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Interpretive reflection in robotic surgery – can digital technologies enhance its learning?

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1. Introduction: The need for work-based reflection in the era of digitalisation and globalisation

Globalisation, the need for customized products, and the continued penetration of new technology set a context where change rather than the stability is the norm, and where skills, competencies and work processes are constantly changed or re-valued (Cressey,Boud & Docherty, 2006,chapter 2). These authors argue about a shift of emphasis from the "organisational learning" in the 1990s to the "productive reflection" where the key need is the managing of complexity and ambiguity, and learning is contextualised in the workplace rather than defined within an enterprise (ibid). The success of productive reflection is in the ways in which it is contextualised and embedded in everyday work within organisations. The demands on contemporary professional work for greater accountability and for more effective knowledge creation and diffusion are stimulating an emergence of a new form of community, a collaborative community (Adler et al., 2008, p. 365). Collaborative communities have social structures that support horizontal coordination of interdependent work practices, they design and use procedures collaboratively, and they increasingly embrace peers from multiple professions (Adler, 2008, p. 366). Features of collaborative community are emerging even in such high-status professions and organizations as physicians and hospitals. We argue that new kind of reflective organisational practices are needed for enhancing collaborative communities across work organisations and networks.

In work, we need knowledge of a kind that can be constructedonly within the work process (Norros & Nuutinen, 2002). Following Polanyi's concept of the 'tacit dimension', knowledge is reintepreted as a form of knowing, as a dimension of practice which is not identical with all the knowledge we can verbally express. The tacit is not only part of practical skills, but also of every act of thinking itseld and consequently in every activity of learning and knowledge creation. Knowledge, as used by people, does not come divided into 'practical' or 'theoretical' (Molander, ref in Langemeyer 2012, p. 6). The terms implicit and explicit introduce a meaningful distinction only within the theoretical knowledge tradition. Due to this background, we also conceive competence, qualification and skill in an objectified and reified way where the worker is reduced to a means of transportation – what is hidden in this paradigm is not some kind of knowledge, but in fact the 'knowing worker'. Knowing, presence of awareness cannot be identified with ready-made bodies of knowledge which exist in an objectified form. It is rather an expression of a linving person, namely the exertion of psychic forces within a work process which existis only in a subjective form (Langemeyer 2012, 6). p 6: Societal shift, related to the broad use of high technologies implies that expertise, competence and knowledge development grounds in new ways of learning *integral* to work practice. Langemeyer suggests to view the role of science in terms of the psychic quality of scientific thinking, from the standpoint of the 'knowing worker'. 'Scientification of work' stands for a different type of social exchange and labout which challenges the intellectual side of work to cope with objects of work that are only partially present as concrete sensual objects.

Scientificated ways of working need to be developed when the subjects of work face an increased process-complexity and when objects of work increasingly resemble scientific objects of study. This kind of work requres vigilance, a keen mind, learning and reflection in the social construction of these objects. The quality of 'awareness' or 'presence' to these dimensions of work depends not only on practical or methodical skills to process information but also on the socially shared strategies to collectively interpret the work process as a whole and a certain situation with respect to what 'needs to be done'. Langemeyer 2012 p 8.

The broad definition of productive reflection by Boud and his colleagues has following characteristics: it leads to action, its outcome can be applied to a real situation linked with production or service work, and it also includes a wider learning enabling personnel to be active players in work and learning beyond their immediate situation. Learning as reflection is also connected to reflexivity which implies a turning back to look at oneself and events rather than simply proceeding with action, and a new form of embedded problem solving (Cressey et al 2006, Hasu et al, 2012; Schulz et al., 2015). Besides benefits for productive work, reflection contributes to employee sense-making and development. The notion of productive reflection has similarity to Samurçay and Rabardel's (2004) notion of constructive activity at work, as contrasted with productive activity. The aim of productive activity is to succeed with the desired outcomes of work, whereas the aim of constructive activity, or learning, is to increase the capability, either as a skill or knowledge, to perform the productive activity better. Productive reflection, we assume, requires a dialogue between productive and constructive activity.

