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Socio-emotional orientation as a mediating variable in teaching learning interaction: implications for instructional design

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Abstract

In this paper we argue that many of the design decisions of modern pedagogical solutions are made unconsciously without articulated view of the issues being addressed by the complex relationship of student's social, emotional and motivational interpretations in learning. We present a theoretical framework for analysing them and discuss of the two empirical experiments, where individual students' social and motivational interpretations were analyzed in a cognitive apprenticeship based technologically rich learning environment. The results of the studies indicate that students with different socioemotional orientation tendencies will interpret the novel instructional designs in subjective ways which subsequently will lead to different actual behaviors among them. We propose that students' interpretations are important variables that interact with variables in instructional environment and claim that this aspect needs more attention in instructional design.

Introduction

During last few years many promising new models of learning environments has been developed based on latest advancement in cognitive theory. These models emphasize learners active problem-solving and collaborative knowledge building as well as apprenticeship like and reciprocal interaction between students and teachers. These learning environments are aimed at supporting students in coping with more complex tasks than the tasks used in traditional teaching. The use of variety of tools and information resources like computers and networks have an important role in these models. Models also try to expand learning out of the traditional circles of the school by making use of more authentic learning tasks and students' participation in various cultures of expertise. Constructivist epistemological approach as well as the ideas of situated cognition serve as joint background for most of the new innovative designs of learning environments. The role of students as an active agent of the learning is emphasized whereas the direct influence of the teacher has been replaced by various indirect methods like modeling, scaffolding, coaching etc. ((Brown & Campione, 1996; Collins, Brown & Newman, 1989; Cognition and Technology Group at Vanderbilt, 1993; Hannafin, 1996; Ellis, 1993; Lambert, 1986; Palincsar & Brown, 1984; Scardamalia & Bereiter, 1994; Wilson, 1995; Vosniadou et al., 1996; Young, 1993

Generally speaking many of those new models have proved to be very successful. They have resulted in more adequate ways to organize teacher-student and student-student interaction, new ways to connect school learning with the activities of the external world, and social cooperation in a more meaningful way. Also progress in students' academic knowledge, learning skills and motivation has been reported (Bruer, 1993; Lamon et al., 1996;McGilly, 1994; Schauble & Glaser, 1996).

In spite of the positive average results of these learning environments there are reasons to doubt that individual differences are not adequately considered in these models. In our opinion, the instructional designers have applied the learning theory-based principles having a confidence in their possibilities to create an optimal learning environment for all students. The assumption has been that every student would interpret the features of a learning environment in an ideal way and that they would share general learning goals with the system developers.

Learners' activities and interpretations in situations (organized according to these models) have not been adequately analyzed as individuals (Lehtinen et al.1995). There is a long research tradition that has paid attention to the individual differences in educational design (Snow, 1986) but this approach has had very little effect on recent attempts to develop experimental learning environments. Studies on social interaction in classroom learning have shown that there is often a low correspondence between the instructors' intentions and the learners' interpretations (Järvelä, 1995; Leinhardt, 1987; Winne & Marx, 1982). Empirical literature also shows that the development of learner's personal interpretations of situations during the learning process is important for his or her goal-orientation and activation of cognitive strategies (Ames, 1992; Dweck & Leggett, 1988; Lehtinen et al. 1996; Salonen, Lehtinen & Olkinuora, in press).

In research on learning disabilities there is lot of evidence showing that systemic conditions, interaction patterns, and individually different adaptation forms typical for traditional classrooms tend to increase progressive cognitive and motivational development in some students whereas lead into maladaptive and regressive coping in others (Lehtinen ym., 1995; Rueda & Mehan, 1986; Mehan, 1988; Salonen, Lehtinen & Olkinuora, in press). It is not self-evident that these features of educational institutions would disappear when we move from traditional classrooms to innovative learning environments based on ideas of constructivism and situated cognition (Järvelä, 1996). In fact there are reason to suppose that some features of the innovative learning environments would increase interindividual motivational and cognitive differences. More challenging and authentic tasks, shift from direct teaching towards coaching and scaffolding and the increasing emphasis on autonomous learning may result in more adequate motivation and higher order cognitive processes in some students whereas these learning environment features can be counterproductive in others.

