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Developing Teaching in the "University Classroom": The Teacher as Researcher when Initiating and Researching Innovations

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Abstract

The teacher's role in the university classroom has traditionally been to present the syllabus to listening students. In Norway new rules have been introduced for the activity in this classroom. The overarching goal for the teaching is to organize a learning situation that makes the students active learners. The article deals with the teacher as a researcher, and focuses on how innovative actions can be implemented by the teacher and studied from a researcher point of view. The text presents cultural historical activity theory (CHAT) as both the theoretical framework for the organized actions in the classroom and as an approach for studying the classroom processes. The article gives an overview over a material that can be gathered in a classroom characterized by student activity. It ends by reflections on how development in one classroom can be transferred to other classrooms.

Since teaching on the university level started, the instructor's role has generally been to present subject material to listening students. Today's prevalent learning theories in the constructivist tradition find that learning occurs in interaction between people and the world or the surroundings they live and interact in. Hence, activity should have a prominent place in the learning process, and consequently the traditional type of instruction provided in universities should be changed or developed. However, any change will place heavy demands on institutions of learning and the instructors working there. If learning activities are to occur within the framework of constructivist perspectives, students must also participate actively in the construction of knowledge. This does not necessarily mean that students will have to adopt new roles. With the background students admitted to universities now appear to have, they arrive with high expectations. The experiences they have gained in compulsory school and upper secondary school include project work and other forms of cooperation. Thus student activity as a dominant aspect of tuition in higher education becomes a natural continuation of the way they have been

studying and perhaps even represents a way of working that they will demand of their instructors. This may be the only way that students experience continuity on their learning paths. But this requires creativity among instructors and students, creativity that means disrupting the rigid and habitual traditions and developing, exploiting and enjoying new ways of working.

The purpose of the article is to show how cultural historical activity theory (CHAT) (Wertsch, 1981) can function as a framework for research both as a method and as a theory. The text describes how the CHAT tradition requires close cooperation between the researcher and the research participant. These two roles are united in one and the same person in the article, the teacher as researcher and the researcher as teacher. The article demonstrates how a teacher can plan teaching in the CHAT tradition or within a social-constructivist perspective, and, moreover, how research may be conducted on such action processes. It concludes with a focus on how newly developed practice may be distributed to more classrooms.

Cultural Historical Activity Theory as a Paradigm for Research

The cultural historical activity theory (CHAT) was developed by Leontev on the basis of Vygotsky's thoughts and ideas (Wertsch, 1981). Vygotsky (1997) attempted to combine the two psychological approaches "Naturwissenschaft" and "Geisteswissenschaft", which were already prevalent in his time. This is clear from his general genetic law about cultural development (Vygotsky, 1978). With this law he explains the relationship between the external world and what happens inside man. Any development that starts in an individual starts in a social, cultural and historical context. In my opinion such a view will have consequences for how to perceive the relationship between a researcher and research participants in a classroom. Once the researcher enters the classroom she becomes part of the surroundings for the actions playing out there. The researcher's goal may be to listen without being noticed, "the fly on the wall" (Madsen, Svendsen, & Gudmundsdottir, 2000), or her¹ intention may be to try to influence the processes as little as possible. This may be accomplished by acquainting oneself with both teachers and students before the research process starts, and by allowing teachers and students to become familiar with equipment such as tape recorders and video cameras used during the data collection process before getting started (Postholm, 2003; 2010). The researcher knows that her presence in the classroom will influence the actions there, but intends to try to minimize this influence. She enters the classroom and acts the friendly observer without breaking into the action processes taking place. I nevertheless believe that all research will be a dialogue between researcher and research participant, and whether this is recognized or not, it influences the practice and the actions unfolding there. Instead of dividing this relationship along subjective and objective lines, the processes between the researcher and the informant may rather be designated as inter-subjective, a construct that comprises both interaction or cooperation and equality (Postholm, 2003; 2010). The close cooperative relationship between a researcher and research participants within the CHAT paradigm means that principally all research within this tradition will be qualitative. Furthermore such a manner of undertaking research will constitute an epistemological standpoint that

¹ To make up for years of gender bias, I shall use the female pronoun.

functions as a guideline for qualitative research on processes, whether narrative or ethnographic research or case studies are used as the research approach. The knowledge that is created and the development that occurs in practice emerge from this interaction between researchers and participants during the research activity.

