



Collective learning: Theoretical perspectives and ways to support networked learning



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Introduction

Looking at Vocational Education and Training (VET), it seems that much attention is given to educational issues. In our view, more attention should be paid to the learning that goes on in the workplace. Traditionally, vocational education and training curricula and processes have been based on imparting a fixed body of knowledge and skills required for identified tasks within occupational roles. With the rapid rate of change in today's workplace, these roles and tasks are no longer fixed and predictable. Workers need to be able to adapt to new skills and processes and to update their knowledge on a regular basis (Attwell & East, 2000).

Organisations, therefore, are increasingly confronted with the problem of managing and creating knowledge in order to respond flexibly to changes in their working environment. They are becoming learning organisations and expect their workers to become lifelong learners. In a learning organisation, workers are stimulated to share and develop knowledge together in or about their workplace.

The learning potential of these groups has become a matter of interest, and social and cultural aspects of learning have become important to understanding and fostering the process. In this article we focus on social learning from various theoretical perspectives and describe ways of supporting collective learning in a networked environment.

Social and cultural aspects of learning

Increasing access to computers as communication tools means they play an important role in restructuring and advancing our current perspectives on learning and instruction, knowledge management and creation, etc. In society, schools and organisations, people are increasingly sharing, discussing, and negotiating knowledge through computer networks, therefore stressing the social nature of learning.

When we study learning at interpersonal level we look at social forms of learning. Social and cultural aspects of learning have, therefore, become important to understanding and fostering learning. Influenced principally by the work of Vygotsky (1962; 1978) many authors (Goldstein, 1999; Lave, 1988; Lave, 1996; Lave & Wenger, 1991; Levine, Resnick, & Higgins, 1996; Moll, Tapia, & Whitmore, 1993; Resnick, 1991; Salomon & Perkins, 1998; Simons, Van der Linden & Duffy, 2000; Smith, 1994; Wegerif, Mercer, & Dawes, 1999; Wertsch, 1991), in attempting to define cognition in groups, have suggested that, in a group meeting, the situation itself may exert a strong mediating effect on individual cognitive and conceptual processes. The thinking of individuals is influenced by the group in which they are working. The merger of intellectual and social processes may be a fundamental feature of group mediated cognition.

In this paper we draw attention to collective learning in the workplace. We focus on social learning from various theoretical perspectives, and discuss different forms of collective learning processes and outcomes. We argue that it is important to consider these differences when thinking of creating possibilities for groups to learn in organisations. Three types of collective learning (networks, teams, and communities) will be reviewed. We conclude that learning in communities is a powerful way to stimulate collective learning processes and shared collective learning outcomes. Finally we argue that workers in organisations are more and more stimulated to share and develop knowledge together with the use of ICT. ICT creates possibilities for networked learning, however we stress that it is also important to focus on group dynamics. They are crucial to coordinate and structure networked learning; two models to support this will be presented.



A second key feature is the tension between the conceptual structure or understanding (of the problem or ideas under discussion) of the group and that of the individuals within it. Understanding may vary among individuals and also between individuals and the group. This tension is the driving force for the collective processing of the group. So, for example, when an individual member of the group expresses an opinion in relation to the shared public understanding of the group, this will be based on an attempt to synthesise personal understanding with the public one. The other members of the group will compare this new synthesis with their individual understanding of the group-accepted version and their individual disagreement with it.

Depending on the outcome of this process, there may be further interaction and negotiation until a new meaning or understanding is accepted by the group. In this process, interaction between individuals, as well as their shared and individual cognitions, are the key aspects of joint construction of knowledge, meaning and understanding.

This article accepts the premise of this social-constructivist view of learning: learners linking new knowledge to their prior knowledge (i.e. learning as a cumulative process) and learners constructing new internal representations of the information being presented (Boekaerts & Simons, 1995). Learning is a process by which the learner personalises new information by giving meaning to it, based on earlier experiences. Meaning is seen as rooted in, and indexed by, experience (Brown, et al., 1989). Each experience with an idea, and the environment of which that idea is part, becomes part of the meaning of that idea (Duffy & Jonassen, 1992). Learning is, therefore, understood as situated in the activity in which it takes place (Brown, et al. 1989; Lave & Wenger, 1991).