In this paper we discuss what are the consequences of a change from one pedagogical context to another from the view point of different individual students. We demonstrate how students' with individual learning orientations meet a new instructional environment and consequently interpret the learning situations according to their individual expectations. We present a theoretical framework for analysing them and base the discussion of this paper on the two empirical experiments, where individual students' social and motivational interpretations were analysed in a cognitive apprenticeship based technologically rich learning environment.

Instructional principles may not always reach the aimed effects

Constructivist epistemological principles are strongly influenced the development of new learning environments. Certain tasks, activities, and learning materials are supposed to be optimal for desired construction processes in students (DeCorte, 1995). However constructivist ideas are very seldom used in analyzing students interpretations of these environments. According to the contructivist point of view each student perceives the features of the learning environment in the framework of his or her prior knowledge and makes his of her own interpretation of the coals, demands, opportunities etc. which actualize in the environment. Thus we could claim that there is never one common learning environment for all students but each student constructs his or her own learning environment.

The complex relationship of student’s social, emotional and motivational learning is often unadequately considered in designing new learning environments (Pintrich, Marx & Boyle, 1993). Evidently, constructivist and situated cognition based ideas of learning environment not only increases the potential of student’s learning but also may increase the confusion of an individual learner concerning goals, demands and threats of the situation. It is not necessarily easy for an individual learner to get involved in social processes, authentic situations and solving complex and ill-structured problems. Becoming an active learner is a demanding process which activates learners’ intentions, goals and interpretations in many ways. As Langer (1989) has demonstrated higher quality self-directed learning activity requires that learners have ownership of their learning and performance.

While situated learning (Collins, Brown & Duguid, 1989) adopts to the social practice in the lived-in world, its' application to the institutional schooling may not be obvious. Traditional apprenticeship is very contextualized, because the skill is learned in a certain situation and for a particular purpose. Learning is bound to the culture of expertise in the specific cultural practices in non-academic settings - for example, in traditional crafts or everyday activities (Lave & Wenger, 1991; Rogoff & Gardner, 1984). However, academic learning is built on its own intellectual culture, which is separate from the cultural practices of which the living disciplines are constituted. The kind of sustained practice required to develop excellence in an advanced domain is not inherently motivating to most individuals and requires substantial cultural support (Anderson, Reder & Simon, 1996; Bereiter, 1994).

Cognitive apprenticeship is a widely accepted model to integrate the best features of these two cultures (practical and academic) into a coherent model.
Esimerkiksi kognitiivinen oppipoikakoulutus on johdonmukainen sysnteesi näistä kahden kulttuurin parhaista piirteistä, mutt toteutuuko se oppilaiden mielssä.

Another, well known and broadly applied instructional principle which not always reach the aimed effects is the overreliance on group instruction at the expence of individual learning. There is a rich tradition, which emphasizes success in various forms of small group learning in a group level (e.g. Slavin, 1989), but ignore many negative effects on a individual student level. Still, many research findings report on studies where group processes may cause a negative effect on individual student interpretations and, thus, not lead to a productive learning environment (Good, Mulryan & McCaslin, 1992; Kerr, 1983; Salomon & Globerson, 1989).

Subjective construction of a learning environment

The very conception of learning environment is based on constructivist thinking. Traditional teaching conception was more or less based on empiristic ideas of knowledge transmission from a teacher to a learner whereas the conception of learning environment refers circumstances which facilitate students' construction. In recent learning research the individualistic and socio-cultural characteristics of construction has been emphasized. Typical design principles of modern learning environments are subjects to critical remarks. from both constructivist view points. If we accept the constructivist epistemological approach it is, in fact, not possible to create a learning environment for students but only a set of arrangements which will be interpreted differently by all students. Thus the actual learning environment is a subjective construction of the learner and there is no guarantee that an individual student interprets goals, tasks, activities, interactions, tools, demands etc. of the situation in the way that was meant by the designer. Same instructional arrangements can facilitate higher order learning in some students and lead to inadequate learning activity in some others.