Research that aims to influence the research field as little as possible during the research process has been carried out within the positivist and interpretative paradigm (Guba, 1990; Erickson, 1986). One might ask whether this is the most appropriate way of carrying out the research process. Qualitative researchers who enter various research fields have more or less studied the theory illuminating the field in advance.² Classroom researchers usually also have classroom experience as teachers (Madsen, et.al. 2000; Moen & Gudmundsdottir, 1997; 2004; Nilssen, 2007; Nilssen & Gudmundsdottir, 1996; Pettersson, 2001; Postholm, 2003; Postholm, Granum & Gudmundsdottir, 1999; Reinertsen, Nordtømme, Eidsvik, Weidemann, & Gudmundsdottir, 1996). Is it then ethically correct that the researcher should not offer the research field her knowledge and experiences and thus assistance and guidance during the research process itself? If the researcher basically feels that she can contribute something to the development of the practice field, the answer to this question must be a clear no. The intention within the CHAT tradition is exactly to change practice while the research is being undertaken (Engestrøm, 1999; Wardekker, 2000). However, this requires the various parties in advance to agree on objectives for the practice and the progress of the research process.

There may be a number of persons or bodies that are interested in undertaking research on practices in the classroom. These may be government Ministries or university faculties engaging researchers or teachers who want classroom processes to be examined through the eyes of a researcher. Hence the research question may be the researcher's or the teachers', or they may agree on a common research question (Postholm & Madsen, 2006; Postholm, 2007). Teachers may, for example, want an external researcher to study various activities and analyze and assess them. In continuous dialogues with the teachers based on the observed actions in the practice, the researcher may contribute to development during the research process itself. In this way teachers may receive input and assistance to change their practice while the research is taking place, and also receive feedback on or discuss with the researchers how the changed practice functions compared to the practice objectives (Postholm, 2008). In addition to helping to change the practice during the research activities based on systematically collected data material, the researcher will also write a text about how the classroom practice functions and develops, if indeed it does. This text may at the next stage serve as a thinking tool for teachers in other classrooms who would like to change or develop their own practice. In both cases, whether it is the researcher or the teacher who initiates the research activities, questions must be raised regarding the purpose of the research, and the roles of the researcher and the teacher during this activity must be resolved.

CHAT considered as theory

The purpose of all teaching in practice, whether it is in compulsory school or on a higher level, is learning and development. Creating a better practice means that the participants in

² An exception from theory-based research is nevertheless the approach called grounded theorizing, which aims to develop new theory.

this practice are able to attain their aims in a more satisfactory manner. CHAT includes goal-directed actions as one of a number of principles. These goal-directed actions are carried out on the basis of underlying motives that propel them. Actions within CHAT are never considered as detached processes but are rather always considered and understood in their historical, cultural and social context (Wertsch, 1981).

As mentioned above in connection with the general genetic law of development, Vygotsky (1978) believed that development commences on an external social level before it is transformed into part of man's intra-mental processes. Both Vygotsky (1981) and Leontev (Wertsch, 1981) claimed that individuals were active during this initialization or transformation phase. In this way the surroundings humans live and act in form the underpinning for how individuals develop their awareness. Vygotsky (1978, 1986/2000) presented language as the most important link between external and internal processes, i.e. processes in and outside of individuals. In this context Vygotsky spoke of an external social speech, an inner speech and an egocentric speech. External speech represents conversation between persons in social interaction, inner speech represents verbal thought, while egocentric speech is an expression of a social speech that is being transformed into an internal language, thoughts or consciousness. This means that the social surroundings and the structure and organization of instruction in a classroom will have decisive importance for the learning that takes place.

Vygotsky (1986/2000) believed that it would be wrong to analyze words and thoughts as two parts of a whole. He compared this to the analysis of water as a product of hydrogen and oxygen, which separately do not have the same qualities and characteristics as water. Similarly he felt that words and thoughts cannot be analyzed separately, but that the interaction between these two may be captured in an expression of meaning. The meaning of a word, or the understanding of a word, is an amalgam of thoughts and words, and it is therefore difficult to determine whether it is a thought or a lexical word. Vygotsky captured the individual understanding in the construct "word meaning". In this way the construct becomes the unification of the individual thought and thus the understanding of the word. Seeing that Vygotsky claimed that all understanding is based on its historical, cultural and social context, this context will colour how each and every individual ascribes meaning to a word. Hence individual thoughts are not relativistic.

Bakhtin's contribution

Bakhtin's theory is seen as an extension of Vygotsky's theory of language and understanding. Bakhtin expands the entity that includes words and thoughts, word meaning, to complete utterances. He defines an utterance as anything a person says, whether in writing or speech, in a specific situation under specific circumstances. He defines the external limitations of an utterance as a distinguishing line created in the exchange between persons speaking. In addition to considering words as parts of complete utterances, Bakhtin also sees an utterance as a section of a link or chain of innumerable utterances (Bakhtin, 1986). He also states that the encounter between thoughts and words will be influenced by both previous and future utterances. In a cooperative situation between persons, the participants will deal with what others have stated and also consider what others have stated when they formulate an utterance in the communication chain that grows. Meaning is not created by the individual, but in the interaction between the two who are conversing. Meaning and understanding are thus construed in a dialogic interaction process.