Whereas social-constructivist perspectives make a distinction between individual cognitive activities and the environment in which the individual is present, the socio-cultural perspective regards the individual as being part of that environment. Its supporters point out that learning cannot be understood as a process that is

solely in the mind of the learner (Van Boxtel, 2000). Knowledge is distributed over mind, body, and its surroundings (Hewitt & Scardamalia, 1998) and is constructed in settings of joint activity (Koschmann, 2000). Learning is a process of participating in cultural practices, a process that structures and shapes cognitive activity (Lave & Wenger, 1991). The socio-cultural perspective gives prominence to the aspect of mutuality of the relations between members and emphasises the dialectic nature of the learning interaction (Sfard, 1998). Construction of knowledge takes place in a social context, such as might be found in collective activities.

In addition, Lethinen et al. (1999) argue that conceptual understanding is fostered through explaining a problem to other students. Therefore, in collaborative learning it is necessary to formulate learning objectives together, to make learning plans, to share information, to negotiate about knowledge and to take decisions (Veldhuis-Diermanse & Biemans, 2000). In a setting of collaborative learning, students can criticize their own and other students' contributions, they can ask for explanations, they can give counter arguments and, in this way, they will stimulate themselves and the other students. Additionally, they can motivate and help each other to finish the task.

These various perspectives on social learning and coming from different orientations such as psychology, sociology and anthropology, are present in different social configurations, in which collectives learn.

In our practice, we found that it is very useful to distinguish different variants of collective learning, because the collective ones especially are difficult for people to conceptualise. They think, for instance, that they are learning collectively when they are involved in teamwork or a network. When this occurs, people fail to organise the possible, more explicit collective outcomes. Sometimes people undergo or undertake learning together but without any actual or intended collective outcomes. Then the learning processes are collective, but the learning outcomes may be only individual ones. In other cases, however, actual or intended outcomes of



learning (in terms of learning and/or in terms of changes in work processes or outcomes) are collective.

Thus there is a distinction between learning in social interactions (with and from others) and collective learning (where the members consciously strive for common (learning and/or working) outcomes). These forms of collective learning are also called group learning and organisational learning. We prefer to use the term 'collective learning' for systems where the intended outcomes (and perhaps, but not necessarily, the processes of learning) are collective.

Table 1 shows the four possibilities, of which three are collective: individual learning processes leading to collective outcomes, collective processes with individual outcomes, and collective processes with collective outcomes. How can one make the step from individual outcomes to collective outcomes? We think that there are three answers to this question:

- when groups or organisations reflect upon the common implicit outcomes of learning;
- when they reflect on or plan common explicit learning outcomes;
- when they define common plans for externalisation in the group or the organisation.

Forms of collective learning

Collective learning is gaining importance. The accelerating developments in our society make it necessary, but not sufficient, to have excellent groups of individuals in a workforce. Increasingly, people need to be able to work together in solving problems and innovating more accurately and more quickly. To highlight the different compositions of collective learning we propose roughly (read broad) three types of collective learning: learning in networks, learning in teams and learning in communities (de Laat, 2001).

These types share common elements, but also harbour distinct differences. The similarities let us think about social learning perspectives and contexts for learning. The differences make us realise how the

Table 1
Individual and collective learning processes and outcomes

Processes \ Outcomes	Individual	Collective
	Individual	Collective
Individual	Individual learning	Individual learning processes with collective outcomes
Collective	Learning in social interaction	Collective learning

intentions and outcomes of the collective affect learning practices within the group. The main difference is the learning intention of the groups. In this respect two perspectives on collective learning can be distinguished: organisation-related collective learning and profession-related collective learning.

Organisation-related collective learning refers to the processes and intended outcomes of learning at the workplace or within an organisation. Groups decide to collaborate in learning, focusing on common learning activities and processes or on common outcomes related to their work. In 'communities of practice' (Wenger, 1998), people, within an organisation, who decide to learn from their work, come together to discuss their shared practice. The collective learning outcomes are strongly related to the work context. Their interest is in improving their work.

Profession-related collective learning consists of professionals working in different organisations, but sharing the same profession, who decide to learn together from their different practices. They do not have a common interest in one organisation; they may even be competing for the same clients. Their interest is in learning. Therefore, we call this communities of learners and not communities of practice.



Different types of collective learning

Table 2

	Implicit	Explicit
Individual outcomes	<i>Networking</i>	<i>Learning team</i>
Collective organisational outcomes	<i>Working team</i>	<i>Community of practice</i>
Collective professional outcomes	<i>Working team</i>	<i>Community of learners</i>

Collective outcomes can be partly the same as those of communities of practice, but collective professional outcomes relate to contributions to the professional field. In a community of learners (compared to communities of practice) there is a weak relationship between collective learning outcomes and work context. Each individual member has to 'translate/convert' the collective professional outcomes to their own work context.