The kind of productive reflection looked for by Boud et al. (2006) can be understood and enhanced with how reflection has been studied and promoted in cultural-historical educational psychology. Nelissen and Tomic (1996) offer a nice account of reflection in this approach. Aldready Kant (1781/1965) thought that knowledge cannot be created from sensory input alone, but requires certain preexisting categories according to which this material is organized. For Hegel (1807-1952), theoretical thought focuses, besides objects, also on the processes of thinking, and reflection means knowing one's own thought activities. According to Vygotsky, reflection evolves from participation in socio-cultural practices. In dialogues with others, humans are confronted with criticisms of their own ideas, and anticipating the comments of another can lead to a critical dialogue with oneself. Here, reflection is internalized dialogue (Nelissen & Tomic, 1996, p. 38).

Vygotsky explains the evolution of reflection as a characteristic way in which scientific concepts are constructed. Rather than academic science, Wardekker (1998) and many other scholars interpret that for Vygotsky, scientific did not mean the term in a universal sense, but as outcomes that were developed and are in use within the professional practice of (Western) science. The meaning of concepts does not rest on the "objective" qualities of the outside world, but on the social activities in which they are developed (Ilyenkov 1977, cited in Wardekker, 1998). Having a concept means understanding the essence of a phenomenon, and this essence is the role the phenomenon (or object) plays in human activities – this is a core of a theoretical thinking or generalization (Ilyenkov 1977; Davydov 1990; Schaupp & Virkkunen, submitted). Scientific or theoretical concepts reveal a deeper understanding about the connection between the object and activity. Such concepts are a result of humans' reflective processes, and, because of their reflective nature, using and learning to use them leads to discussion and reflection (Wardekker 1998).

The context of this paper is how a develomental intervention method of crossed self-confrontations, developed in France (Clot 2011, Kloetzer et al.,2014), was applied in Finnish hospital work, namely in robotic surgery. The use of a robot has considerably changed the surgical work by making it more collective and by radically changing the conditions of perception, as compared to open surgery. The introduction of the robot has reorganized the surgical activity, and the organizational transformation may continue as technologies and knowledge about the relationship of robot-assisted surgical practices to microanatomy, physiology and oncology advance.

Theory. Our assumption is that a particular way of relating to environment, called interpretive way of working, is particularly important for dealing with complexity and uncertainty, prevalent in digitalized and globalizing work (Wahlström et al 2014). Interpretiveness, having its origin in Peircean pragmatism, is characterised by people expressing presence in the particular situation – that means observing specific features and anomalies of the situation, building hypotheses of their meaning, and accumulating comprehension of the situation and future events (Norros, 2012). Reflection and collaboration are essentially included in interpretive way of working. The implication of this notion for a new organisational practice is that the learning method should encourage people to reflect and interpret concepts as elements to be used in co-reconstruction of practices (Wardekker 1998).

I argue that interpretive way of working can potentially be enhanced by the Vygotskian principle of double stimulation. Briefly said, double stimulation means that for a problem to be solved or to be made sense of, an external and auxiliary means is created to manage it. The problem to be solved is a first stimulus, and the auxiliary means is a second stimulus or stimuli-sign that gives a new understanding or meaning to the first stimulus. Tying a knot for remembering something is a classical example of a sencond stimulus. Double stimulation is increasingly used in empirical studies in education and elsewhere, and in it, voluntary action (or volition) and conflictual aspects play an important role (Sannino, 2015).

While interpretive practice and reflection, needed in complex work, require situational judgement within work (as contextualised in the workplace (Cressey, Boud & Docherty, 2006)), how can they be enhanced by information and communication technologies? The aim of the presentation is, first, to describe and analyse the interpretive way of working in robotic surgery, and based on it, to discuss the technological possibilities for enhancing interpretive practice as digitally enhanced co-creation of value.

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