

Towards Computer Support for Collaborative Learning at Work: Six Requirements

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Abstract

Instead of being an isolated activity reserved for classroom settings, learning is nowadays thought to be a central part of productive working activity. The growing use of information technology at work is a potential resource to support these - often collaborative - learning needs. However, it might be beneficial not to restrict support for collaborative learning at work to the same modes as in schools. To find out some suggestions how collaborative learning might be supported in working environments, some elements of learning are discussed and six requirements for learning support are identified.

Keywords — Workplace Learning, Collaborative Learning, Learning Support, Activity Theory.

1. Introduction

Until relatively recently, institutional education has been the main area where computers have been used for supporting learning while less attention has been paid to learning support at work. However, in the ongoing discussion about the new work and workers there is a demand to connect learning and working. As Zuboff [19, p. 395] argues, instead of being something separable from work, learning is crucial to productive activity: "Learning is no longer a separate activity that occurs either before one enters the workplace or in remote classroom settings. Nor is it an activity preserved for a managerial group. The behaviors that define learning and the behaviors that define being productive are one and the same. Learning is not something that requires time out from being engaged in productive activity; learning is the heart of productive activity. To put it simply, learning is the new form of labor."

Since learning has become an inseparable part of working, it should be supported also in the workplaces. The growing use of information technology at work is a potential resource to support learning at work. As Soloway et al [17, p.40] argue, "given that computers are being used for doing one's job, there is a clear opportunity to use those same computers supporting learning as one is engaged in 'doing'".

There are already some ideas of how to support learning at work, but they usually assume that individuals are learning without collaboration. Since work is more and more carried out cooperatively (as the growing concern on CSCW applications shows), learning should not be an individual task, either. Studies on the learning of computer usage at work [e.g. 12, 1] show that computer users help other users to resolve problems and to make more effective use of such tools. However, Clement [7, p.23] notices that "there has been comparatively little work done to help users collaborate informally in learning to use the technology or in repairing interactional breakdowns when they occur."

However, it might be beneficial not to restrict support for collaborative learning at work to the same modes as in schools. The needs, constraints, and technological alternatives of learning support at work differ from those of school learning. Therefore, the purpose of this short study is to explore how collaborative learning might be supported especially in working environments. In this study collaborative learning is assumed to take place in the context of the emerging new form of work which requires understanding of overall processes, broad view of one's job, and local innovation to improve overall effectiveness [e.g. 15, 3]. In the next section some elements of the collaborative learning at work are discussed and six requirements for the learning support are identified.

2. Requirements for Computer Supported Collaborative Learning at Work

As a guideline in focusing the interest in this analysis is Activity theory and in particular the concept of activity and its general structure as suggested by Engeström [10]. All activities share the structure, learning as well as working. According to this structure an activity has an active subject, who understands the motive of the activity. This subject can be individual or collective. Furthermore, the actor uses tools (material or knowledge) to transfer the object of work. People participating in an activity are members of communities and their activity is cooperation according to the rules and the division of labour. These elements of collaborative learning and their requirements for support systems are next discussed in more detail.

2.1. Object

The traditional conception about learning at work is a continuum from novice to expert, where becoming good at various tasks requires gradual internalization of already invented knowledge and procedures. However, the context of working is in constant flux and "people regularly invent ways around difficulties, discontinuities and unexpected irregularities in the course of their daily work" [4]. To appreciate these local innovations implies second-order learning, which according to Ciborra and Schneider [8] involves being aware of the context of working and ways of doing things usually taken for granted. Similarly, Engeström [11] criticises the exclusive focus on internalization of the given and raises the question of generation of culturally novel models of practice. According to him [11, p. 17], becoming an expert is "learning what is not yet there" so that learning "becomes a venture of designing, implementing and internalizing the next developmental stage of the activity system itself". This, he argues, is a long-term and collective activity. Thus, the first requirement for a support system at work is that it should support creation of novel solutions and the improvement of work.

2.2. Tools

The tool of collaborative learning at work is the support system under scrutiny. The support systems at work usually include assumptions about the work and learning they are trying to support. However, these reasons for the tools being the way they are designed, start to disappear along with the development of the work while the support system remains the same. On the other hand, as work, its procedures, and its context develop in the course of time, they are left unsupported if the support system is not changed (see e.g. Bødker's [6] analysis on the tool used in Danish National Labour Inspection service). Therefore, learning support systems should be changeable in the course of time.

In addition, if workers are to invent ways around difficulties and unexpected irregularities, and learn

what is not yet there as suggested previously, the computer support systems should be modifiable. It is not enough that the users are accompanying the designing process before it is implemented, they must have a possibility to redesign it all the time while working. Thus, the second requirement for collaborative learning support at work is that these support systems should be modifiable.

2.3. Subject

Focusing on the subject of learning at work raises the question about the notion of workers and learners. The traditional way of supporting learning at work has been implementing independent learning systems as in schools. Thus, people at work are thought to be either in the role of workers or in that of learners, only one of which should be supported by the system under scrutiny.