In many cases, however, teams do not have explicitly intended (collective) outcomes. The outcomes are then either individual ones only (learning team) or they remain tacit for the group members (working team). Then the concepts of communities of practice and communities of learners do not apply at all. Table 2 presents the possibilities.

Next we will discuss each type of collective learning more in detail. First we describe learning in networks, then learning in teams and, finally, learning in communities.

Learning in networks

Learning in (social) networks is the most loose form of collective learning. People in a network share a common interest, exchange ideas, and help each other. They call on each other when they have a problem to solve or something to offer (Dekker & Kingma, 1999). They participate voluntarily and have a great deal of personal freedom. Although individuals within the

network frequently meet person-to-person, the whole network rarely meets (McDermott, 1999).

Networks facilitate individual collaboration and leave it to the individuals to determine the content and form of knowledge-sharing (Walton, 1999). In such a network, according to Walton, power is distributed; everyone owns their own situation. Those who can make continuous adaptations to discontinuous change survive and flourish. People create through their network new shared meaning. They legitimise new ways of behaving. They provide systemic (as opposed to programmatic) solutions and they provide a framework in which focused improvement efforts can be launched. Walton points out competences people must have to be able to learn and participate in a set of relationships in order to operate within a network.

Several relevant competences are (see Walton, 1999, p. 541):

(a) spanning structural boundaries: establish broad networks across existing hierarchy and work them directly, making opportunistic use of meetings;

(b) making transitions: use transitions as opportunities to learn new skills, look for alternatives/role models, tend to dive in and enter quickly, stay focused on needs being served, facilitate major change through communication, set new expectations, and build trust;

(c) communication skills: engage in building shared meaning, focus on the need of others and anticipate questions, the real communication tends to go on outside meetings;

(d) problem solving: look at the whole situation (out of boundary or lateral thinking) or the big picture, and coaching others;

(e) power relationships: treat bosses as coaches or mentors, as supporters or as people who could add value to an idea. Play leadership roles without authority.

Learning in teams

Where networks are loosely coupled, teams have a more structured pattern.



Collective learning in teams is task-oriented. Where people in a network contact each other to solve a work-related problem, teams are initiated or created around a certain task or problem that has to be solved. Characteristic of learning in teams is the temporary nature of teams. They are established for a certain task; when this is completed the team breaks up.

When thinking of learning in teams, a distinction must be made between working teams (organisation-related collective learning) and learning teams (professional related collective learning). The learning that goes on in working teams is implicit but increasingly recognised as an important asset for the organisation (Nonaka & Takeuchi, 1997; 2001; Engeström, 1999a; 1999b; Eraut, 1998).

An example of learning in working teams is drawn from the work done by Engeström. He uses the activity theory to analyse work practices, also called activity systems. Activity systems are social structures in which people learn and work together. Learning outcomes can be implicit and a side effect that remains unnoticed. Activity theory provides three characteristics for analysing learning in work teams (Engeström, 1999a):

- (a) activity theory is deeply contextual and oriented at understanding historically specific local practices, their objects, mediating artefacts, and social organisation;
- (b) activity theory is based on a dialogical theory of knowledge and thinking, focused on the creative potential in human cognition;
- (c) activity theory is a developmental theory that seeks to explain and influence qualitative changes in human practices over time.

Collective activity is driven by a communal interest. This communal interest forms the object of the activity. The object in turn is to be understood as a project under construction, moving from potential 'raw material' to a meaningful shape and to a result or an outcome (Engeström, 1999c). During this process, expansive learning may occur.

Expansive learning is a dialectical process by which contradictions lead to ten-

sions in the activity system and enable transformation. Contradictions act as starting points and energy sources for development. Expansive learning begins with individual subjects questioning accepted practice, and it gradually expands into a collective movement (Engeström, 1999c). The activity system model developed by Engeström (1987) provides a way to describe the actions that take place within the working team. The model provides a holistic picture of a collaborative knowledge construction process and its interdependences, and can help to organise thorough description of such systems (Hansen, et al., 1999,). Human activity can be described as an interdependent system of several components, namely: subjects, tools, rules, community and division of labour (see Engeström, 1987 for a detailed description).