When a discussion is completed, this does not mean that the thought processes come to a halt. Each person who has participated in the discussion will probably also continue to weigh various arguments against each other to arrive at a conclusion or a question which might propel the understanding further. The new thoughts may be aired in the same group, in a new constellation, or the person may continue to reflect using, for example, utterances in a book. Thus there will always be a dialogue between various voices, whether this occurs within one and the same person or between persons. Both Vygotsky (1986/2000) and Bakhtin (Holquist, 1990) spoke of inner speech or "inner dialogues" in which a person can always process and fine tune different thoughts in comparison to each other. However, this inner dialogue will never be isolated from a social dialogue, while both these types of dialogue supplement each other. Thus the communication chain, in the words of Bakhtin (1986), will not only be linear and grow in length, but also circular, moving in spirals and growing increasingly thick as understanding develops. Each person's inner dialogue, which may also be fertile for a group dialogue, may be symbolized as a pendant for this growing chain. This may become true in a group where the members work together over some time. Moreover, each person belongs to various other groups so that opinions uttered in this group will also be dispersed to others, the seed for growth in other compositions of groups. Hence a coral of increasingly more substantial communication spirals will be formed.

Cultural artefacts

Vygotsky (1986/2000) found language to be the most important tool in interaction processes between people. In Stalinist Russia it was considered threatening or politically risky that the common people held opinions (Kozulin, 1990). In CHAT, which was developed on the basis of Vygotsky's thoughts and ideas during this period of time, the word, or language and dialogue, was therefore replaced by technical tools, which were seen as being most important. Examples of such tools include a hammer, a saw or a needle. Physical actions were therefore also emphasized as most important. Opinions differ as to whether this actually expressed Leontev's ideas or whether this was a result of the time when this theory was developed. Today it is nevertheless common to look upon psychological tools, language and signs and technical tools as natural artefacts in action processes (Cole, 1996).

Wartofsky (1979) has described these artefacts on three levels. He calls the first level primary artefacts. These include tools such as words, a hammer, a saw and also information and communication technology (ICT). Wartofsky's secondary artefacts are representations of the primary tools or artefacts that include actions where these primary tools are used. These may be recipes, traditional belief, norms and constitutions. The way teaching has traditionally been carried out may thus be perceived as a norm and thus a secondary artefact (Postholm; et al. 1999). The third level, tertiary artefacts, are artefacts that may form an independent world that is different from real life. This imagined reality with its rules and conventions may nevertheless have importance for what occurs in practical day-to-day affairs. Concepts on how teaching occurs may, needless to say, have consequences for the actions that actually take place in a classroom.

As a theoretical point of departure, CHAT provides directions for research. With such a theoretical standpoint it is inadequate to focus either on individuals or the surrounding context. The focus for the research must be on mediated action processes, whether these take place through psychological or technical tools, in their natural contexts. As

mentioned above, Vygotsky (1986/2000) provided examples of this comprehensive thinking, using water as an expression of a complex whole. Vygotsky rightly asserted that no better understanding of or familiarity with water as a phenomenon may be acquired by studying either hydrogen or oxygen atoms. This means that the focus for research cannot only be the consideration of individual aspects of a phenomenon, but that all factors that mutually influence each other must be considered and must be perceived as entities in the research process. Mutual influence processes can never be static; they are indeed dynamic processes, meaning that changing one factor causes changes to other factors and thus the whole. This mutuality is depicted in the activity system.

The activity system

While CHAT was developed on the basis of Vygotsky's thoughts and ideas, the activity system has been developed from CHAT (Engestrøm, 1987; Engestrøm, 1999; Engestrøm & Miettinen, 1999). The activity system as a graphic representation of activity theory is shown in Figure 1 below.

