on video-supported joint reflection of real robotic surgical operations. We outline the necessary principles and steps of the method in this context, and finally, discuss the potential of the outlined method for learning.

Keywords: activity theory, developmental instruction, orientation basis, professional learning, robotic surgery, theoretical-genetic generalisation

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Introduction

The need for customised products, and new technology's continued penetration into work and life set a context in which change rather than the stability of work is the norm, and in which skills, competencies and work processes are constantly changed or re-valued (Boud, Cressey & Docherty, 2006). Boud et al. (2006) argue about a shift of emphasis from the 'organisational learning' of the 1990s to 'productive reflection', in which the key need is to manage complexity and ambiguity, and learning is contextualised at the workplace rather than merely defined in formal strategies. A societal shift towards 'high technologies' implies that expertise, competence and knowledge development ground learning in new integral ways to work or practice (Langemeyer, 2014). These new ways of learning mean not only that the significance of expert knowledge is increasing, but also that science, embedded in artefacts and practices of work, reorganises, through new scientific concepts, the knowing worker's entire intellectual behaviour.

Learning, in which new knowledge is continuously and flexibly created, is, we assume, increasingly required. The aim of our ongoing research project 'Interpretive work: Developing new forms of work-based learning for the age of digitalisation' (Wahlström, Norros, Seppänen, Schaupp & Toiviainen, 2014) is to make sense, by using and combining various methodological resources, of the new forms of learning that are needed in complex high technology work. For this purpose, we use the notion of interpretive practice, originating from Peircean philosophy and later elaborated by Norros and her colleagues (Norros, 2017; Norros, Savioja & Koskinen, 2015). An interpretive way of working means questioning the observed phenomena, discussing with the team, anticipating the system state, and using various information sources. We have carried out developmental interventions using a methodology of self-confrontations elaborated in French cultural-historical psychology (Clot, 2011; Kloetzer, 2012; Kloetzer, Clot & Quillerou-Grivot, 2015). Self-confrontations serve our purpose by making professionals face multiple viewpoints of their activity, giving birth to new dialogical objects which may turn into new 'theoretical' objects of thinking that have the potential for transforming material objects or organisational activities (Seppänen, Kloetzer, Riikonen & Wahlström, 2016).

Another aim of our research project is to sketch a method for learning interpretive or theoretically informed ways of working. Our argument is that learning can be enhanced through a methodology of self-confrontations, but still needs a method of instruction to organisationally and institutionally support it. A promising method is developmental instruction, based on the notion of theoretical-genetic generalisation, as elaborated by Davydov (1990, 2008) and inspired by the works of Ilyenkov (1982, 2007). Further, the Davydovian theory of developmental instruction was taken into use and elaborated by the community

of Developmental Work Research (Engeström, 1987, 1994). Theoretical-genetic generalisation, or theoretical thinking for simplicity, refers to the identification of the 'genetic' origins of phenomena. A phenomenon's functional relationship is looked for when the parts of the relationship may be completely different, but still dialectically and functionally interdependent (Sannino, 2011, p. 586). Modelling, practical transformation and experimentation are at the root of theoretical thinking, emphasising its processual, practical and method-like character. Theoretical thinking enables practitioners to look for generating mechanisms behind the problematic phenomena they face in their work, which helps them not only to find renewed solutions to emerging dysfunctions or anomalies, but also to build systemic, dynamic and 'abstract' knowledge about the phenomenon in question. The interpretive way of working, and the methodologies of self-confrontation and theoretical thinking share the common focus of enhancing participants' learning of new processes and methods of more theoretical and contentful thinking and production of knowledge.

Our aim in this article is to discover, by following the processual logic of theoretical thinking, the ingredients of the process, and a method for promoting and learning theoretical thinking in complex and technology-mediated work that requires addressing and resolving uncertain issues. We will apply the above mentioned theoretical ingredients to an empirical research case, oncological robotic surgery. The theoretical investigation and the method generation of this article is rooted to ethnographic studies and task-analyses that we have conducted on robotic surgery (Wahlström, Seppänen, Norros, Aaltonen & Riikonen, submitted).

In this article we first take a look at the theory of theoretical generalisation, together with its principle of ascending from the abstract to the concrete and modifications (next section on *Forms of generalizing in thinking and learning*). Second, we describe the main contents of the work activity in question, oncological robotic surgery, after which we sketch three designs for learning, based on our previous work in this domain. These designs vary greatly, ranging from small local learning events to possible large-scale research projects. Later, the section *Steps of learning theoretical thinking in robotic surgery* applies the principles that are needed in all designs if they are to be both practically and theoretically useful. At the end, we discuss the potentials of enhancing theoretical thinking in robotic surgery.

Forms of generalising in thinking and learning

Humans use different kinds of generalised representations of reality as a way of knowing and learning about things in the world. These representations can be internal and mental or external and in some material form. These representations are produced through specific actions of abstracting and generalising, and

once created, they can be used as instruments of similar kinds of thinking and learning actions in various contexts. There are, however, two fundamentally different forms of abstracting and generalising (Davydov, 1990; Ilyenkov, 1982).

Empirical abstraction is a central form of our everyday thinking. It is based on the comparison and classification of objects and phenomena according to their externally identifiable characteristics and common nominators. The connection between things classified through empirical abstraction is formal, which means that no concrete relationship necessarily exists between these things within any real-life system. Generalisation through comparing and identifying similarities also produces an endless amount of different classifications. For example eggs and golf balls fall into the common category of white and round objects, but just by changing the basis of the classification golf balls might be categorized as 'sports equipment' and eggs as 'groceries' or from yet another perspective as 'reproductive cells'.

Instead of categorising of things on the basis of their observable characteristics, theoretical generalisation (or theoretical thinking) is oriented towards examining objects and phenomena as systems of functional relationships and interdependencies. Here, a golf ball is a part of a system that in addition to other golf equipment consists of players, fields, rules of the game, golf clubs and associations, and so forth, that in their mutual interactions form the activity of golf playing. This system of relationships gives its parts a real meaning of existence and invests them with various characteristics that they would not have outside the system. Thus, theoretical generalising does not strive to find universal and eternal definitions of 'things as such', as separate unrelated entities, but to explain things in their systemic contexts through identifying their genetic origins. This also makes it possible to explain why very multifaceted, externally different and even seemingly contradictory things can be a part of the same system, and to investigate the essence that keeps these complex systems together.

Ilyenkov (1982, chapter 3) explains theoretical thinking as follows: '[t]o comprehend a phenomenon means to establish its place and role in the concrete system of interacting phenomena… …and to find out precisely those traits which make it possible for the phenomenon to play this role in the whole.' To realise this, it is not necessary to make comparisons within a large group of similar phenomena, but to 'study at least one typical case of a living dialectically developed system of internally interacting objective phenomena.' Because of their inherently systemic nature, theoretical generalisations exist primarily as methods, models or concepts that reproduce the core relations that should be scrutinised to understand the phenomenon that the generalisation denotes. Next we will explain how theoretical thinking proceeds and how it is learnt by presenting the principle that crystallises the process of theoretical thinking, the principle of ascending from the abstract to the concrete.

Steps in learning theoretical thinking and the principle of ascending from abstract to concrete

Ilyenkov (2007, p. 19–22) describes one of Pavlov's experiments, in which a trained dog loses its mind when presented with a combination of the stimuli that it had been taught that required conflicting responses. The dog was unable to cope with such a contradictory situation. For humans, on the contrary, this kind of situation and appearance of contradiction is a signal, a potential cognitive conflict, that activates thinking. It is also a point, at which formal categories, 'it is either this or that', no longer serve as instruments for thinking and solving the task at hand, as the contradiction is by nature a paradox; 'A' and 'not-A' at the same time. Encountering this kind of a contradiction may prompt a person to investigate the object more deeply and orient towards explaining something that is yet unknown, towards new concepts and methods of acting, and this calls specifically for theoretical thinking.

Theoretical thinking is an important part of all human activity, but it is especially necessary in work activities that require deep expertise and action on very complex, problematic and systemic objects, as in oncological surgeons' robot-mediated work. The mastery of these kinds of work objects can be supported with theoretical abstraction which, as Sannino (2011, p. 586) argues, 'allows one to generate and project complex, theoretically mastered concrete manifestations and developmental forms of the reality under scrutiny'.

The concept of contradiction is a central notion in the principle of ascending from the abstract to the concrete, which Davydov (1990, 2008) has elaborated as the method for learning theoretical thinking in primary school instruction and curricula. The central idea is that in order to assimilate a new way of acting, it is necessary to become acquainted with how those questions arose for the person who was the first to solve such tasks. As Ilyenkov (2007, p. 17) argues, in order to learn to think theoretically it is necessary to learn the ability to ask the questions correctly. In addition, the principle of ascending from the abstract to the concrete emphasises the importance of creating theoretical concepts and models that help practitioners in various work contexts solve problematic and contradictory situations in the course of their work.

Models that especially support theoretical generalisation 'are a particular kind of abstraction, where the visually perceived and represented connections and relations of the material or semiotic elements reinforce the essential relations of the object' (Davydov, 2008, p. 95). They may be simple prototypes, algorithms or system models that consider the interplay of several different relationships within the same object or phenomenon, or in the form of a 'germ cell' model. A germ cell crystallises the way of dealing with a contradiction that is constantly present within an activity, a contradiction that motivates learning and development as it can be managed in different ways but never ultimately washed away. In oncological surgery, this type of constantly present contradic-

tion exists between removing (cancerous) and saving (healthy) tissue at the same time.

In other words, a learning method that strives to activate theoretical thinking should on the one hand support the learner's ability to observe, formulate and analyse the motivational conflicts that unveil a logical contradiction within their activity, and on the other hand to find a way to manage it through concrete examination of the object, by thoroughly studying some carefully chosen observations (Davydov, 2008, p. 131; Ilyenkov, 2007, p. 21). In our data, the situations named most critical by the surgeons were also situations of a contradictory nature. The contradiction arose from the conflicting goals of removing all the cancerous tissue while at the same time doing it as little invasively as possible to enhance the patient's recovery and retain as normal states and functioning of the operated area. In the videos of the surgeons' robotic operations, this contradiction manifested itself as hesitation, slowing movements, stopping to think or making explorative movements to gain more information. In some cases, this contradiction is more easily mastered than in others, but it nevertheless generates a recurrent learning problem in surgeon's activity and calls for theoretical thinking.