However, if work is not taken as a static situation but as a dynamic one requiring workers continuously to adapt themselves to circumstances and new working methods, it would mean continuous updating of two separated support systems, a system for working and a system for learning. If these systems are partly modified by their users as previously required, those people changing or increasing the knowledge in the learning support system might not be the ones who benefit of the update. As Grudin [13] has noticed, "application fails because it requires that some people do additional work while those people are *not* the ones who perceive a direct benefit from the use of the application." Therefore, a learning support system should not be a separated addition, but instead a central part of the work support system. This is the third requirement for learning support systems at work: a learning support system should be embedded in the working support system.

2.4. Community

The community of collaborative learning in schools is often a small group of learners, usually students in the group because learning is the main activity [as in 9, 16]. At work, however, working and learning are intermingled and it is recognised in recent CSCW research that collaboration does not require homogenous groups but collaboration is constituted by work processes that are related as to their content [2]. Thus, the learning community does not have to be a previously defined group of people, but instead it should be formed more or less around the working activity. This demand is furthermore supported by the study of Eveland et al [12], who found that the help providers were "sought out as much for their similarities to the help recipients in terms of work and position as for their technical qualifications" [p. 272]. Therefore, the network of helping relationships should follow in the first place work activity alignments rather than technical or pure subject matter specialization.

The learning community does not have to be previously fixed, however. The community of learning may also be in continuous change as the work and its context change. This requires that the learning community may be expanded when necessary and the support system should help in expanding the community. Thus, the fourth requirement is to support the construction of learning community around the work and to expand it.

2.5. Division of labor

The traditional assumption about learning in schools is the division of labour between students and teachers. There are supposed to be a teacher who knows the knowledge and students who are ignorant and need to learn. Similarly, the dichotomy between experts and novices at work assumes that experts have learned enough and it is the novices who have to learn. However, the distinction between those who know and those who do not know is not important [5, p. 172], because "expertise is a fluid, social construction that is constantly subject to redefinitions, the more so in times of rapid change".

Instead of using the separations between novices and experts, people should be considered both experts in their own practice (learning aspect) and the representatives of the requirements, the constraints, and the possibilities in their context of work (working aspect). They bring both this expertise and point of view into learning and the creation of new solutions. Therefore, the division of labor should be made according to this expertise and viewpoint in relation to the object of learning. This requires a support system that can be in the middle of a group of actors with divergent viewpoints and expertise. This requirement resembles the concept of boundary objects, which are according to Star and Griesemer [18, p.393]: "objects which are both plastic enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across sites." Thus, the fifth requirement for collaborative learning at work is that the support system should be a boundary object.

2.6. Rules

Rules concern explicit and implicit norms, as well as conventions within a community. One common norm in school has usually been related to the assessment of learning. There has been the ultimate authority (namely the teacher) telling the correctness of actions and results. At work this kind of authority loses its meaning when people have to assess their doing and learning in the course of their daily work to be able to modify their work procedures and tasks. For instance, Howard [14, pp. 177-178] argues that "As work becomes more interdependent, a particular kind of skill becomes increasingly crucial to effective work performance. I call it 'organizational reflexivity', and

by that I mean the capacity on the part of members of a work organization to systematically reflect upon their own organizational practice and to engage in the ongoing modification of work procedures and tasks. Organizational reflexivity, in short, involves learning about an organization and its possibilities and knowing how to influence them."

This transition from an authority to self assessment and collective reflexivity requires that the learning support system should support critical reflecting and the going beyond the existing ways of working. Ciborra and Schneider [8] have also noticed this requirement and suggest that the tools "should support people's capabilities for reflection and inquiry within the context in which they are embedded." [p. 286]. Thus, the last requirement for support systems is to support continuous and collective reflexivity at work.

2.7. Summary of requirements

This analysis has brought out six requirements for computer support for collaborative learning. These requirements are:

- it should be embedded in the working support system
- it should be a boundary object
- it should support the construction of learning community around the work and to expand it
- it should support creation of novel solutions and the improvement of work
- it should support continuous and collective reflexivity
- it should be modifiable

3. Conclusion

As learning is increasingly intermingled with working practices, learning support needs special attention in context of working environments. However, that is not to say that existing practices in school would not be useful - they have their own benefits and are needed - but the working environment may also need the support for its own special conditions to be optimal.

This paper has identified six special requirements for collaborative learning support at work. These requirements have two consequences on implementation. First, although there are some examples of how to fulfil some of these requirements at the same time, the real support system should integrate all the requirements into a coherent whole. Secondly, there are many possible ways to implement these requirements, and the chosen implementation should be derived from the work and the existing work support

systems. Therefore, having one support system which could be brought everywhere is not possible as it is in schools. These consequences mean that there are still a lot of open issues to be solved and these requirements are only a context for further research and applications design.

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