From the point of view of socio-cultural theory schools and classroom activities will be interpreted in the frames of culturally constructed meanings which in addition can vary between subcultures. It would be naive to suppose that these culturally mediated meanings only affect student behavior in traditional classrooms but not in innovative learning environments.

Any attempt to change the quality of learning by creating new learning environments presupposes the idea that the new environment would arouse new learning goals and enable new cognitive activities in students. This influence is, however, mediated by students subjective interpretations of features of the new situation. According to our prior research on learning and learning disabilities in traditional classrooms we assume that student's socioem

A theoretical framework for the development of student's learning activity: motivational orientation point of view

In our research group we have developed a systemic approach that describes the long-term development of learning activity of students in typical learning environments. This approach is based on the assumptions that learning, as a constructive process, is subordinate to a larger goal-oriented activity system of student (Lehtinen et al. 1995). This activity system can be described in terms of subjective coping efforts, which are influenced by challenges and possibilities of the environment (i.e. social interaction, cultural conventions, social organization, evaluation systems, and features of the tasks) and by the socioemotional, motivational, and cognitive interpretations made by the learner. In a concrete learning situation, involvement in learning, quality of learning strategies, and metacognitive awareness are related to subjective interpretations of task demands, personal meaningfulness of the contents and the quality of social situation. From another perspective, the social and motivational interpretations of learning situations are influenced by the learner's emotionally important experiences from their learning histories and the quality of learning strategies available for them in that particular domain (Olkinuora & Salonen, 1992; Olkinuora, Salonen & Lehtinen, 1984).

In the model we have aimed to describe how motivational and emotional dispositions develop interactively in learning situations. In learning interaction either task-oriented or non-task-oriented coping strategies are gradually reinforced trough cumulative processes that increase the probability of a similar cognitive-emotional interaction in future learning situations. The individual is involved in a progressive cycle if interaction processes lead to task-oriented coping efforts that increase the integrity and duration of task-related cognitive activity during the next learning and performance episodes. The cycle is regressive if the processes lead to non-task-oriented coping efforts that disorganize and shorten the subsequent task-related cognitive activity. We illustrate progressive and regressive dynamics with three hypothetical examples of coping tendencies.

(a) Task-Oriented Coping

Suppose that a new task is given to a student who has a generalized motivational disposition toward task orientation. At the task-approach phase, the student's initial cognitive appraisal of task cues and instructions consists of recognizing the task as intelligible, partially familiar, or not insurmountable. This tend to include at least moderate expectation of success. Emotions like curiosity, interest, or enthusiasm arise. Such emotions are likely to promote task-approaching behaviors. The original motivational tendencies - sense of control, self-efficacy, and mastery motivation (Dweck & Elliot, 1983; Harter, 1978; Schunk, 1989) - thus interact with the initial cognitive processes to produce task-oriented coping behaviors like exploring, recognizing and mental transformation of the task elements, as well as systematic planning (Diener & Dweck, 1978; Dweck & Wortman, 1982) This in turn reinforces the student's sense of self-efficacy with regard to the tasks and will subsequently affect the next learning situations. The probability increases that any following inconsistencies, obstacles, or teacher prompts are more likely to be interpreted as positive challenges to be responded to with growing persistence in task-related efforts and with cultivated cognitive strategies.