Engeström (1994), based on the formulations of Davydov, has operationalized the process of ascending from the abstract to the concrete in six steps of developmental instruction, each demanding specific learning actions. The first step is the *arousing motivation* through identifying a cognitive conflict that cannot be solved through concepts that the learner already possesses. The second step is *orientation*, that is, forming a preliminary hypothesis, 'an orientation basis', which helps the learner structure and model the knowledge needed for solving the problem and link together the essential points of concern. The orientation basis is a first hypothesis, a preliminary model, in the process of constructing a functional general abstraction of the phenomenon. The third step is *internalisation*, which means enriching the preliminary model by incorporating new knowledge into it while at the same time studying how accurately the model structures and explains the object of learning and organises its parts and details. Through this process, some parts of the explanatory model gradually transform into the learners' internal model. The fourth step is *externalisation*, which means using the created model as a tool for solving concrete problems within a (work) activity. The fifth step is *critique*; in other words, critical evaluation of the validity and usefulness of the model based on the experience of its use. The sixth step is *control*, when the learner stops to analyse his or her own learning and performance in the light of the new model, and corrects the model when necessary. The learner also evaluates the learning method (Engeström, 1994, p. 32–33). The process has been widely applied in Developmental Work Research interventions (e.g. Engeström, Nummijoki & Sannino, 2012; Virkkunen & Ahonen, 2011). As the basis of developmental instruction lies in the

specific content of the activity or work in question (Davydov, 2008, p. 120), we will next examine the contents of robotic surgery.

Oncological robotic surgery

Technological advances in optics, digital video equipment, computers and robotics have opened up new possibilities in surgery. A robotic surgery device called the da Vinci Surgical System was first introduced in 2000. Since then it has become the dominant device in the field. The robotic-assisted operation is performed via tubes (trocars) inserted into the patient through small incisions. With the sophisticated technology incorporated in the robot, a surgeon can teleoperate the instruments in the human body with the subtlety of a human wrist. The popularity of robot-assisted surgery, with its 'minimally invasive' technique, can be attributed to the novel means it offers to the managing of the central contradiction in oncological surgery, removing the cancer as carefully as possible, while doing minimal damage to the body and its life functions.

Most importantly, robots offer better visualisation than other technologies. A specialised stereo endoscopic lens and camera provide the surgeon with a three-dimensional view of the field under operation (Su & Smith, 2012). As palpation, that is, touching and concretely feeling the body of the patient, are essential in open surgery, in robot-assisted operations surgeons need to see or induce visual indicators to guide their operation, because there is no tactile (haptic) feedback from the robotic device. All members of the team in the operation room see the operation online, and can anticipate forthcoming tasks. The robotic device is expensive and surgeons need to operate often to maintain their good performance using the robot, which increases specialisation and inter-organisational centralisation.

The operative team often consists of two surgeons, two assisting nurses, an anaesthesiologist, and an anaesthesia nurse. Our research focuses mainly on the work and learning of the surgeons, in which the principal surgeon is responsible for controlling the robotic instruments and the camera at the console, distanced from the body of the patient, while the assisting surgeon is next to the patient and handles and transports instruments. The whole team mediates the control of the robot and the surgical operation: the operating room nurse positions the devices, monitors and records patient and operation data into the computer and maintains telephone contact with other hospital functions and the outside world. The anaesthesiologist and the anaesthesia nurse mainly monitor and control the state of the patient, but they may also help in other tasks.

Our empirical study, the methods and data sources of which are more comprehensively reported elsewhere (Seppänen, Kloetzer et al., 2016; Wahlström et al., submitted), is in urology; the surgical management of carcinoma of the prostate, an area in which an almost revolutionary introduction of robotic-assisted

surgery has taken place. The main objective of this robotic surgery operation is to remove the cancerous prostate gland from the patient's body (Figure 1). The surgeon must be careful not to damage important adjacent structures. If the surgeon dissects the prostate too near the prostate surface, there is a risk that some cancerous tissue may remain. The correct dissection plane is estimated by preoperative studies, such as blood tests, radiological images, and prostate biopsies. The challenges of learning and operating centre around the boundary between the cancerous tissue of the prostate to be removed, and the surrounding tissues, organs and nerves that need to be saved as well as possible. Based on this, we sketch '*mastering the boundary*' as an initial germ cell of this activity.

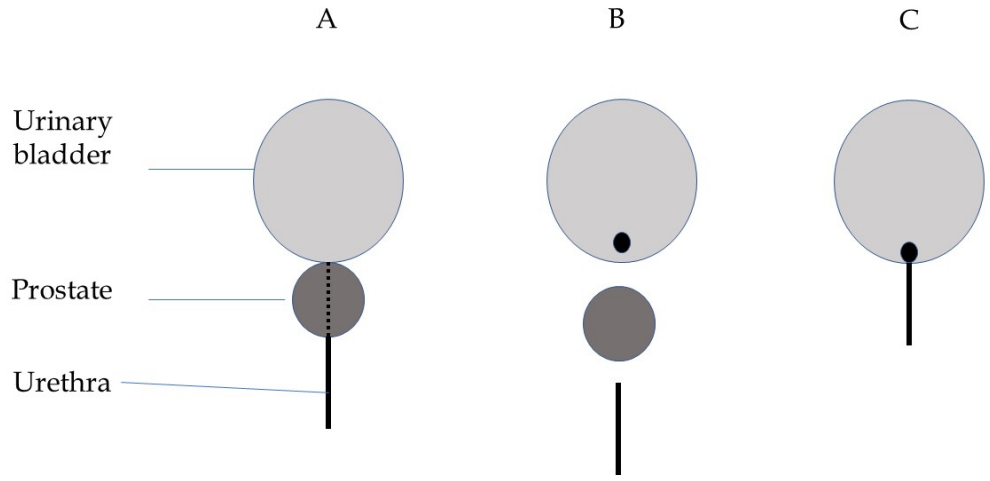

Figure 1. A rough sketch of the radical prostatectomy. A. Original location of the urinary bladder, the prostate and the urethra that goes from the bladder through the prostate. B. In the operation, the prostate is separated and removed. C. The urethra is reconnected to the urinary bladder. (Simplified from Taari, Aaltomaa, Nurmi, Parpala & Tammela, 2013; see also Seppänen, Kloetzer et al., 2016).

After the prostate is removed in the operation (Figure 1), it is taken to pathological examinations to discover exactly the place and quality of its cancerous tissue. Sometimes, *positive margins* are discovered. This means that cancer cells are found on the surface of the removed prostate. This is not desirable because some cancerous tissue may have remained in the body, although only about 30% of positive margins imply growth of cancer in the body after the operation. Positive margins are, we argue, a manifestation of the central contradiction of this surgical activity, and at the heart of the preliminary model of mastering the

boundary. Next we look at the learning designs and how their ideas were formed.

Three designs for learning

Our study involved video-stimulated self-confrontation events that have been transcribed and reported more specifically elsewhere (Seppänen, Kloetzer et al., 2016; Seppänen, Kloetzer & Riikonen, 2017; Seppänen & Riikonen, 2016). When analysing the data of video-stimulated self-confrontation events, three themes, or developmental objects emerged that seemed to be significant from the perspective of surgeons' work and learning. These themes seem to arouse motivation for learning and therefore constitute an important element in the learning process. The first theme is identification of tissues or organs, especially their boundaries and shapes. The second important theme is actions and practices on the boundaries, which means that variance in action, as rendered visible by video clips and surgeons' knowledge and experience, is a source of learning. Thirdly, motivation for learning may come from the conditions or phenomena that prevent surgeons from knowing or acting. We call these knowledge gaps, which can be handled with systemic analysis of boundary zones. One example of why the third theme is important is the uncertainty related to positive margins, explained in the section *Oncological robotic surgery* above. We combine these three developmental themes with our preliminary germ cell, which is the concept of mastering the boundary. One learning design is sketched for each theme. The designs below cover both small and local, and large ambitious learning efforts.

Identification of boundaries

We learned from the surgeons that identification is a challenge they very concretely face when learning robotic surgical operations, and this motivates their learning. Even though the image produced by the robotic camera considerably improves surgeons' vision compared to open surgery, the visual identification of tissues and organs must be learnt without palpation (touching and feeling), and as mediated by the digital video view. The identification challenge is partly due to anatomical variance in patients' anatomy which cannot be totally anticipated by pre-operative examinations.

Most importantly, the surgeons learn the identification when they assist in robotic operations (see the section *Oncological robotic surgery*). Before being able to operate as responsible main surgeons at the console of the robot, they may see tens or hundreds of operations and thus develop their vision for identification. They may create for themselves conceptions of 'right' places and ways of operating in different phases – partly standardised mental models that help and speed up the operation. Nelissen and Tomic (1996) call these *iconic representa-*

tions, meaning that the correct way to act is judged on the basis of a general, average image. An iconic representation most likely works well in standard operations, but it may lead to trouble when the patient has a special anatomy, or when the location of the cancer differs from the information obtained through pre-operative examinations. Iconic representation does not help surgeons perceive the systemic relations between a patient's particular anatomy, the occurrence of the cancer, the various health outcomes of the operation, and surgeons' action options. Nor does iconic representation account for the grounds of the formation of these phenomena. Special anatomies or disturbances in the operation process are the external stimuli that activate motivating cognitive conflicts (Engeström, 1994; Sannino 2015, p. 10) for surgeons, producing uncertainty or hesitation. The conflict may also be socio-cognitive, as surgeons are accountable for patients, their peers and the health care community as regards their operation outcomes. Theoretical thinking may be enhanced if the experienced surgeon at the console explains these relations, in occurrences of dysfunctions or anomalies, to the assisting surgeon during operations.

Video-mediated evaluation and reflection of operation actions efficiently supports identification, especially when it focuses on operation phases relevant for the learner (or, as made relevant by the information on patient records). It is not only about identification, but also about how local and situational identification is connected to the general complex surgical activity, and the learning surgeons to their intentions, feelings and knowledge. In addition to visual perception, identification also includes gestures and motoric movements through which surgeons induce visual information for identification. In other words, tissues are identified partially via their resistance to manipulation. Identification also involves situational synthesis of visual markers – objects are not simply seen, but inferred on the basis of various forms and colours depending on their location inside the patient's body. Furthermore, the space within which identification takes place is actually created by the surgeon as they open up the path towards the organ to be removed – the way in which the surgeon operates in the early phases of the surgical operation influences how easy it is to identify objects in later phases of the surgery: so-called landscape-making (Wahlstöm et al., submitted) is required. All these features point to the complexity of the identification task.