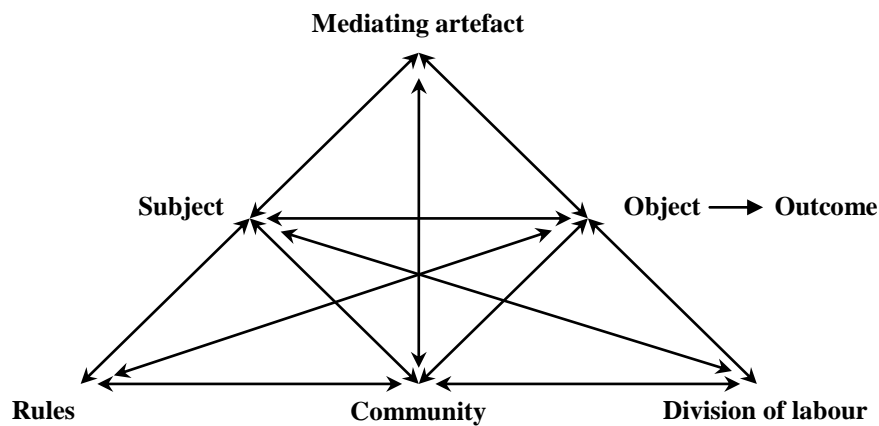


Figure 1: The complete activity system

The factors comprised by the activity system are subject, cultural tools or artefacts, object, results, rules, community and division of labour/roles. These factors influence each other mutually. As an acting subject we use cultural artefacts to attain our goals. The result factor represents the final result of the actions carried out. The upper triangle of the activity system may be called the action triangle. The context the actions take place in are represented by the factors "rules", "community" and "division of labour/roles". These factors form the lower three triangles in the activity system. The factor "rules" means guidelines for actions. In a teaching context these guidelines may be presented as White Papers, acts and regulations. "Community" stands for all persons in a community who share the same goals, and "division of labour/roles" means that the work or goals-directed actions are divided between the persons who belong in this community. The factor "division of labour/roles" also makes it possible to distinguish between collective activity and individual action (Engestrøm, 1987; Cole, 1996; Engestrøm & Miettinen, 1999). These factors, all on the base line of the activity system, may set the premises and any limitations for the actions that can be performed.

There are also connecting lines between the various triangles, as we see in Figure 1 above. The line between the acting subject and division of labour/roles represents a division of

work between various persons who are part of the acting subject. This means that various persons may carry out different tasks to attain a common goal. In the system we also find a connecting line between rules and goals. This means that the rules provide the directions for the goals to be attained and how they are to be attained. We also find a connecting line between the factors community and cultural artefacts. People create artefacts which in turn influence people's actions. These may include a pencil in a classroom or a mobile phone in the home's activity system.

The activity system shows that there is a close relationship between the acting subject, who may be an individual or a group of persons, and the context. The context has not been reduced to something merely surrounding the actions, but rather it is woven into the actions taking place (Cole, 1996). In these actions people consciously use various cultural artefacts to attain their goals. In an educational situation the teacher as the acting subject may use textbooks or initiate conversations or discussions from which the students will learn and thus develop understanding of the themes being studied. The teacher may also choose to initiate writing processes as a work form to attain the learning objectives. Hence the oral and written language and the structure of the teaching become tools in such a setting. In this way both primary and secondary artefacts have been used.

Tensions between the various factors in this activity system are the basis for and thus the point of departure for change and development (Engestrøm & Miettinen, 1999). According to Engestrøm (1999), the researcher must aim to create new ways of carrying out actions together with the local participants. This means that the researcher should adopt an active role together with the participants in the research to attempt to change the practice. Changing a practice may thus be initiated and occur in relation to the common notions held by both the researcher and practitioners when it comes to how a changed practice should be (Postholm & Madsen, 2006; Postholm, 2007). This common notion of a preferred practice is thus a tertiary artefact and also a goal to work toward in the work process. A notion of a changed practice will also provide directions for plans made before teaching starts. Wardekker (2000) states that the quality of research work should be expressed in relation to whether this work has caused positive changes. This means that the researcher has co-responsibility for both the research results and the changes of practice, and this implies an extension of the researcher role that has been prevalent in the interpretative paradigm (Erickson, 1986). The researcher is not merely a fly on the wall collecting data in the classroom to be presented and analyzed in a text that may be read. That the text is read is no guarantee that changes occur in practice. The researcher in the CHAT paradigm is co-responsible for change processes throughout the research work and for creating a research text.

CHAT Considered as Method

Within the CHAT tradition internalization and externalization are two central concepts in a development process. Internalization involves socializing and training new members within a system. In this way newcomers may become competent members of an activity that is carried out routinely. Creative externalization according to Engestrøm (1999) occurs when an individual attempts to carry out innovations. As this innovation becomes more demanding in relation to the activity carried out, the internalization that has been taking place becomes more of a form of self-reflection, and the externalization which means finding new solutions increases. The externalization is at its greatest when a new way of carrying out the activity has been implemented. When the new way of carrying out

this activity has stabilized, internalization may again become the most dominant way of learning (Engestrøm, 1999). Such a path of development is called the expansive circle by Engestrøm (1999). The interaction between internalization and externalization in a development process is shown in Figure 2 below.