Learning in working teams is not only implicit but – as with the working team itself – can also be temporary. Instead of being part of a stable working team, the combinations of people collaborating to perform a task may change constantly. Yet in their basic pattern, they are continuously repeated (Engeström, 1999b).

Engeström recognizes the temporary notion of working teams and suggests the concept of knotworking to capture the innovative and creative nature of team learning. Knotworking is related to the rise of temporary groups (Meyerson, Weick & Kramer, 1996). However teams are understood as one-time formations created for the purpose of completing a task with a clear deadline. Knotworking suggests a longitudinal process in which knots are formed, dissolved, and re-formed. The notion of a knot refers to rapidly pulsating, distributed and partially improvised orchestration of collaborative performance. Engeström therefore suggests that the knot itself should be the focus of attention.

The intention to learn within a learning team is different from a working team. A learning team is formed to explicitly study a certain task or problem. The members of a learning team organise meetings and make agreements on how to complete the task. Huczynski & Buchanan (2001) speak in this context about project teams. According to them, a project team consists



of individuals who have been brought together for a limited period of time (from different parts of the organisation) to contribute towards a specified task. Once this has been completed, the team is either disbanded or else its members are given new assignments.

Project teams are created when:

❑ creative problem solving is required involving the application of different types of specialised knowledge;

❑ there is a need to coordinate closely the work on a specific project.

The project teams are overlaid upon the existing functional structure of the organisation, and hence are an addition to it.

Learning teams, in summary, have the following characteristics:

(a) representative: they are representative in that their individual members usually retain their position their 'home' functional department;

(b) temporary: they have a finite life, even if their end is years in the future;

(c) innovation: they are established to solve non-conventional problems and meet challenging performance standards.

An example of team learning is action learning, a term introduced by Revans. With it he meant creating learning teams to work on real organisational problems and to structure experiences in such a way that both useful solutions to these problems emerge and substantial learning occurs for participants. This offers learning that goes on beyond the technical details of the particular problem (Vaill, 1996). Within those learning teams people come together to discuss their own real work-related problem and share this project with the other members.

Although action learning can be transferred to a wider scope, its focus was mainly on management education. Some elements of action learning are relevant here (see Mumford, 1999 for a more elaborate description). First, the learning process is social; people learn best with and from one another, but the members

are responsible for their own achievements in their own project. Next, the social process is achieved and managed through regular meetings in which individual projects are discussed. The group is usually called a set. The members are comrades in adversity (Mumford, 1999). Third, the role of people providing help for members of the set is essentially and crucially different from that of a normal teacher. Their role is not to teach but to help to learn from exposure to problems and to one another.

Learning in communities

Teams are as we just mentioned created to solve a predefined problem. Communities are emergent (Brown & Duguid, 1991). Their shape and membership emerges in the process of activity, as opposed to being created to carry out a task. Communities emerge around a topic of interest shared by voluntary members. They can be characterized as an informal group that emerges from spontaneous interaction between persons as they talk, joke and associate with one another (Huczynski & Buchanan, 2001). Huczynski and Buchanan define informal groups as a collection of individuals who become a group when members develop interdependences, influence one another's behaviour and contribute to mutual needs satisfaction.

According to Ackroyd and Thompson (1999) groups organise themselves around shared interests, through establishing autonomy by defining what their community is about and creating boundaries, and by establishing identities (individual identities through group membership and group identity by which groups can be distinct from each other). Barth (1981) argues that a group can be described in terms of how members imagine the community's boundaries. Some are core members; others participate more peripherally (Wenger, 1999).

In communities the intention to learn is based upon individuals who have a certain learning goal for themselves but come together to learn as a group to help out each other. They share insights and negotiate and create knowledge together. Over time a sense of belonging arises between the participants. Membership to a community is voluntary and people stay



a member as long as they are interested in the theme that is discussed within the community. In this article we focus on the emergence of communities in two different contexts mentioned earlier. One is situated in a professional context; the other draws its attention on an organisational setting. When we speak of the professional context we refer to communities of learners. In work settings we refer to communities of practice.

First we will discuss communities of learners. Here we draw inspiration from Brown and Campione, who introduced the concept of communities of learners, and from Scardamalia and Bereiter, who introduced the concept of the knowledge-building community.