Identification could be learnt in a light way, as separate encounters between colleagues for watching the video clips. In this case, surgeons would learn about particular cases, but the enrichment of the involved knowledge would remain perhaps less systematic and less collective as compared to constructing a conscious and collective orientation basis. It would be important that senior surgeons, with their skilled vision, could participate in the encounter and help learners with identification. A practical condition, though, is that someone, most probably the learner him/herself, looks for interesting or demanding op-

eration cases in patient records, and finds the operation phases from the digital videos corresponding to the cases. All this takes time in busy hospital work. Digitally marking the phases of general interest and relevance on the video already during the operation would speed up this work.

Actions and practices at the boundaries

Here, the object of examination turns from the patients' features to the surgeons' own actions, or those of their colleagues, the final aim of which is to release the cancerous organ or tissue from its environment. This method may follow the steps of the self-confrontation method, which is efficient in 'generalising downwards' by developing the local and concrete work practice itself (Clot, 2009, p. 289). First, in *simple self-confrontation*, a surgeon watches, explains, and reflects on the actions seen in the video, above all to him-/herself, but also to another support person. The support person's status as external or internal to the surgical domain considerably affects the quality of reflection. The presence of an external person prompts surgeons to articulate the issues that are self-evident or implicit, as explaining to a peer surgeon is professionally more evaluative.

Based on our analysis, the real operative situation as seen in the video, and the patient record information directing its interpretation, are relevant elements in generating reflection, but the support person can also enhance reflection through open questions that extend the learner's horizon of possibilities. *Would it be possible to act otherwise, what are the risks here, and what is particularly remarkable in this situation* are such questions (Seppänen et al., 2017). The support person can direct the learner towards reflecting on how learner's actions relate to patient health outcomes, such as improving the removal of the cancer or diminishing the ill effects of the operation. The learner can also be directed to evaluate his/her performance according to concepts or categorisations of their professional domain.

Second, in *crossed self-confrontation*, the same video-mediated work situations are jointly reflected on between peer surgeons and a researcher. The variance created by watching different ways of enacting the same practices or distinct actions in similar situations is a powerful source of learning (Pihlaja, 2005)[1]. The variety of audiences forces surgeons to express the same actions or situations in different ways, which opens up possibilities for new interpretations (Seppänen, Kloetzer et al., 2016). Self-confrontations rightly remind us that no model is useful for practitioners unless they take and enrich the model as their own instrument of activity. The orientation basis and the construction of the 'abstract' model is embedded in a broad set of practitioners' tools and knowledge (Engeström, 1994, p. 34). The principles and steps of crossed self-confrontations have been described in more detail elsewhere (Clot, 2009; Kloetzer, 2012; Seppänen & Riikonen, 2016).

Joint reflection between peer surgeons seems to be useful, particularly if the peers have not been operating together as a pair of main/assisting surgeons. The third stage of the self-confrontation method, a collective encounter of peers for common reflection of the same video clips, could be applied in scientific conferences, or in virtual meetings between different hospitals offering robotic surgery.

Systemic analysis of boundary zones

Surgical knowledge, which is embedded in bodily movements, is partly tacit – but still based on medical science – and thus not easily transferable from one professional to another through standards. Our data and findings, together with the idea of modelling in the method of theoretical thinking, offer interesting insights not only to organising and representing existing knowledge in a new way, but also to systematic creation of new knowledge regarding this particular surgical domain, and for developing corresponding new techniques.

In our data, many of the surgeons' initiatives focused on the operation phases in which, based on patient records, positive margins were formed (see the section *Oncological robotic surgery*). Positive margins seem to arouse cognitive conflict in the form of questioning or hesitation and consequently a need for theoretical thinking. Surgeons were especially interested in watching and reflecting on the phases in which the positive margin side of the prostate was released. The information regarding positive margins, either in general or occurring in some specific location, could be collected from patient records. By examining video clips of corresponding operation phases of the same patients, it would be possible to chart different causes for positive margins, and gain new knowledge regarding the conditions and action options for managing this phenomenon. We assume that positive margins manifest the central contradiction of oncological robotic surgery and that they are at the heart of the 'mastering the boundaries' germ cell. In addition to new knowledge regarding the distribution of the cancer, the variation of the form of the prostate could be better understood, and perhaps virtually modelled. The videos made by the robot can thus be a vehicle for collective learning through research of this kind.

It is notable that surgery being a largely science-based activity implies a kind of uncertainty: like any science, medical science is not perfect, and surgical practice therefore progresses hand-in-hand with the scientific activities of surgeon researchers. Surgical work draws from inferring the features of human anatomy as well as from statistical studies in which patient recovery and health is contrasted against different surgical methods and practices – from reading medical descriptions of procedures (Su & Smith, 2012), it is apparent that there are scientific debates on where and how certain tissues should be dissected exactly. Systematic analyses of the actualised operations could provide a basis for hypothesis creation for medical inquiry: if the surgeons find out, for example,

that there is variance between their actual work practices and that there is the looming possibility that these could influence, for example, the positive marginal results, these thoughts could be tested by orchestrating experimental research (that is, comparing one work practice to another in a number of patients). According to data, videos were previously used for micro-anatomical location of erectile nerves, and for developing nerve-saving operation techniques. Digital marking of certain critical phases in the videos already during the operation is also necessary for this method.

We have now looked at the learning of theoretical-genetic thinking, presented the work context in which expertise is needed, and suggested three preliminary designs based on surgeons' learning needs in robotic surgery. The next section will apply the steps of learning theoretical thinking in the activity of robotic surgery.

Steps of learning theoretical thinking in robotic surgery

Following the process of developmental instruction (Engeström, 1994) and based on the learning designs above we suggest that methods for surgeons' learning, in order to both improve concrete operations and produce general knowledge, should include the following steps.

Arousal of motivation. Professionals' learning at work is motivated by the questions they face in their work. Motivation for surgeons is aroused by focusing the joint watching of video clips on features and surgeons' actions when operating those phases that cause cognitive conflicts. For instance, the identification of tissues in a crucial phase of operation, in our data, is a cognitive conflict for surgeons starting out in robotic operations: it cannot be solved with knowledge from books only, nor with experience in traditional open surgery. For surgeons already experienced in robotic operations, in turn, identification may come automatically. For them, mismatches between the expectations and outcomes of operations prompt motivating conflicts. Instances of positive margins are such mismatches. Learning a new operation technique that has proven, in research, to be beneficial for patients' recovery can be motivating for all.

Orientation. Conscious building of orientation is a crucial part of learning theoretical thinking, to which developmental instruction needs to pay special attention. In this, learners form a preliminary orientation basis that helps them structure the knowledge needed for solving a problem such as a cognitive conflict in the previous step. Discovering and shaping an orientation basis is an instructional task in itself. Therefore, a ready orientation basis provided by instructors does not suffice. An orientation basis, or several competing sketches for such, are arrived at by utilising learners' own experience and experiments (Engeström, 1994, p. 75). We sketched 'mastering the boundary' as a germ cell of oncological robotic surgery. For the purpose of orientation in instruction,

however, this is too abstract, unconnected from the practical surgical activity. Mastering the boundary can rather be used as a principle for directing the way in which learning surgeons watch the video-clips of an operation, or how they articulate the crucial elements and functionally relevant relations during a particular phase of an operation. For instance, several competing sketches of how to identify the correct place for cutting can be made jointly visible by writing them down on a wall. As our data shows, some surgeons rely on one or two signs for identification, while others infer the correct place for cutting by using several visual cues in the landscape. Based on these competing sketches, it is possible to outline a general initial orientation basis, to be elaborated further. An orientation basis should serve as an aid for thought or as a map to guide real task performances.

Internalisation. By interpreting a certain operation phase as seen in video-clips of many different operations in the light of the orientation basis formulated in the previous Step 2, learners both enrich the orientation basis and start using it. Through this process, some parts of the orientation basis gradually transform into the learners' internal mental model. Moreover, new elements and objectives need to be incorporated into it. For instance, simultaneously with identification and cutting, surgeons need to investigate the size and shape of the prostate. How this is done needs to be included in the orientation basis. One also has to identify some delicate tissues and avoid touching them. Moreover, a new technique, proved beneficial for patients' recovery, will radically change the conditions of identification. The orientation basis thus grows in complexity. There is a risk of drowning in a sea of endless details, and therefore the instructor continuously supports surgeons' articulation of general and functionally important features and elements. Moreover, by answering why-questions, learners connect the operation situation visible in the videos to the pre- and post-operation information of the patient. Use of patient records thus constitutes part of instruction, providing temporal sense for operative actions and making visible origins of phenomena or revealing information uncertainties. An evolving orientation basis can be represented in many ways and be used to create concrete practical guidelines. Elaboration of an orientation basis requires a great deal of work. As visual perception is central to this activity, the orientation basis could be built on a digital visual learning tool that surgeons themselves can continuously modify and enrich.

Externalisation. While previous steps take place in joint video-stimulated learning events, externalisation happens in the productive surgical activity. The main point of the orientation basis is to be able to look at the concrete specific surgical actions and environments, not as something sensually concrete, but as contextual, systemic knowledge of the object in question (Engeström, 1994, p. 93). In externalisation, surgeons consciously use the orientation basis in their operations for better structuring and judging the involved elements and actions.

The assumption is that the orientation basis would help see or induce some similarities between the situations, and that this, in turn, would yield improved decisions and actions in particular operations. In other words, an orientation basis is a vehicle that helps connect situations of particular patient operations to general systemic knowledge of oncological robotic surgery.

Critique and control. It is important to organise opportunities for surgeons to critically evaluate and control both their own learning and the evolving orientation basis. This can be done again by watching video-clips of critical operation situations and interpreting the actions in the light of the orientation basis. This is a two-way process: surgeons evaluate their operation situations with the orientation basis, and they critically evaluate its validity and usefulness on the basis of experience in its use. The orientation basis needs to be modified accordingly. If properly elaborated, it may offer criteria for quality control of robotic surgery in the hospital.

Discussion and conclusion

In this article of sketching developmental instruction for learning in robotic surgery, we started with the notion of theoretical-genetic thinking and its principle of ascending from the abstract to the concrete as possibilities to enhance learning to cope with complexity, uncertainty and technology-mediation in work. This, together with our attention to the surgeons' learning challenges in robotic operations, has informed us of how theoretical thinking could be developmentally instructed in robotic surgery.

The insights of this article will be examined and elaborated together with hospital surgeons and trainers. If successful, the learning method can in turn support professional education and training professionals in their work. The same principles, in our opinion, apply to vocational training as well.