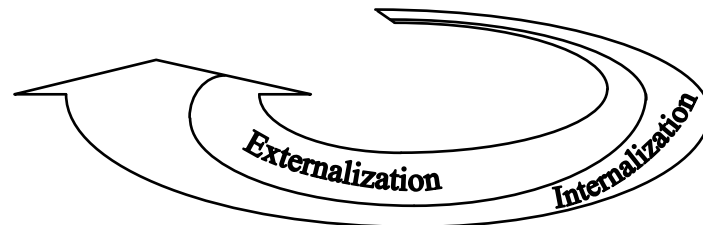


Figure 2: The expansive circle

The expansive circle shows processes occurring right from completely routine actions being carried out to questions being asked related to these actions and new solutions being tested for later adoption in practice. The newly developed practice eventually becomes the routine way of carrying out actions. The expansive circle shows that this process is a circular one. What actually occurs in the development phase between the old and the new practice is nevertheless not very visible in the figure. Starting from the time the internalized practice is questioned, ideas of a changed practice start to surface. Conflicts and tensions between the traditional practice and the wish for a changed practice lead to critical reflection (Engestrøm, 1999). During this reflection phase thoughts are striving to pinpoint possible changes that may lead to an improved practice. This means that plans for how new activities may be carried out can be formed on the basis of this reflection. This does not mean that critical reflection, planning and implementation necessarily are a linear process. Thoughts may lead to actions that are tested, but which upon critical observation are assessed as either to be discarded or improved. This means that an interaction is created between planning, implementation, evaluating observation and critical reflection, which is not only a circular process, but also a spiralling one moving in one direction finally to end in a focus or solution. This is shown in Figure 3 below.

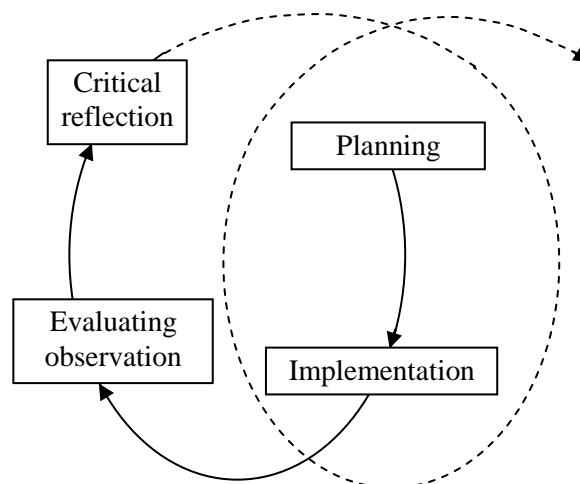


Figure 3: Interaction between planning, implementation, evaluating observation and critical reflection.

This focus or solution forms the basis for a new model for the activity to be carried out. The new model is then considered as the new practice in force. Internalization again becomes the central form of development, until questions are again raised concerning the practice in force, which again moves the activity into a new expansive circle. The way through the expansive circle may be a long and complex process. Such a development process also has importance for all the concerned parties, for the students who are in practice and for the teacher and researcher practising it.

Teachers and Researchers as Learners

Using CHAT as the methodological framework for research requires a close cooperative relationship between researchers and teachers in a classroom. This helps the researcher to develop a more thorough understanding of the practice actions. In my opinion it is not only researchers who want to learn, and using Lave and Wenger's (1991) terms we can add that teachers basically have legitimate peripheral participation in the ongoing research work. Through such participation teachers may also move *toward* full participation in the researcher's world. The participants or teachers may thus understand the researcher and her use of artefacts better. In qualitative research the researcher is seen as the most important research instrument (Creswell, 1998). How this "instrument" functions depends on the history and thus also the background of the researcher, the perceptions, experiences and theories that control and assist her in her work.

Needless to say, teachers have another point of departure than researchers. They do not have the same background as researchers who have learned the craft of research. However, as participants in a research community teachers may adopt some research strategies as tools to develop their educational practice also after the researcher has left the site of research or the classroom. Teachers see how the researcher collects data, analyzes, interprets and draws conclusions that emerge in conversations they have. In this way teachers may also learn some strategies for how research may be conducted and thus have the opportunity to use these strategies in future development activities (Postholm & Moen, 2009). Thus through her presence during the teaching the researcher has launched processes on both the teaching and the research levels. Both parties gain better understanding of each other's practices by acting in a community (Lave & Wenger, 1991; Wenger 1998), as well as by being in continual dialogue with each other (Vygotsky, 1978; 1986/2000; Bakhtin 1981; 1986; Holquist, 1990). The crucial point is nevertheless whether the teachers have time to research in their own practice, and further reflect upon the action processes so that changes may take place. In this context I would claim that reflection *is* the key to development (Postholm, 2008), and hence the time factor becomes essential if teachers are to be able to effect changes in practice from one teaching session to the next.