The approach of communities of learners developed by Brown and Campione (1994) is a pedagogical model that is designed to take advantage of the distributed expertise and cognitive diversity. The approach is focused on adopting the goals, values, beliefs, and forms of discourse characteristic to scientific practice. Conceptual advancement is made by cultivating each members' own expertise. The participants engage in self-regulated and collaborative enquiry, being responsible for the task as a group (Lehtinen *et al.*, 1999).

The participants are apprentice learners, learning how to think and reason in a variety of domains (Brown *et al.*, 1997). In a community of learners they try to foster supporting and overlapping zones of proximal development that stimulate growth through mutual appropriation and negotiated meaning.

Scardamalia and Bereiter (1994) speak of a knowledge-building community when there is a culture of learning that seeks to advance collective knowledge and in consequently supports the growth of each of the individuals in the community. Organisations that adopt the knowledge-building approach have to shift from learning to construction of collective knowledge (Scardamalia & Bereiter, 1999).

This shift involves treating students as participants in a learning organisation instead of as clients that receive knowledge.

The students are, therefore, engaged in producing knowledge objects that also lend themselves to being discussed, tested, and so forth without particular reference to the mental states of those involved, and where the students see their main job as producing and improving those objects (Scardamalia & Bereiter, 1996).

By introducing the concept of knowledge-building Scardamalia and Bereiter give form to the socio-constructivist perspective of learning, in which knowledge is situated and distributed, and that learning must be seen as a process of participating in various communities in which knowledge is being shared, negotiated, and advanced. They let go of the idea that knowledge is solely an asset residing in people's mind. The conception of knowledge as a resource or knowledge as a product, as something that can be created and improved or found to have new uses, is put to use in knowledge-building communities. The knowledge-building process can be characterised as follows (Scardamalia and Bereiter, 1994):

- focus on problems and depth of understanding – the focus is on problems, and engaging community members in producing and advancing theories to explain increasingly diverse and seemingly contrary ideas, that come to light trying to solve these problems;
- decentralising, open knowledge building communities focusing on collective knowledge – social interactions are expected to realize constructive responses to one another's work to ensure that the community is working at the forefront of their collective understanding.

In a context of learning in work practices people refer to the term communities of practice (Brown & Duguid, 1991; Wenger, 1998; 1999). This is based on the notion of Lave and Wenger (1990) who describe learning as legitimate peripheral participation in various communities. According to Brown and Duguid (1991) workplace learning can best be understood in terms of the communities being formed or joined and personal identities being changed. Their central issue in learning is becoming a practitioner, not learning



about practice. In a community of practice, participants, who share a common interest in the field in which they work, come together to help each other, solve problems, and share and create knowledge collaboratively.

A community of practice, therefore, is a group of people informally bound by a shared practice related to a set of problems. They typically solve problems, discuss insights, share information, talk about their lives, and ambitions, mentor and coach each other, make plans for community activities, and develop tools and frameworks that become part of the common knowledge of the community. Over time these mutual interactions and relationships build up a shared body of knowledge and a sense of identity. They constitute an informal, social structure initiated by members and reflecting on their collective learning (Wenger, 1999, p. 4).

A community of practice defines itself along three dimensions (Wenger, 1998; 1999):

- (a) what it is about – a joint enterprise as understood and continually renegotiated by its members;
- (b) how it functions- mutual engagement that binds members together into a social entity;
- (c) what capability it has produced - the shared repertoire of communal recourses (routines, sensibilities, artefacts, vocabulary, styles, etc.) that members have developed over time.

All these different forms of collective learning can be present in an organisation at the same time. An employer can even be part of various collectives both as a worker and as a learner. But how can this collective learning be stimulated and supported within organisations?

At the beginning of this article we said that ICT plays an important role in creating possibilities for communication between people. ICT has an advantage in bringing people together without time and place constraints. Organisations nowadays make use of knowledge management systems, stimulating workers to share and

create knowledge. These systems are being used with some enthusiasm, but outcomes do not always meet expectations. Brown & Duguid (2000) argue in their book *The social life of information* for more attention to the contextual and social processes that are present while using certain ICT-tools. In our view (de Laat, De Jong & Ter Huurne, 2000; de Laat, De Jong & Simons, 2001) it is important to support collective learning through ICT by focussing on the group dynamics that are needed to organise and coordinate learning and to support the clarification and the aim of the discourse by providing insight into how knowledge is created.