Our argument, derived from the theory of theoretical generalisation, is that the learning method sketched here would deepen surgeons' learning, improve their learning abilities, help create both general and situational new knowledge and thus improve the quality of robotic operations and their outcomes. Our previous analyses have shown how surgeons' field of actions, directed by medical terms, is in reality ambiguous and uncertain. This requires constant interpretation of the micro-anatomic cues (Wahlström et al., submitted) and theoretical thinking. Professionals do also construct their orientation bases without external efforts of training or instruction. The method of theoretical thinking suggests that in the future, we analyse in detail how surgeons create and use orientation bases and theoretical generalizations by, for example, moving between features of particular cases and general knowledge. In practice, developmental instruction may require close collaboration between practitioners, HR developers and researchers (Virkkunen & Schaupp, 2011).

Alvunger and Adolfsson (2016), in introducing their critical dialogical model for vocational teacher education, emphasise the importance of enacting the interface between theory and practice in enhancing students' learning. The method presented in this article deals with the same interface, but in a different way: the aim is to build 'theory', through visualising and elaborating orientation bases, from complexities of practical work activities. The content of learning originates from the contents of activities people face in their work.

Our studies of robotic surgery suggest that the combination of patient record information showing dysfunctions or anomalies in the course of the operations, and collectively watching the corresponding real phases of operation situations as seen in the video-clips is a promising path for learning (Seppänen et al., 2017). Collective elaboration of an orientation basis as a dynamic model is a key feature in the proposed method. The use of videos, and digital means for learning by modelling, may offer new possibilities for developmental instruction that need to be investigated further.

Contentful theoretical thinking has two different directions: producing general, abstract understanding about dynamic interrelations within a phenomenon, and flexibly tailoring good solutions for each particular work situation. The latter is particularly important in the clinical work of hospitals and surgery. The methodology of self-confrontations used in our study can contribute to theoretical thinking by highlighting 'generalisation downwards' and seeing one's own and collective work activities in new ways. The challenge now, from the perspective of theoretical thinking, is to make orientation bases collectively visible, evaluate them in terms of their ability to help with concrete problematic situations in robotic operations, and to constantly develop them. We assume that a common orientation basis which is able to extract relevant features and relations within complex activities co-evolves with professionals' learning of theoretical thinking. Here we have initially outlined some ideas on how this might proceed. Possibilities for such a process need to be tried out in practice.

Endnote

[1] Here, Pihlaja (2005) refers to Marton, F. (2000). Variatio est mater studiorum. *Magyar Pedagógica, 100*(2), 127–140.

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'Hinged' activity systems: Expanding the utility of activity theory

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Abstract

As a derivative from Cultural Historical Activity Theory (CHAT), where gaining insight into the circumstances of an activity is among its applications, this article presents an approach to initiating and structuring activity system guided conversation where the intent is to strengthen stakeholder empathy and partnership in action. Whilst this paper is not, in-itself, an outcome of so-focused research, it is a sharing of insights accruing from ethnographic research largely in the vocational education and training (VET) arena and, in particular, on-going exploration of the circumstances aiding and inhibiting Australian VET teachers including researching and drawing upon the research of others as part of their professional practice.

In essence, this article posits that activity system – as derived from CHAT – guided conversation has much utility in achieving empathetic partnerships between stakeholders in an activity where their respective interests might otherwise be in conflict. Accordingly, the notion of the 'Hinge' is offered as a device to expand the utility of Activity Theory. The 'Hinge' being constructed by conversation agreeing the 'Object', which is the most influencing of 'Rule', 'Community' or 'Division of Labour' and then the nature of enabling 'Tool'.

Keywords: activity theory, activity system, conversation, partnership, vocational education and training, scholarly

Introduction

This offering is motivated by experience that some (if not much) social research has lesser outcomes than would otherwise be the case consequent upon subtle nuances of insights going un-noticed and/or not acted upon. And, in the case of Vocational Education and Training (VET) in Australia, this is particularly the case in respect of VET teachers who are not routinely awakened to research of interest to them, but have latent interest which, if acted upon, would expand their capability (Hughes, 2000) – noting that *latent interest* is a nuance of not engaging. With this in mind, and informed by experience, engaging stakeholders in research in such a manner that they are motivated to act upon research outcomes (having ownership and commitment to act) is advocated. Also, doing so in such a way that stakeholders (in the instance of this article – especially VET teachers) have empathy for the interests of other actors has much merit. Accordingly, I make this offering of a 'hinged' approach to drawing upon an activity system guided conversation.

Largely, informed by research into nurturing the occurrence of Australian VET teachers researching and drawing upon the research of others, as a part of their professional practice (later referred to as *VET teachers and research*), this article is an overview of an activity system approach to initiating and sustaining conversation and commitment to action. The conversation being between stakeholders with common overall goal but differing purpose as relates to their immediate interests. For example, in VET delivery both a VET teacher and their department head have a common overall VET delivery goal, but the teacher is likely motivated by professional satisfaction as is connected to student learning outcomes. Whereas, the department head is likely – as an immediate satisfier – motivated by department sustainability which has connection to enrolments, retention and course completions. Clearly, these respective interests are entwined, but the individuals are differently motivated.

Motivation and the teacher as reflective practitioner

With motivation very much in mind, and prompted by emerging VET system interest in teachers as reflective practitioners in a *scholarly* (albeit fuzzy in meaning) sense, the notion of a teacher being *scholarly* – as associated with researching and reflectively drawing upon the research of others – generates debate. The seeming aversion by some VET teachers to '*going scholarly*' is potentially a barrier to partnership between teacher and manager in respect of teachers engaging 'in' (researching) and 'with' (drawing upon the research of others) research as a part of their professional practice. Accordingly, in the current *VET teacher and research* exploration, conversation between teacher and manager regarding the 'what', 'why', 'environment' and 'how' of teachers' research en-

gagement has much value in finding common ground regarding their respective valuing of research as strengthens VET delivery. And such purposeful conversation has been found to be aided by an approach which draws upon the conversation generating character of an activity system – i.e. bringing structure to the conversation, achieving empathy, and having in mind the quest for a 'tool' to be applied to achieving a mutually valued goal. Interestingly, in the current research, a VET manager convened a second meeting involving those speaking with teacher voice and those with management voice using the title '*Why do VET teachers not participate in research as an activity … or do they?*'. The ensuing discussion, points to an approach to establishing VET teacher *scholarly* communities by valuing current dispositions and encouragement to just-take-a-next-step. Such, being grounded in the agreement that VET teachers do, routinely, informally research; and, therefore, it is not such a leap to embrace – with 'tool' support – the notion of *being scholarly*.

Further, in the quest for enriched delivery of VET through teachers researching and drawing upon the research of others, it has emerged that there is (at least in instances amongst the early adopters such as those undertaking further studies) a perception that they have to be proactive in identifying and resourcing research projects with relevance to VET – i.e. a perception that management doesn't take the lead and the teacher has to argue their cause. The potential for conflict lies in teachers seeking professional growth and the appearance that management interests, primarily, lie in meeting department short term goals with little regard to teacher continuing professional development (CPD) and maintaining vocational currency.

The following extract comes from VET provider B first meeting/conversation – the outcome being an 'awakening' of the issue and an indication of a, to-come, purposeful conversation approach to stronger *scholarly* partnership between teachers and managers across the provider. Significantly, this conversation has the potential to lead to expanded conversation seeking resolution of the vexed matter of whether an Australian VET teacher is solely responsible for their professional development and vocational currency or is this shared with teacher, management and the system.

> Teacher 1: There is a bit of a disconnect there in terms of how those things [teachers undertaking research] come about. Because I have met two people in the last little while that have done international research projects. And one went to America looking at pipe fitting and the other one did a carpentry journeyman's type project... But they often come from the person themselves. So the teacher.... say Mary [pseudonym] decides that she wants to do a research project in some form of art and go to Paris and do a lot of things. So she will put through a proposal to management who then weigh up – oh yes we will let her go and do that. But it doesn't go the other way. Management don't come to the staff and say that 'We reckon there is going to be an opening in this area of STEM research. We want you to go and do a project looking at STEM research overseas'. So it doesn't go the other way. It always seems to have to come from the ground up rather that from the top saying 'We actually can see a reason for this research to happen.'

> Researcher: That is really helpful because that takes me to that second question – Is there a connection to the prevailing culture of the VET provider and/or the overall culture in VET? And what's in my mind then is that you are saying there is a dependence – as I understand what you are saying – on the teacher. Is there a partnership here?
>
> Management voice with a teacher orientation: Ownership also ... Does the trainer, or the VET person, buy into it? If he is told or she is told to go and do it rather than driving it?
>
> Researcher: OK... So what sort of culture would you require to nurture this partnership – Shared ownership ...?
>
> Teaching quality voice: Both ways, I suppose. It needs to be available to access and to be available so that both are aware of it – both the senior management are saying 'Yes, it's available' and the other one is coming up and defining – you know – whatever their research projects is going to be.
> Because they are both meeting in the middle. It's not one or the other.
>
> Manager: And I think that time is money. Um... there is no allowance in our sector ongoing that I can see in any role that values people getting industry currency and reporting back or investigating the appropriateness of new design. It's that the person who wants to do it has to be internally motivated ...
>
> Teaching quality voice: Yeh
>
> Manager: ... to drive it. Find funding ways to do it. Um... take on extra duties to get out of doing what they ... they have almost got to overfill their own cup [John (pseudonym) agreeing]. Whereas in other sectors – say higher ed. – there is an agreement that under that salary that twenty percent of the time will be spent on research whatever that looks like – and it is pretty loose sometimes.

Note that the VET system movement toward teachers *going scholarly*, without system up-front commitment to adequate support, potentially adds to the contradiction/tension between VET quality requirement of teacher CPD and maintaining vocational currency but not, seemingly, resourcing this. However, the experience, to date, is that activity system shaped conversation – when directed at constructing the 'Hinge' (as later addressed) – does reveal tensions and contradictions in a manner which builds empathy and a commitment to stakeholder partnership(s) in action – resolving contradictions and tensions.

VET in Australia and teachers researching as part of their professional practice

To put the forgoing in context, the following is a snapshot of VET in Australia as a non-compulsory education arena. In this space, a young person in their later years of secondary education can proceed to tertiary education (including a pathway from VET to university if they so seek) and adults, throughout life, can come and go as meets their changing *needs* and *wants* in the changing world of work.