(b) Ego-Defensive Coping

Suppose that a new task is given to a student with a generalized motivational disposition toward ego involvement or helplessness (Butkowsky & Willows, 1980; Carr, Borkowski & Maxwell, 1991; Chapman, 1988; Licht & Kistner, 1986 LÄHTEISTÄ JOTAIN POIS? MYÖS LÄHDETIEDOT PUUTTUVAT). The student will be sensitized to task-difficulty cues and the demand aspects of instructions (Zatz & Chassin, 1985). The initial appraisal may lead to interpretations like "It's too difficult a task" or "I am no good at this" (Diener & Dweck, 1978). The student's expectations of success are low. Anxiety, fear of failure, and other conflict -laden, inhibitory emotional states arise. The student does not aim at approaching and mastering the task but at relieving tension or conflict. After this initial cycle, the probability of similar interactions increases. Even a minimal difficulty or teacher demands is seen as an insurmountable obstacle that confirms the expectation of failure. The tension will increase, and further avoidance-type coping strategies will increase, and further avoidance-type coping strategies will be included. The cumulation of such interaction cycles inhibits the elaboration of cognitive-strategic activity. Plentiful off-task behavior interferes with task-related activities, and tension interferes with possible hierarchically organized systems of action. When the student fails, he or she tends to explain the failure in a self-blaming manner - for instance, in terms of poor ability or task difficulty. Negative emotional responses such as shame follow. Also, in the case of eventual success, the student typically engages in self-deprecating causal attributions, like luck or the ease of the task. To relieve postperformance negative emotional states, the student tends to avoid returning to the task. This weakens the future possibilities of encountering similar performance situations in a task-oriented manner. Thus, the disposition toward ego involvement or helplessness will be cumulatively reinforced during regressive developmental cycles.

(c) Social-Dependence- Type Coping

In this type of coping, students meet the presentation of a new task with a generalized motivational disposition toward the seeking of help and approval (Crombie & Gold, 1989; Crombie, Pilon & Xinaris, 1991). The initial coping appraisal reveals the possibilities of finding the hoped-for solution and sensitizes the student to possible guiding social hints for acceptable behavior.

The students’ expectations of success are high and are not related to the self-contained task control but instead to the possibility of getting the teacher’s help and rewards. Positive emotions are connected with expected satisfaction of the teacher or with reward from the teacher. Students are not prepared to proceed independently by constructing task requirements on the basis of given instructions. Instead, they try to cope with the situation by seeking detailed stepwise advice and positive feedback. Concentration on getting teacher’s advice for the next step hinders students from self-contained exploration, transformation of task elements, and systematic planning. Because of first social-coping efforts have been successful, even a slight obstacle will later induce a similar process. Independent of how contradictory or unsystematic the students’ trial and error efforts may have been, the only thing that matters is that they will try to get as many rewards as possible, and to achieve a final product that will be accepted by the teacher.

On the basis of our previous studies (Järvelä, 1995; Lehtinen, Vauras, Salonen, Olkinuora & Kinnunen, 1995; Vauras, Lehtinen, Kinnunen & Salonen, 1992) we can assume that students with different dominating orientations tendencies will interpret the novel instructional designs in different ways which subsequently will lead to different actual behaviors and developmental cycles among them.

Empirical experiments of cognitive apprenticeship-based learning in a technologically rich learning environment

In this paper we present the data of two empirical experiments in order to demonstrate the role of the students' situational interpretations of learning interaction. In both experiments the same technology-rich environment was used for mediating modern technological thinking and problem-solving for 12 years old secondary school male students. Students constructed physical models of automated machines by using Lego bricks. They also wrote Logo programs in order to control the functioning of the models. In both experiments the learning environment was organized according to the principles of the cognitive apprenticeship model (Collins et al., 1989, for a review of the model and cognitive apprenticeship methods see Järvelä (1996). In the experimental lessons the experienced teacher determined the practical implementation of the three essential methods, scaffolding, modeling and reflection in each different situation of a lesson. The only difference between the instructional designs of the two experiments was in the definition of the tasks. In the first experiment a previously planned task (construct a model and write a program that simulates an automated washing machine) with written instructions was given by the teacher. In the second experiment students were at first asked to visit some modern offices, supermarkets and service stations in which it was possible to observe the functioning of different automated machines. Subsequently the students were asked to define themselves the target for their model constructing project.