The teacher as Researcher

McNiff (2002) claims that there is a need for practice-based research on the teacher's tasks as carried out by the teacher herself, and it is according to Stenhouse (1975), the teacher who carries out her practice and thus knows and understands the work from the inside. In this way the teacher becomes the natural choice for developing and documenting work performed in the teaching situation. The teacher becomes a researcher in her teaching, a dual role that requires knowledge about teaching and research. This dual role means that

relevant experiences, knowledge and literature are consolidated in relation to the teaching to be carried out. Bearing this in mind, plans for teaching may be tested, preferably in cooperation with colleagues. During this implementation phase the teacher as researcher will also have to document the processes that have been carried out. In this way the development activities taking place inside the four walls of the classroom and thus the knowledge created may reach other educators in similar contexts. The main purpose of classroom research is to create a text that may inspire and initiate debate and discussion so that the field of practice may develop and improve (Gudmundsdottir, 1997; 2001). This was initially intended for classrooms in compulsory school and upper secondary school, but it may equally well be extended to apply to all the levels of the education system. If readers of a text identify themselves in it and hence perceive what is written as parallel experiences, the text may function as a tool for thinking that may mediate development in similar contexts. Hence a text may form the underpinning for a naturalistic generalization, which means that readers perceive what is described as parallel experiences that may be adapted to their own situation (Stake 1995; Stake & Trumbull, 1982).

Universities emphasize that teaching should be research-based. Educational research results shall provide the guidelines for the content of the instruction and how it is to be undertaken. On the other hand, teachers who teach higher levels may also perform research on the teaching being performed, in their own classrooms or those of others. In this way the teaching will not only be based on research results but will also be the basis for research. Those who teach on higher levels have research competence from master or post-graduate levels, and they are thus qualified to teach and undertake research. If a teacher is to undertake research on her own teaching she assumes two roles that must be balanced as the same time. Thus the teacher will participate in dialogues on different levels.

Based on the theories of Vygotsky (1978, 1986/2000) and Bakhtin (1981; 1986; Holquist 1990) this means that the teacher and researcher carries out an internal dialogue on three levels. First the teacher carries out her thinking activity based on completed action sequences while keeping in mind how future practice actions may be carried out. Second the researcher will reflect upon action sequences that have been studied and make plans for future research activities. Third the researcher will be in continual dialogue with the teacher and vice versa. In this way one and the same person's reflections on different levels may contribute to changing the practice, while the collected data material and analyses and interpretations of it will end as a research text on practice.

Activity in a University Classroom

Lectures have been the traditional form of teaching in the university classrooms. The teacher has given lectures and the students have been listeners to the presentation. Such a form of teaching may give the students good basic knowledge and an underpinning for reflection, but in itself this is not adequate for creating good learning processes. In my opinion lectures or teaching and student activities are two complementary forms of learning that may provide the students with good basic knowledge and competence to develop their knowledge and understanding themselves. The question is how the teacher can help make the activity an integral part of the ongoing teaching so it can support the learning process. In the coming text I shall present some proposals for how students may learn through activities. These proposals are based on the theories of Vygotsky (1978; 1986/2000) and Bakhtin (1981; 1986; Holquist, 1990) on language and dialogue as tools

in the learning process. This thus means that group processes and using the language orally and in writing become central activities.

Learning through activity

Student groups could be given tasks to orally present syllabus articles they have read. Furthermore, based on these articles they could be required to initiate and chair discussions on the theme discussed in the article. As an aid to launching such discussions the students could first work orally on written questions they have prepared. Starting in small groups could thus help make everyone participate and contribute to a common summary. As part of this learning process the students could also be requested to write a reflection journal where they would note down thoughts on both the process and the content.

In addition to oral activities the students could work with written texts in groups. These could be texts based directly on the themes addressed in the teaching sessions, or they could be small texts that would be assembled into a comprehensive text at the end of the semester. The students could be assisted in a number of ways as they make their way to a comprehensive text. If the small texts are written in groups, the students could exchange views with others in the group on the form of the text and its content. In this way they could exchange opinions and arrive at a common idea about what the text should include and how it should be written. When working toward a comprehensive text the students could be asked to provide responses to each other's texts, as well as receive feedback from the teacher to help improve the text. In this activity the students would have the opportunity to learn in both give and receive situations. When they give a response they will be in a communication chain between texts, their own knowledge and expectations to provide assistance to the receiver. When they receive help they will also be moving in a contiguous communication chain that will influence their processing of the text and what they will learn. In this connection they would have to deal with the text and various comments. These comments would then have to be consolidated with their own knowledge, and thus lead to a development of both the text and knowledge. In this way new recipients would be able to read a processed text. In such a process the understanding of the theme addressed and the text that is written about it would most likely be improved (Vygotsky, 1986/2000; Bakhtin 1981; 1986). Moreover, the students as part of the learning process could be required to reflect upon what such a work process has led to and may lead to in a learning context by entering this in a separate journal.

Research on Activity

If the teacher is to conduct research on her own teaching practice this means, as mentioned above, that she will have a number of roles. One and the same person must do the teaching, attempt to develop this teaching and carry out research on it and thus document what is going on. According to Stenhouse (1980), research is a systematic study that is published. This means that the teacher as researcher must collect data material that together may represent the events that have occurred in the classroom in a text. Thus the action processes may be interpreted and understood by means of theory. Initially theory has provided the teacher and researcher with assistance when it comes to how teaching should be undertaken. Together with previous experience, theory has been an important partner in the planning activity. Theory has helped create an idea on how different ways of organizing and structuring the content may lead to learning results which the teaching

intends to attain. Theory is thus important in all processes, both before and after teaching. After each teaching session theory is also used as a reflection tool. This means that there is continuous interaction between theory and practice, research and teaching, or between deduction and induction.