Supporting collective learning in ICT networks

ICT tools such as groupware applications play an important role in bringing people together and offer a platform through which collectives communicate, share information and learn. Organisations are increasingly making use of knowledge management systems, which are designed not only to retrieve knowledge from databases, but also offer possibilities to discuss and update this knowledge based upon new experiences of their employers. In modern organisations, workers are stimulated to share and develop knowledge together.

There are many different ICT tools available for this purpose. We argue, however, that for learning it is important to focus attention on how to organise and support learning independent of which tool is being used. Groupware applications offer the possibility for shared workspace, but do not seem to provide enough support for the group to regulate their own learning activities. Hakkarainen *et al.* (in press) argue that members in a networked environment are not able to work productively with knowledge alone, but need considerable pedagogical guidance and expert modelling.

This is especially true for collaborative learning in an organisation. In a classroom setting there is always the teacher who can regulate the learning activities



of the group. Communities of practice, in contrast, have to be self-regulative to be constructive learners. This involves being able to apply cognitive, meta-cognitive and affective learning activities to regulate the discourse (Boekaerts & Simons, 1995; Van Hout-Wolters, Simons & Volet, 2000; Vermunt, 1992; De Jong, 1992).

For online communities of practice to become used to sharing knowledge, deepening their own and common understanding and creating further insights, it seems to be crucial for them to be able to coordinate, clarify and regulate the discourse themselves. A study with a centre for expertise in the Dutch police force indicated that members of an online community desire more structure and support to guide the learning activities of the community as a whole (de Laat, De Jong & Ter Huurne, 2000). This community had difficulties in coordinating discussion and clarifying the goals and direction of the discussion.

The two kinds of support introduced in this article are two possible ways, in our view, of addressing this problem. The first type of support derives from a content-driven perspective by introducing a discourse model; the second from a group dynamics perspective by assigning roles to the members of the community. These two kinds of support can be used separately but, in combination, they can strengthen each other.

Progressive enquiry

The model of progressive enquiry can be introduced to assist clarification of the content and the aim of the discourse enquiry. This model, developed by Hakkarainen (1998), addresses the way knowledge is created in scientific communities. Progressive enquiry engages members of the community in a step-by-step process of question- and explanation-driven enquiry (Hakkarainen & Muukonen, 1999). An important distinction (or addition) with reference to other problem-solving cycles is the emphasis on development of shared expertise. Making use of the distributed expertise of the community members, the aim of this model is to support the collaborative problem-solving process resulting in a shared understanding.

The successive elements of progressive enquiry are discussed below.

Creating the context

To be able to explore the problem more deeply, members have to become familiar with it. A context needs to be created to clarify why the issues in question are relevant and worth investigating (Hakkarainen, 1998). This way the community develops a body of understanding that serves as an anchor for the formulation of the problem statement or research question.

Setting up research questions

The next step is to set up questions that guide the process of enquiry. Scientific enquiry can be seen as a problem-solving process. Initial questions guide and direct the search for information.

Constructing working theories

Once the community has agreed on an initial research question, the members are invited to construct their own interpretation. Construction of personal working theories guides the participants to use their background knowledge to offer an explanation for the problem. A first knowledge base of the communities' understanding of the problem is being created.

Critical evaluation

This knowledge base or inventory of distributed expertise needs to be evaluated. Critical evaluation is important to assess advancement in the theories or explanations being offered. Through evaluating whether, and how well, the working theories explain the chosen problems, the community seeks to assess strengths and weaknesses of different explanations and identify contradictory explanations, gaps in knowledge.

Searching deepening knowledge

Considerable advancement of enquiry cannot be made without obtaining new information. By examining prior problem statements or working theories with the help of new information, the community may become aware of their inadequate



presuppositions. New information may help them to reconstruct their conceptual understanding of the problem.

Engagement in deepening enquiry

Progressive enquiry is a process of further refinement. At first the community has a broad conception of the problem that leads to general questions. After inventory of prior knowledge and searching for new information, more specific questions emerge. Advancement in enquiry is captured by examining a chain of (ever-deeper) questions.

Constructing new working theories

By finding answers to subordinate questions, the community comes closer, step-by-step, to answering the initial question or problem statement.

Shared expertise

All the above mentioned elements of this model will be performed and shared by all the community members. Cognitive research indicates that advancement of enquiry can be substantially elicited by relying on socially distributed cognitive resources, and collaborative efforts to advance shared understanding and expertise (Hakkarainen, 1998).

Introducing this model of progressive enquiry offers support in structuring and regulating the learning activities of participants.