At 2015:

- 4.5 million VET participants out of a working age (15–64 years) population of approximately 16.8 million people. (26.8% of working age Australians.) Note: Total population of Australia, at 2017, is approximately 24,623,000.
- 7.5% of VET students were apprentices and trainees undertaking off-the-job training.
- 92.5% of VET students were undertaking studies not connected to apprenticeship or traineeship.
- The fields of education include – Natural and physical sciences; Information technology; Engineering and related technologies; Architecture and building; Agriculture, environmental and related studies; Health; Education; Management and commerce; Society and culture; Creative arts; Food, hospitality and personal services.
- Australian Qualification Framework (AQF) enrolments – Graduate diploma – 2,500; Graduate certificate – 3,800; Bachelor degree (honours and pass) – 2,400; Advanced diploma – 70,100; Associate degree – 800; Diploma – 566,700; Certificate IV – 540,300; Certificate III – 1,000,700; Certificate II – 609,800; Certificate I – 212,500. The total for all AQF programme enrolments was slightly over 3.9 million with an additional 506,000 other programme enrolments not leading to an AQF qualification. (Source: NCVER, 2016 – Data was collected from 4,277 of the [then] 4,930 nationally registered training organisations [RTOs]).
    - Public RTOs – 42 (at 1. March, 2017. Source – Department of Education and Training, emailed advice)
    - Private RTOs – 4,594 (at 1. March, 2017. Source – Department of Education and Training, emailed advice)

In the above context of VET in Australia, contrary to acceptance that a Certificate IV in Training and Assessment is adequate teacher qualification, there is now movement toward nurturing *scholarly* practice by VET teachers as a step beyond, arguably, shallow training. In part, it may be that this is a remedial response to past inadequate delivery of the Certificate IV as alerted to by the Australian Skills Quality Authority (ASQA, 2017). However, more positively, the motivation could be an outcome from realisation that there is gain in overturning a commonly held mis-perception that VET is a second-best (compared to university) pathway to tertiary qualification. Accordingly, VET teachers being acknowledged as having expanded capability/scholarly attributes beyond initial training has merit; and this includes motivating and supporting teachers in researching and drawing upon research as part of their professional practice. For example, the recent establishment of the VET Practitioner Network (VPRN – www.vprn.edu.au) is one manifestation of acting upon the need for motiva-

tion and support of VET teachers as researchers. And it is in this context, as a founding VPRN partner and member, that I am pursuing two questions:

- Primary question – What motivates, aids and/or inhibits VET teachers in drawing upon research and, themselves, engaging in research – i.e. being a reflective practitioner?
- Secondary question – Does the process of 'hinging' activity systems strengthen conversation and increase the likelihood of co-operation between stakeholders?

Accordingly, what is here shared isn't an outcome of expansive deliberate research to date, but is an auto-ethnographic informed approach which others may find useful. The experience has been that an activity system guided conversation has much merit in constructing empathetic partnership between parties with different interests in achieving a common goal.

Auto-ethnographically drawing upon researching experience

In addition to the current *VET teacher and research* exploration, this article is informed by auto-ethnographic reflection upon previous research where the employment of activity systems enriched understanding and now, with benefit of hindsight, informed finding common ground conversation between stakeholding parties – i.e. agreeing validity of an object in activity system terms. Therefore, this article is not reporting upon specific targeted research findings, but is to do with an experienced approach (process) to generating mutual commitment to action and partnership in action – the article is an experience grounded theoretical offering.

'Arming' change and an introduction to the 'Hinge'

Whilst the Australian VET teacher engagement 'in' (researching) and 'with' (drawing upon) research is used for illustrative purposes, this is a sharing of a Cultural Historical Activity Theory (CHAT) approach with broad application in using conversation as a pathway to empathy and partnering in action between stakeholders with differing goals. In this *finding-common-ground* respect, the elements of an activity system present as a structure for scoping the matter and, in particular, revealing contradictions/tensions between the elements which may otherwise go un-said and, hence, not addressed, Also, what is here shared is an example of deliberate use of researching as a device to join contributing parties (co-researchers and themselves research subjects) in co-operative 'change' action. This, having connection to the prospect that the act of research-

ing has the potential to change the environment – consequent upon asking questions causing reflection by respondents, in concert, and *arming* change.

A word about *arming* change: Firstly, this is not to imply aggression. Rather it is to do with resourcing in the sense that where change involves the activity of people, it is their willingness and capacity (empowerment, competency, resourcing, etc.) to act which is at the core of change transition; and these are valued as arms in much the same way as would be the case in a military sense, but with inherent strength in mind more so than aggression. Accordingly, in this article, awakening, empathy and commitment building conversation are valued as an understanding and utilisation pathway to the arms (tools) of change.

With '*armed*' co-operative change action in mind, conversation between stakeholders is a powerful tool in initiatives such as action research as historically reviewed by McTaggart (1993), action learning as developed by Revans (1977) and the Change Laboratory as arising from Engeström's (1999) notions of expansive learning and now facilitated by the University of Helsinki, Center for Research on Activity, Development and Learning (CRADLE). And there are many other instances where crafted – structured with purpose – conversation has a place as a device in sharing stakeholder positions in such a way as goes beyond just understanding to building empathy, ensuring capacity, and mutual commitment to action/change.

In the foregoing 'structured with purpose' is very deliberately expressed. It is a significant outcome (thus far) of the *VET teacher and research* exploration, that the research having a clear VET purpose is very important. Both VET teachers and VET heads of department and other managers (when awakened to valuing research) are attracted to research which is unambiguously directed at resolving a known problem and/or exploring opportunity with clear connection to VET – e.g. strengthening VET pedagogical practices and being at the forefront of vocational matters. Whilst not denigrating the notion of discovery research (curiosity driven expanding the boundaries of knowledge), as associated with the university stream of tertiary education, there is an indication that the manner of focus upon purpose may be what sets research by VET teachers (to be encouraged) apart from university teachers/lecturers – noting that there is an escalating Australian trend toward non-university delivery of higher education and inherent concern about preserving what I style as **VETness**.

Whilst the *VET teacher and research* current exploration is coupled with work-in-progress researching the utility of the 'Hinge' and consideration of preserving **VETness**, this article is also informed by revisiting earlier research and experiences in an auto-ethnographic mode. In this regard – predating but significantly prompting the current *VET teacher and research* exploration – a '*You have got us all talking*' feedback from an interlocutor in the exploration of relationship between VET and strengthening social capital (Hughes & Hughes, 2013, p. 6) evidenced activity system utility in shaping and generating conversation in

such a way that stakeholders with differing – and maybe, initially, competing – interests can find common ground and engage in co-operative activity. The evidencing referred to here is that the feedback occurred following a group meeting in which conversation was generated by reference to the mediating elements of an activity system and the tensions/contradictions which do and/or may arise in the delivery of VET programmes where attention to the 'E' is in the mind of the teachers, but VET system valuing of the 'E' appears to have evaporated in favour of focus upon the 'T' (see Hughes, 2017).

The VET and Social Capital '*You have got us all talking*' feedback strongly resonates with an exchange between a teacher and a head of department during one of the, to-date, *VET teachers and research* conversations. In this conversation, common ground was found in respect of the example of an auto-mechanic teacher seeking to justify release from teaching so as to, temporarily, return to the workplace for maintaining vocational currency purposes which is a VET system requirement. However, VET system support for maintaining vocational currency is not routinely in place – giving rise to contradiction/tension in activity system terms. From the teacher's perspective, there was 'want', but from the head of department's perspective, the concern was that the temporary revisiting of an auto-servicing workplace would mostly involve *cups of tea with the blokes* and there would not be a tangible return to the VET department. However, there was a realisation that by shaping the release as a research project, the teacher had structure and the head of department would have a tangible research report which would then feed sharing within the teaching team. Interestingly, this conversation subsequently revealed to all that drawing upon research was a requirement for achieving department funding. And, accordingly, keeping-one's-job emerged as acknowledged motivation for teachers to include researching as part of their professional practice – hence, demonstrating merit in conversation directed at VET delivery wants, needs and opportunities as arise from constructing the 'hinge'.

In essence, the 'Hinge' approach is to abut interacting activity systems as derived from Cultural Historical Activity Theory (CHAT). Such activity systems are conventionally presented as pyramid shaped and associated through meshing of respective objects (Figure 1a) but in this article are represented as abutted in right-angle triangle representation (Figure 1b). In this 'hinged' case, the abutting being along an axis of Agreed Common Object, selecting/agreeing one of 'Rules', 'Community' or 'Division of Labour' as being the most influential environment element in pursuing the goal, and striving to develop a tool (broadly configured as an assembly of artefacts/tool) appropriate to attaining the goal. And the axis – being tool, agreed common object and one of 'rules', 'community' or division of labour – designated as the 'Hinge'.

Note that it is the conversation leading to constructing of the hinge which has value in finding common ground – not the 'Hinge' itself. For, example,

agreeing which of 'rule', 'community' or 'division of labour' should be at the pivot point (Figure 1b) does not make a difference to the utility of the activity system; however, the conversation reveals much and forges commitment to co-operatively act.

With stakeholders acting together in mind, generic extrapolation from Robert Mager's (1968) advice on scholarly teaching practice embedding a positive student attitude toward learning is useful.

Where are we going?
Why are we going?
How shall we get there?
How will we know we've arrived?

These questions have merit in constructing the 'hinge'; and this advice is applicable even in other than guiding scholarly teaching activity. With reference to Figure 2 (see later in the article), the first two questions are the 'what' and the 'why' respectively, the third relates to drawing upon and being responsive to the components of the environment – 'rule', 'community' and 'division of labour' and the 'tool', and the fourth finds its place in the 'tool'.

With respect to going *scholarly*, the *VET teachers and research* exploration, thus far, points to a teacher aversion to being thought of as scholarly; however, the term – *scholarly* – is newly arising in the Australian VET vocabulary. A quest now is for VET teachers to embrace the *scholarly* term, but in a VET way; accordingly, the Mager questions have mind-opening merit.

Viewing the above Mager (1968) questions as relevant to stakeholders acting (performing) in partnership, in addressing expanding the utility of activity theory, this offering has two audiences especially in mind. On the one hand there are those already drawing upon activity theory with varying purpose, but possibly not for generating conversation. And, on the other hand, there are those with an interest in generating purposeful conversation, but not having activity theory in mind.

Whilst the Australian VET teacher engagement 'in' (researching) and 'with' (drawing upon) research is used for illustrative purposes, this is a sharing of a CHAT approach with broad application in using conversation as a pathway to empathy and partnering in action between stakeholders with differing goals. In this *finding-common-ground* respect, the elements of an activity system present as a structure for scoping the matter and, in particular, revealing contradictions/tensions between the elements which may otherwise go un-said and, hence, not addressed. Also, what is here shared is an example of deliberate use of researching as a device to join contributing – to the research – parties in co-operative 'change' action.