Theory provides the teacher and researcher with ideas or various assumptions about what will happen with the teaching that has been planned. These assumptions or working hypothesis may be confirmed or disproved. This either means that the teacher and researcher must change her course or continue the practice based on the theory frameworks that appear to serve the various practice goals. Matters might also surface in the teaching that the researcher or teacher did not consider in advance. This means that the researcher must find other theories that may illuminate these matters or develop new theory. In this way a bridge will also be created between theory and practice, and a theory may be developed or even new theory may be developed based on this practice. This means that research and teaching are going on continuously, and it will therefore be difficult to draw clear lines between when the teacher is the teacher and when the teacher is a researcher. It may well be claimed that this one and the same person is wearing two hats at the same time, or that she is using multi-focal glasses. However, the researcher role probably appears most clearly after all the teaching sessions have been finished and the researcher sets about writing a research text based on the practical experiences in the classroom. This text will nevertheless point to new planning phases of teaching, and thus the teacher will not lose sight of her practice. How the teacher as researcher may collect data from the classroom will be addressed below.

Collection of data material

The report will be written on the basis of the data material, observations, analyses and interpretations made while in the teaching and research sequence. The data material this report is based on will, needless to say, be a picture of the activity that has occurred, therefore the activity will determine the data material that may be collected and thus what the teacher/researcher in question will have at her disposal. As mentioned above, student activity will make action processes visible, thus also making them easily accessible to the teacher and researcher. If the teacher as a researcher had been a participant in the teaching sequence that is described above, varied data material could have been collected.

In the course of the teaching it is important that the researcher uses various strategies to remember what happens and continuously note down her interpretations. These could be conversations between observed students or mentoring conversations between the teacher/researcher and students. During the teaching itself she may write observation notes with immediate interpretations. Cassette recordings and video recordings may be useful to preserve the sequence of events so they may be recalled. After each teaching session it may also be useful to write a journal. The researcher may systematically record in this journal all interpretations based on theory, analytical interpretations, or she may interpret based on her own role, a self-reflecting interpretation.

According to Engeström (1999) researchers should listen to all participants who are influenced by the innovation activities. This means that the students' voices must be listened to. The teacher may have an open continuous dialogue between herself and the students. Furthermore, the students' reflection journals on oral and written work will be good data relating how the students perceive the learning situation. The written work produced by the students and the responses of the students to each other and the teachers'

comments upon these may also be important contributions to the data material. The researcher may also carry out assessment interviews with one or more student groups to capture impressions of how the work process has been experienced. A final questionnaire may also be useful to obtain information about how the students have perceived the teaching. In such a connection it may be questioned how the group activity has functioned and, for example, whether all the students have contributed constructively to the group activities. Another question may be whether the students find that the student activity positively influences the learning process. Student opinion may be obtained using such questionnaires.

Based on these data the researcher may analyze and interpret what the teaching has meant for the students' learning and draw conclusions about any changes that should have been made in the planning and implementation of the topic in a new semester. In this way there may be changes and development during the teaching of the topic and in the intervening period between teaching this topic. This means that planning, action, evaluating observation and critical reflection are not only cyclical processes, but also spiral-shaped, which means there is change and development from one reflection phase to another. The utterance chains (Bakhtin, 1986) or the spirals formed during this process may thus rightly be called reflection spirals.

To sum up we can say that the following data may help to provide understanding of the teaching:

- The journals of the teacher/researcher based on observations
- Mentoring interviews between the teacher/researcher and students
- The teacher/researcher's observations and observation notes
- Cassette recordings of student communication as part of the observation
- Open continual dialogue between the teacher/researcher and students
- Student journals based on oral presentations and chairing discussions, and based on cooperative processes with written texts
- Written texts
- Written feedback related to written material given by co-students in another group
- Written feedback related to written material given by the teacher/researcher
- Evaluation conversations between the teacher/researcher and students
- Student evaluation of teaching sessions/work processes (questionnaires)

The facilitation of these actions and research on them may be conducted in a single classroom with one or only a few teachers. This means that the practice occurring in this classroom does not need to be typical of the work forms of the teaching in various topics in the same subject. I shall discuss how innovation and development may be distributed to additional classrooms in the next and final section of this text.

Development of Teaching and Further Growth

In this article I have presented the direction CHAT gives for research and thus the research issues raised. Research within this paradigm means research on action processes in their natural setting. The purpose of such research is to improve the ongoing practice.