Roles

In the second type of support, several roles are introduced to stimulate interdependence and collaboration (Johnson & Johnson, 1999; Forsyth, 1999). These roles are chairman, process evaluator, content evaluator, log keeper, and technical support.

To stimulate interdependence, each member must have a unique contribution to make to the community. Therefore the community must consist of members who deal with the work-related problem from different perspectives, which creates a heterogeneous community that can accomplish something an individual could not alone (Johnson & Johnson, 1999). To accomplish this, someone has to play the

role of a chairman, who will be responsible for overall coordination.

Specific tasks of the chairman are to:

- (a) invite people into the community according to their expertise;
- (b) provide an introduction to the work-related problem;
- (c) make sure that the members give an introduction to the others, about what their expertise is, why they join this community and what they expect both for themselves and for the community;
- (d) suggest a learning agenda, in which the learning goals will be clarified, and the roles will be assigned.

Effective collaboration is influenced by whether or not the community reflects on its own learning activities. To foster collaboration is to structure the community processes. The purpose of community processing is to clarify and improve the effectiveness of the members in contributing to the collaborative efforts necessary to achieve their goals (Johnson & Johnson, 1999).

A number of roles are identified to stimulate this, the first of which is the process evaluator, responsible for evaluation of the activities of the participants. The specific tasks of process evaluator are to:

- Maintain contact with all the members to stimulate their engagement and to promote active participation. In order to contribute to each other's learning participants need to attend, be prepared and contribute to the community efforts;
- assess the quality of the interaction, by applying to the individual's expertise. Stimulate the cohesion of the community, and ask for suggestions on how community efforts can be improved.

A second role is that of content evaluator. Participation needs more than just stimulation; the content of contributions needs to be evaluated and structured. When members of a community become involved, their different expertise, perceptions, opinions, reasoning processes, theories and conclusions will result in intel-



lectual disagreement and conflict (Johnson & Johnson, 1999). Specific tasks of the content evaluator are to:

- structure the contributions in the knowledge base. When managed constructively, an active search for more information, a reconceptualisation of contributed knowledge and conclusions will lead to knowledge building activities;

- assess the quality of the written contributions in the knowledge base. For all these contributions to be managed properly, the knowledge base that has been built needs to be reflected upon. The community must reflect on whether or not they are working towards the goals that are being set in the learning agenda. They need to assess the quality of their work, conclusions and summaries have to be made to be able to engage in a deeper analysis of the problem.

A further role is that of log keeper. In addition to structuring the content of the contributions, the discussion process needs guidance. A logbook helps the community to clarify or reread various steps that have been taken during the discussion process. This can be understood as a learning agenda in which the learning goals are expressed. Other functions are to keep track of the decisions that have been taken, clarify what kinds of arrangements have been made, etc. This will provide insight into how the discussion has taken place and can help newcomers to follow the discussion so far.

Finally there is the role of technical support. This covers actions such as providing information about how to work with the programme, finding solutions for technical problems (getting logged on, uploading files, etc.).

These roles offer the community support in organising collaborative learning. The person who is assigned to a certain role does not necessarily have to carry out all the tasks alone; tasks can be delegated to other members in the community. What is most important is that people feel (or

can be addressed to) a responsibility for keeping the discussion alive and moving in the desired direction.

Conclusion and Discussion

In this article we discussed the various forms of collective learning and tried to conceptualise them. We think it is important to consider that people undergo or undertake learning together, that sometimes they learn without any actual or intended collective outcomes, and that sometimes learning goals are made explicit in advance. This is important to realise when thinking of creating possibilities for groups to learn in organisations.

By conceptualising different forms of collective learning we provide an overview of what collective learning is and how it can be organised. When people are fostering collective learning in organisations, it is important to take into account that different forms of collective learning result in different learning outcomes. In our view, fostering participation in communities of practice and communities of learners is a powerful way to stimulate people to learn collectively because collective learning is manifested most in this form of social learning.

The distinctions we offered also help in considering what kind of ICT tools are helpful to stimulate learning. We are aware that there are numerous different types of ICT tools, all with their strengths and weaknesses, but in our view the most important thing in supporting group learning in a networked environment is to focus on the learning processes that are needed to foster collaborative learning. In this article we proposed two kinds of support for fostering collective learning by focussing on the social and content aspects of learning. At the moment these models are the subject of research. Preliminary results, however, indicate that these models support participants in regulating and structuring discourse.



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