The above said – prompted by the Northern Metropolitan Institute of TAFE, social capital focused, Centre of Excellence for Deaf and Hard of Hearing Students winning two Victorian State Training Awards – in exploring VET and Social Capital (Hughes & Hughes, 2011, 2012, 2013) I was especially awakened to the utility of consciously drawing upon conversation to construct the 'Hinge'. A further realisation is that I have been doing this since drawing upon Engeström's (2001) activity theory third generation approach to interacting activity systems in the course of exploration of the relationship between lifelong learning and organisational achievement (see Hughes, 2007, p. 239). In this respect I have, somewhat unconsciously, transitioned from the Engeström (2001) conceptualisation of interacting activity systems (Figure 1a) to a hinged approach (Figure 1b).

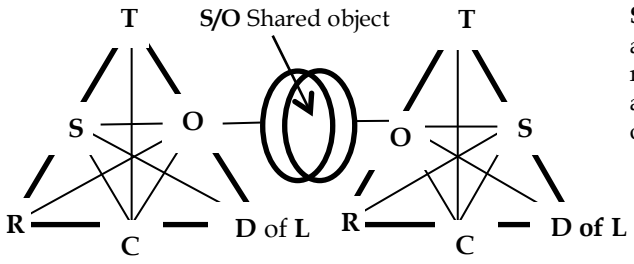

Figure 1a. Conventional portraying of 3rd generation Interacting activity systems (Engeström, 2001).

S – Subject
O – Object
S/O – Shared Object
R – Rules
C – Community
D of L – Division of Labour
T – Tool

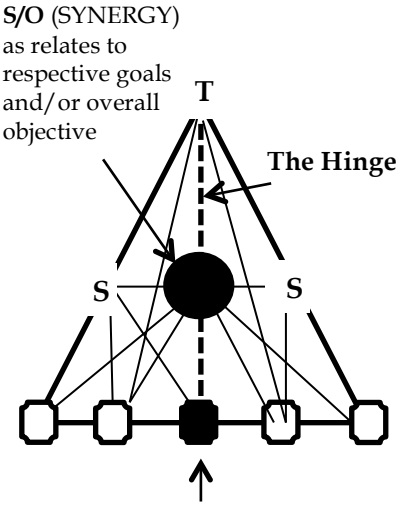

Figure 1b. 'Hinged' interacting activity systems (Hughes, 2007, p. 239).

Figure 1. Comparison of conventional to hinged interacting activity systems.

Consequent upon convening a VET and Social Capital conversation group, it was the '*You have got us all talking*' feedback which awakened Libby (co-researcher) and me to what had been subconsciously (tacitly known) in our minds regarding purposeful conversation, between parties with different goals (e.g. as in this instance – teachers seeking professional satisfaction as compared to managers seeking teaching department sustainability), but with common purpose in strengthening VET outcomes. Also, and highly relevant to the pro-

cess of finding common ground in circumstance of tension between stakeholders, these conversations were occurring in a context where it was known, by all, that some of the interlocutors would not have employment contracts renewed. However, there was strengthened commitment to partnering action notwithstanding job security anxieties and teaching department sustainability. In essence, there was gain to both parties (even though some would be moving on to other employment) in sharing a goal of VET students graduating with social capital attributes such as desire to actually draw upon what they know and can do in ways which add to social cohesion in the workplace and the wider community. Such graduating students being lifelong learners progressively expanding personal capability in the changing world of work and society. With this in mind, there is intersection between professional satisfaction by teachers and pride in department outcome by managers – activity system shaped conversation between these parties strengthens this intersection.

Curiously, why was it so that a human capital (people as commodities) focused VET system so recognised and applauded a social capital (pride and cohesion in society) grounded VET initiative? It is this question which prompted and shaped inquiry – spanning three years – in which partnership between teacher, student and community – in an activity system division of labour sense – emerged as entwined with enriching social capital (Hughes & Hughes, 2011, 2012, 2013). This is but one example of conversation vitality which has arisen through use of an activity system framework as a conversation generator.

Again with the benefit of hindsight, life's experience which informed advocating learning partnerships as a strategy for quality exemplar VET providers were made explicit through the prism of activity theory; and an activity system framework shared as an approach to convening and sustaining VET learning Partnerships (Hughes, 2011, p. 14).

Activity systems as framework for conversation

It is with the power of '*You have got us all talking*' conversation in mind that my earlier drawings upon CHAT (activity theory) for the purpose of understanding the 'why', the 'what', and the 'how' of a particular activity has been revisited with a view to the influence of conversation. From this, there is an arising notion of forging stakeholder commonality with respect to valuing the 'what' (Object) of an activity, interrogating the environment (Rules, Community and Division of Labour) of an activity with a view to developing and drawing upon a tool(s) to support action – see Figure 1 in which some familiarity of an activity system is assumed.

However, for those new to activity theory the Leont'ev (1981) illustration of the collective hunt is helpful. In this example (with some embellishment by me), a primitive tribal group is hunting an animal for meat and pelt. The hunting

party (the subject) are using a division of labour with some of the tribe acting as beaters forcing the animal (the object) toward others lying in wait, above a ravine, to kill by throwing rocks (the tool) – noting that it could be argued that the ravine is also a component of the tool as is (by way of further example) the motivation to hunt the quarry and form a partnership in doing so). There are rules which apply to who does what and how the carcass is drawn upon. And, in addition to the hunting party being of-itself a community, the totality of the tribe is the stakeholding community for which killing of the animal has survival implications. To reflect upon the potential for one element mediating upon another – consider the possible implications if a rifle was available to one member of the tribe. As an example of changing one thing brings about other changes, in the case of my Country Fire Authority (CFA) research the changing demographic of rural communities (population declining) necessitates a shift from the informal rule that men fight the fires and women contribute off the fire ground – women are now welcomed as firefighters and aspects of the environment (equipment, fireground culture, etc.) are modified to suit.

Further, for those who are not familiar with activity systems and CHAT which informs their construction, in addition to the companion articles in this edition of NJVET, Daniels, Edwards, Engeström, Gallagher, and Ludvigsen (2010), and Engeström, Miettinen, and Punamaki (1999), are useful sources of discovery along with Daniels, Cole, and Wertsch (2007) which provides insight into the work and thinking of Vygotsky, the early 20th century Russian psychologist from whom the representation of activity systems has evolved. In respect of myself, it was highly fortuitous that I was introduced to CHAT and activity systems in the course of my Deakin University PhD Candidacy; and this became the prism though which I viewed data arising from my research into the relationship between lifelong learning and organisational achievement and evolved into the framework of inquiry for much of my subsequent explorations.

Now, and much with the benefit of hindsight, I recognise that my ethnographic use of conversation, and practice of engaging research subjects in such a way as to lay the groundwork for action, is largely drawing upon the power of conversation to open the window to understanding and setting stakeholders (contributing to the research) along the pathway of action. Accordingly, Figure 2 displays the activity system showing connection between the elements – with mediating and contradiction/tension potentialities – overlaid with the conversation foci of 'why', 'what', 'environment' and 'how'.

Interestingly, in the case of the *VET teacher and research* current explorations, I have found that conversation is best started by raising the issue *whether or not a teacher should engage 'in' and/or 'with' research* prior to guiding the conversation toward **why**? Because asking 'why?' is an assumption that all agree that VET teachers should engage 'in' and 'with' research (the object), my experience is

that richer conversation arises by inviting conversations upon the '**what**' as teachers and other interlocutors don't initially recognise the wider picture of community good – they tend to focus upon the 'self' and a subsequent wider view emerges from this when prompted. And this raises in my mind that, depending upon what has prompted conversation and 'the who' as interlocutors, conversation might commence at any of the four foci with a quick return to the 1, 2, 3, 4 sequence. For example, a conversation could begin with questioning an established tool such as the validity of an acceptable (VET system specified) particular entry level training for VET teachers and, then, grounded by this initial conversation, questioning the 'Why' and moving on to modification (maybe) of the tool.

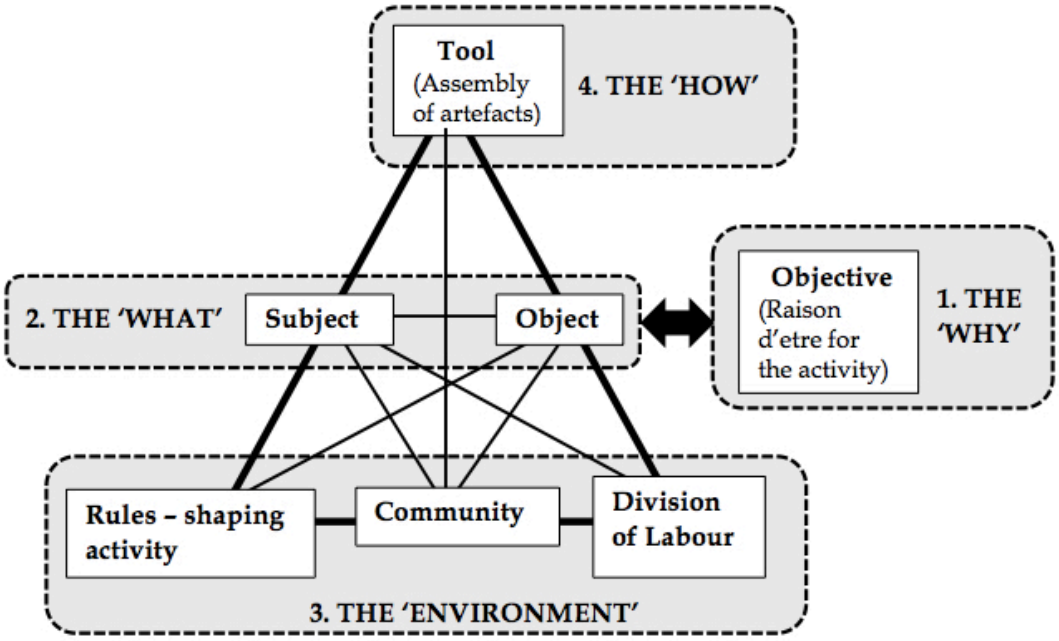

Figure 2. Conversation components of an activity system (modified from Engeström, 2015).