According to the theory this should occur in cooperation between the researcher and research participants (Engeström, 1999; Postholm & Madsen, 2006; Postholm, 2007). In this text I have first reflected upon what the close cooperation between a researcher and a teacher may mean, and then what it means to unite these roles into one and the same person, the teacher as a teacher and researcher or the researcher as researcher and teacher. The epistemological standpoint for CHAT theory as a social-constructivist theory means that knowledge is created in the close cooperation processes between the researcher and research participants. The text also describes how the researcher as teacher in this theoretical perspective initiates learning processes that set premises for the students to develop their understanding in social interaction. The presented data collection strategies show that both observation and interviews will be important ways of collecting data. By using interviews in addition to observation as a data collection strategy, we also move beyond a realistic empirical way of researching.

The classroom may be considered an activity system with the teacher and researcher in this classroom seen as the acting subject. A teacher/researcher may adopt other ways of working than the established and traditional methods of working in a classroom, if they are in conflict with the teacher/researcher's conviction as to what good teaching and learning is. Basically there will then be tensions between the person's understanding of and convictions on how teaching should be performed and the current practice or work method used to attain the objectives of the teaching. Such a tension may initiate creative externalization (Engeström & Miettinen, 1999). The students in this classroom are part of the activity system. They may be defined as part of the community, and thus they constitute part of the context for the actions the researcher (and teacher) plans and implements. As mentioned above, researchers should listen to all participants who are influenced by innovation. The students may be able to give the researcher and teacher feedback on how the action processes that have been initiated and the cultural artefacts that have been used function in relation to the stipulated goals for the teaching. They may be able to answer whether more student activity offers more room for learning than traditional teaching. The students may thus give the teacher and researcher in a classroom or activity system feedback related to how they perceive the process, while the teacher as teacher and researcher may observe and systematically collect data that may be further analyzed and interpreted and presented in a text.

The students generally study a number of topics from a subject at the same time, and they are thus students in a number of classrooms or activity systems. One type of teaching in one classroom and another in another classroom means of course that the students experience several ways of learning. The students' movement among several activity systems will probably also make them more aware of these dissimilarities. This will probably initiate discussions about which form of teaching functions best related to their learning situation. This will reveal tension between ways of working (secondary artefact) and how these are perceived by the students (community). The students' movements among the various activity systems may thus cause tensions or bring to light differences between the practices in various classrooms. These tensions may in the next instance initiate reflections, debates or discussions between the acting subjects of various systems, i.e. the teachers and researchers. If they share approximately the same goals for the work and understanding of how these may be attained, such discussions may lead to the externalization that started in one classroom also causing changes and development of

work methods in other classrooms or activity systems. These tensions may be visualized as in Figure 4 below.

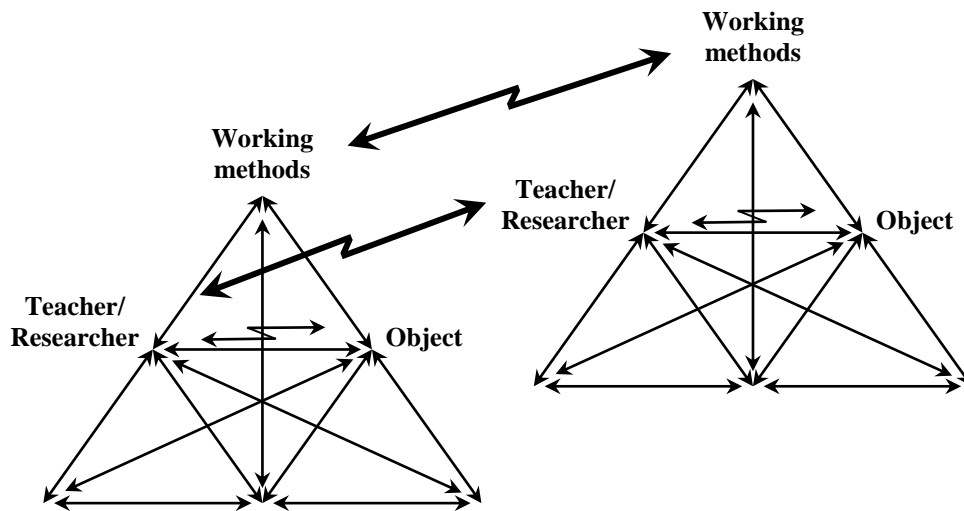


Figure 4: Tensions in and between activity systems that may lead to change and development

Engeström (1999) contends that the validity and transferability of results are determined by whether the new action practice in an activity system is distributed to other activity systems or other classrooms. A single event may fade quickly and thus disappear into oblivion. If a new action practice is distributed, there may at least be a greater chance that the newly developed practice will take hold and gain acceptance and hence find opportunities for further development.

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