Again, to assist readers new to activity theory – drawing upon the Leont'ev (1981) use of a primitive hunting party example, in Figure 2:

- the 'Why' of the activity of hunting an animal is to do with survival in that the flesh of the animal yields food and the pelt can be shaped to clothing for warmth and protection from the rain;

- the 'What' of the activity is the hunting party (Subject) and killing of the animal (Object);
- the 'Environment' is to do with the rules which determine matters such as who gets what part of the animal and when, the community involved and being served by the activity of hunting, and the division of labour (partnership) installed for the purpose of hunting;
- the 'How' is the assembly of tools (various artefacts) employed in the hunt – whilst rocks are a significant part of the tool, motivation, competency and empowerment are examples of other 'capability/capacity' inclusions.

Continuing with the hunting party theme, it may be that the tribe in question is competing for survival with a neighbouring tribe under circumstances of diminishing game availability. Under these circumstances of depleted animals-to-hunt, an influential peace-maker may emerge and the tribes achieve survival co-operation through – for example – co-operating in hunting larger or more wary animals (hitherto beyond the manpower capacity of one tribe and/or necessarily evolve beyond the hunter-gather mode so as sustain both tribes rather than embrace the risk of conflict leading to mutual destruction – i.e. there is change in specification of the object arising from seeking *cooperation rather than conflict* consideration of two interacting tribal activity systems.

With co-operations in mind, the *VET teachers and research* conversations have been marked by entwining the 'What' and the 'Why'. In this respect, the requirement for having-purpose is a recurring theme and exampled by teachers seeking a period of release from teaching duties to return to the workplace for vocational currency reasons, but not having a clear plan which causes the department head to have uncertainty in giving approval. Structuring the release to the workplace as a research project with clear purpose overcomes this uncertainty for the department head and the teacher has focus on what is to be tangibly returned to VET. Importantly, this also yields a device for sharing/engaging with colleagues and an abiding record.

The 'Hinge'

Figure 3 is a representation of two interacting activity systems represented as right angle triangles rather than the conventional pyramid shaped triangles. Such a representation doesn't change the mediating linkages within an activity system; rather, it facilitates showing the coupling along the Pivot Point, Agreed Object and Tool(s) hinge where the 'What' and the 'Why' of the activity are at the core of finding 'Agreed Object'.

Using VET teachers and research as an example, one activity system (say, the left) has teachers as the Subject in the 'What' arena (noting that this is where conversation may mostly begin). And a second (say, the right) activity system

has teaching department heads as the subject. In each system – by agreement – the Object of teachers engaging 'in' and 'with' research as part of their professional practice remains the same, but the nuances of their respective interests are different. For example, a teacher may have passion and commitment and/or job security as their prime focus; whereas, a department head may have enrolment numbers, retention and completions as performance-criteria imperatives. Consider, what might this look like from the student's perspective as the Subject (of a third 'hinged' activity system), and the teacher as researcher - being the Object in the activity system – remaining the same? Note that my exploration of the teacher as a researcher has not – thus far – included students in the conversations.

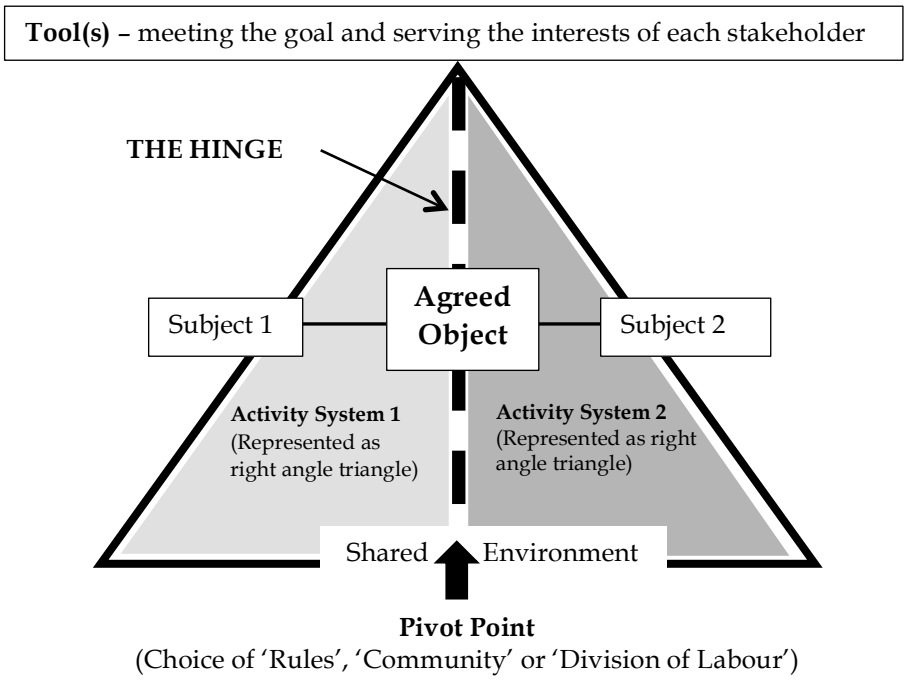

Figure 3. Hinged activity systems (an instance or two but there could be more).

Considering the 'What', the 'Why' and the 'Agreed Object'

Maybe as a consequence of VET in Australia languishing as second-best compared to university education, it is revealing that generally the VET teacher and research conversations searching for 'Agreed Object' did not quickly turn to broad community good as being 'Why & What' connected. Rather, the interlocutors focused upon VET provider outcomes driven by teacher concerns regarding job security and provider survival/sustainability in the Australian *competing for government funding* environment.

In the foregoing respects (job security and organisational survival), the casualisation of the Australian VET teacher workforce is a factor to be considered – i.e. does – or should – a casual teacher have the same level of professional commitment as might be expected of a longer-term contracted teacher? This question is put in acknowledgement of a possibility that casualisation distances a teacher from professional commitment. With this in mind, including casual teachers in the *VET teachers and research*, hinge constructing, conversation beckons. Interestingly, and encouragingly so, one of the responding VET providers spoke of their practice of encouraging casual teachers to wear clothing displaying the provider logo – i.e. identifying with being part of the teaching community.

In the course of the conversations informing this article, the prospect arose of drawing upon recipients of travelling scholarships as ambassadors for VET teachers as researchers. It was evident that where such a recipient shared their experience with others there was an awakening of interest – not necessarily involving overseas travel – by others. This gives rise to the prospect of conversation between those who do research and those who don't being a powerful device in bringing teachers to the point of valuing being a member of an overtly valued scholarly community – casual teachers included. Whilst this might be said to be obvious, it also emerged in conversations that even staff teachers – consequent upon workloads – are losing contact with one another and, maybe, sharing of researching (including informal) experiences is a vehicle for reconnecting teachers and other VET practitioners. Being mindful of constructing the 'Hinge' will give strengthening (purposeful) structure to such sharing conversations.

Arising from the 'Hinged' conversations, although it could be argued that casualisation of the VET teaching workforce has the possibility of addressing maintaining vocational currency, on the negative side there is the possibility of reduction in commitment and attention to the 'E' as contributing to VET graduate social capital attributes. Accordingly, the prospect (but not necessarily so) of diminished attention to social capital strengthening consequent upon teacher casualisation has connection to my and Libby's (Hughes & Hughes, 2011, 2012, 2013) exploration of the relationship between VET, **when well taught** and strengthened social capital as a missing link in the productivity debate (Svendsen & Svendsen, 2004. p. 2). Also, noting that our VET and Social Capital research has substantially informed advocating the '*hinge*' approach, it was not surprising that the conversations between teachers and managers gravitated to common ground regarding the role of an '*educationalist*' VET teacher. Noting that in our mind, an '*educationalist*' VET teacher is one who facilitates learning beyond just attention to knowledge and skill – i.e. valuing the 'E' in VET.

Considering the Environment and selection of 'Pivot Point'

Both teachers and their department heads function in a common overall environment as embracing rules, community and division of labour. However, there are nuances of difference. For example, teachers are closer connected to students than is the case for department heads; and department heads are closer connected to governing authorities such as those who allocate funding. Accordingly, initiating discussion regarding which of 'Rules', Community' or 'Division of Labour' is most important, with respect to the 'Agreed Object', gives rich insight as to contradictions/tensions and opportunities – e.g. vocational currency being required but no provision for how this is to be achieved. It is the discussion about the environment which generates shared insights and feelings informing, empathetic, partnering action. Noting that, in activity system terms, the actual choice does not affect the relationships as all relationships, within an activity system, link each to the other. However, this said, the choice is nominated as the Pivot Point and serves as a reminder of the insights from the conversations and where emphasis beckons.

In the case of *VET teachers and research*, thus far it is the division of labour between the teacher and provider which has been identified by all as being at the Pivot Point. This reflects a feeling that continuing professional development and maintaining vocational (technical field) currency is a shared responsibility between the teacher and the VET system – engaging 'in' and 'with' research being connected to this. This is not to downplay the significance/impact of rules and the respect and engagement with communities as variously apply, but is identification of a special point of emphasis.

Considering the 'How' – tool – as is the enabler of sought outcome

Throughout the conversation, the attention is very much on two things. Firstly, the Object as in this example instance – VET teachers researching and drawing upon the research of others – and, secondly, the means of motivating and supporting this. Accordingly, the conversation – although somewhat free flowing – is guided toward construction of a tool (broadly meant) and employment of this tool as is appropriate to the activity of addressing the object.

Thus far in the *VET teacher and research* conversations, sharing of views regarding 'need' and 'want' have been entwined with 'how'. Accordingly, as this is work-in-progress, the development of a 'tool' is likely to be more confirmation (progressively emerging from conversation) than discovery (Eureka!) orientated. Potentially, this is important as the quest for a taking-action partnership is embedded in the rationale of the conversation(s) and what emerges over time – shared ownership of the tool is strongly connected to commitment to use the tool.

Consequent upon the *VET teacher and research* focus entwining valuing lifelong learning acquired knowledge of the teacher and VET system achievement, the LCM Achievement Model (Hughes, 2007) is a logical offering for potential inclusion in the assembly of artefacts comprising the 'Tool' – see Figure 4. Accordingly, accruing insights are matched against this potential tool as an inclusion in a broader assembly of artefacts.

In overview the LCM Achievement Model – drawing upon the outcomes from lifelong learning for organisational (broadly defined) achievement purposes – is illustrated in Figure 4. And it should be noted that this model is offered as a potential inclusion in an assembly of tools/artefacts where drawing upon what people know and can do has a place – i.e. it does not necessarily follow that the model is always an inclusion in taking action or that it stands alone. It should also be noted that exploration of *VET teachers and research* is a work in-progress and, although there are grounds for anticipating a place for the LCM Achievement Model, its inclusion (here) in establishing the 'Hinge' is more of an inclusion in structuring-conversation device than it is, presently, a confirmation of place.

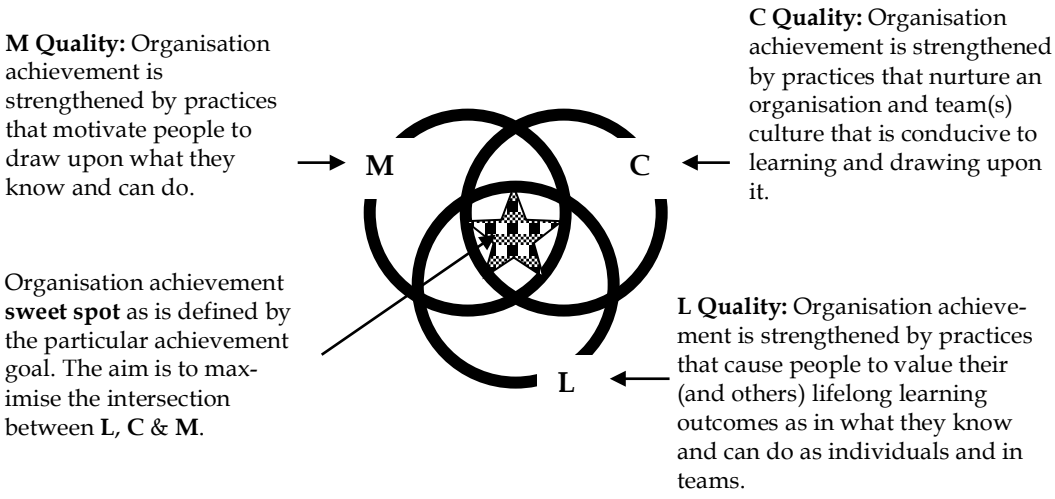

Figure 4. LCM Achievement Model © (Hughes, 2007).

The LCM Achievement Model arises from my Deakin PhD candidacy research into the relationship between lifelong learning and organisational (broadly defined – e.g. could be read as community) achievement. Principal among the arenas of inquiry, retaining Country Fire Authority (CFA) of Victoria volunteers was the object with community safety as the objective. And in this instance, although not at the time as consciously alert to the notion of a '*hinge*' as is now the case, the retention of volunteer firefighters was found to be strongly linked to

bonding connection between two activity systems as illustrated in Hughes (2007, Figure 10.3, p. 239) – showing:

- On the one hand – an activity system from the volunteer's perspective as to why they joined and remained.
- And on the other hand – an activity system from the brigade's perspective as to why the brigade sought to retain the volunteer as a member.

In essence, this bonding is encapsulated in the sentiment '*I found a family*' variously articulated by CFA volunteers. This has some resonance with the practice of one of the VET teachers and research locations of inquiry providing all teachers – importantly, including casual teachers – with provider logo displaying clothing as a contribution toward identification with this VET provider family.

In the case of the *VET teacher and research,* drawing upon the LCM Achievement Model:

- begins with specifying the **Sweet Spot** as ***VET teachers engaging 'in' and 'with' research as part of their professional practice***. This is the **Agreed Object** in Figure 3 and directly connects the tool with the object of the activity system; and then
- the '**L**' is VET teachers valuing what they know and can do as an outcome from their lifelong learning (no matter what the source and as a continuing occurrence – including researching) and valuing this in others. Engaging 'in' and 'with' research is clearly attached to valuing learning and its outcomes in the case of partnership between VET stakeholders, this is a reciprocating of valuing process and, in which, the teacher engaging 'in' and 'with' research has much connection;
- the '**C**' is having in place an environment which culturally nurtures the 'L' and empowers with respect to a person acting;
- the '**M**' is identifying, enriching and appropriately respecting the motivations which, variously, energise pursuit of the Sweet Spot – noting that, whilst in this case the focus is upon teachers, others (with their motivations) are also active in the milieu of activity.

As cautionary put, the LCM Achievement Model is not offered as an assumed device or a stand-alone tool. Clearly, resources such as appropriate funding and allocation of time are likely inclusions in an assembly of tools/artefacts. However, the notion of the '*Hinge*', which includes the LCM Achievement Model, is grounded in a position –

- that there is merit in stakeholders, with differing interests, finding common ground; and

- that conversation leading to empathy and commitment to act in partnership is a pathway to achievement.

Accordingly, in addition to use as a taking-action tool to be drawn upon by stakeholders in division of labour partnership, drawing upon the LCM Achievement Model as an inclusion in structuring conversation and mining data is helpful. In these respects, in the initial phases of conversation, care is taken to avoid directing conversation to fit the model. Rather, in the beginning, the conversation is directed at yielding insights which evidence efficacy in drawing upon the LCM Achievement Model. And, then, only later is there directed attention to the 'L', the 'C' and the 'M' – this later providing the opportunity for triangulation against what emerges in general conversation against what is said in response to specific questioning.

Although much in mind, I have not in this paper raised the matter of getting stakeholders to the conversation table. Of course, this is a precursor to constructing the '*Hinge*' and can present difficulty. For example, in the *VET teacher and research* case, there was an instance of a teacher questioning whether as 'just a teacher without researching experience' (paraphrasing) they would be welcome to participate in conversation with more senior, and experienced, others. Likewise, there were other instances of reluctance to participate such as 'I haven't got the time' and 'I don't have an interest' – across the spectrum of potential interlocutors. Accordingly, I offer the LCM Achievement Model as having utility as a recruiting to the conversation tool. This initiated by specifying the **Sweet Spot** as '***Recruiting stakeholders to the conversation***'.

Although there may be constructing 'the arising tool' instances where the LCM Achievement Model does not have a place, experience to date is that it has conversation utility in fleshing out the properties of an appropriate tool – the utility being grounded in the logic of the model and specifying the **Sweet Spot** as describing the sought goal. Noting that the sought goal is likely to be a step toward achieving a larger objective – e.g. the goal of VET teachers researching and drawing upon the research of others is a step toward stronger community and economic productivity.

Hinging multiple – beyond two – activity systems

Whilst Figure 3 is a representation of '*hinging*' two interacting activity systems, the opportunity for hinging as a device to encourage and support VET teacher research conversation extends to multiple systems as shown in Figure 5.

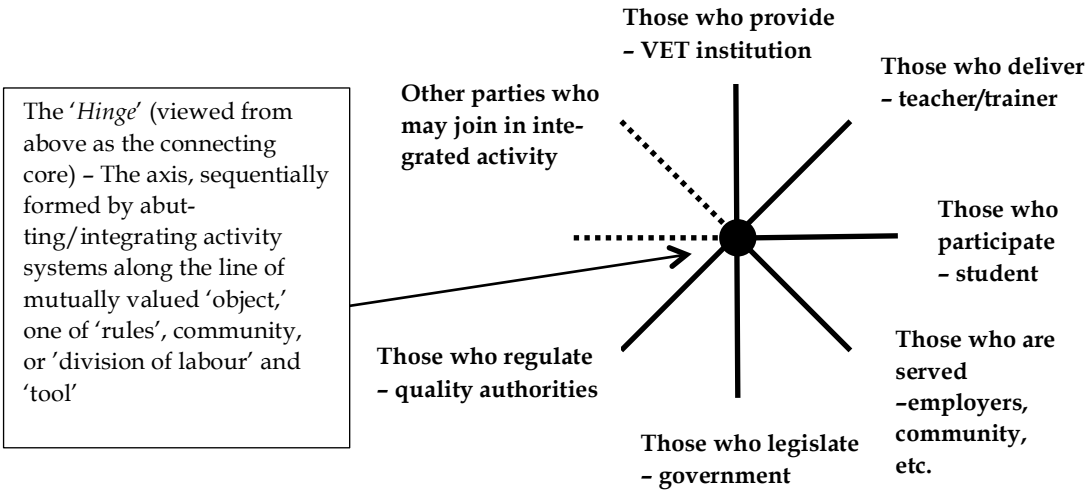

Figure 5. Helicopter view of interacting activity systems as might apply in the VET teacher and research instance.

In bringing about, and sustaining, a circumstance where VET teachers engage in research and draw upon the research of others as part of their professional practice, there are many stakeholders – as exampled in Figure 5. Variously, these stakeholders will have different interests and differing levels of direct engagement with teachers; however, the potential is there to include them in the conversation in some way – noting that there is, likely, a limit to the number of effective interlocutors at any one time – foreshadowing a research question along the lines of '*What is the optimum number of interlocutors, and diversity of stakeholding, in a "hinged" conversation?*' Having in mind, by grouping, the prospect of '*hinging*' multiple hinged conversations to accommodate large and complex assemblies of interlocutors.

In raising the question of 'How many?', it is in mind that even though conversation groupings are identified, there are groups within groups and each person within a group has individual stakeholding and motivations. Accordingly, Figure 5 could include activity systems for teachers predisposed to being researchers, teachers with neutral positions, and teachers actively opposed to including research as some part of their professional practice. And, similarly, in the VET provider category there could be separate activity systems for those who are not dual sector (VET and Higher Education) providers, and those who are dual sector providers – noting that there is a trend for non-university higher education providers to emerge in Australia.

Review of the 'Hinge' rationale

Whilst action research, action learning and Change Laboratory are instances of extended periods of conversation which inform and motivate action, there are potentially many occasions where the opportunity and/or need for forging an empathetic relationship is much briefer – the purpose being to quickly get to a point where there is acknowledgement of much to be gained by stakeholding parties, with different goals, finding common ground. For example, the initial bringing together of VET managers and teachers to find common ground through sharing views regarding VET teachers incorporating researching and drawing upon research as some part of their professional practice – a marked change – is a short period activity of an hour or so. Noting that to achieve empathetic *seeing-things-from-the-other's-perspective*, in a short time, the conversation requires focus – and '*hinging*' the conversation has much utility in this respect.

Whilst activity system framed conversation has 'immediacy' utility as above, this approach has application – as an extension of the utility of activity theory – over extended periods of time. In essence, employing the 'Hinge' is a strategy to focus on-going partnership conversation upon the 'What', the 'Why' and the 'How' of an activity in the context of the 'Environment' of the activity as comprised of rules, community, and division of labour. In this way construction of the 'Hinge' is offered for consideration as a way to extend the utility of activity theory. Where the need and/or opportunity exist to bring stakeholders into partnership, empathy and commitment building conversation has much merit.

Notes on contributor

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