Experiment 1

The Experiment 1 focused to describe how the learning interaction based on cognitive apprenticeship in a complex technology-based learning environment affects the student's situational motivational and emotional interpretations (see Järvelä, 1995). Eight students' social and motivational interpretations of cognitive apprenticeship-based learning interaction episodes were analyzed. The project consisted of three lessons, each lasting three hours. Detailed qualitative on-line data of the working processes and teaching-learning interactions were collected during the experiment. The working of student pairs was videotaped and after each session the students were interviewed using a stimulated recall method. The content analysis was directed to selected episodes of the students' learning processes, because the aim of the study was to describe and interpret certain instructional interaction episodes.

Results

The results of Experiment 1 demonstrate that only some students interpreted the tasks and the teacher's activities in the way that is implicitly assumed in the cognitive apprenticeship model. Many students, compared to the other students in the experimental classroom, had a very different orientation during the experimental program. It was seen that the contextual features, such as the challenging learning task, self-responsible activities and social interaction, actualized different motivational coping strategies among the students.

For example, the essential methods of cognitive apprenticeship, scaffolding, modelling and reflection worked well between teacher and task-oriented students in terms of increasing self-directedness and formation of the relevant cognitive and metacognitive strategies. It turned out that these students had an individual heuristic approach toward the complex tasks, which was independent of the immediate social interaction offered by a peer or the teacher. Thus, for example, scaffolding discussions with the teacher became more like joint goal-oriented problem solving, where the interactors indicated a real interest in solving a complex problem (see Example 1 of an episode of the data).

Example 1 (2nd lesson)

TEACHER: The problem is, that when it stops here ...
TUOMAS: Uhm.
TEACHER: ...it'll return to the previous procedure, which then calls ...
(the boys are intensely following the teacher.)
TAPIO: Why's that? I mean, time's here (points with his finger).
TUOMAS: Yeah. how can you make it stop?
TEACHER: Well, the problem's here, you see... I don't know how to solve this.
TUOMAS: I mean, I was just thinking that if you put here, like, the end in parathesis
and then end and "onfor 40".
TEACHER: Uhm.
TUOMAS: No, no, I mean "to" end and "onfor 40".
TAPIO: What? It's going to end at four seconds.
TUOMAS: (Laughs.) ...and it'll go nuts! Right! So, I just put here end and then
"talkto a", let's say "onfor 40". (Types it into the computer.)
TAPIO: Then the motor should rotate for four seconds.
TUOMAS:That's right. Will it restart after that?
TEACHER: Well, there may be a couple of problems left ...
(They all try the program out.)

Interview:

INT: Tapio, what's happening here?
TAPIO: We've got a problem there on that program and we're trying to solve it with the teacher.
INT: Tuomas, can you guess what the teacher was thinking about at that point?
TUOMAS: Well, we'd done that pretty well, so I guess he thought we were quite good at it.

Researcher's interpretation:
The teacher and the boys are solving a problem together. The teacher indicates that the problem is difficult to solve, but still they are highly involved in solving it, even though it is the end of a lesson. It seems that all the interactors are equally contributing to the joint aim.

Instead, confronting obstacles and feeling insecure in problem solving led to negative situational interpretations among non-task-oriented students. Negative self-appraisals aroused ego-defensive or social dependence type of coping behavior among some students and resulted in a lower level of cognitive engagement. The teacher's scaffolding discussions strengthened the students' beliefs in self-efficacy but the students were not able to benefit from the scaffolding discussion for progressively increased self-directed work. Rather, they became motivationally more and more dependent on frequent help from the teacher (See Example 2 of an episode of the data).

Example (2nd lesson)
PAULI: There's some problem there. It starts off but if you open the door
it won't close until you type in "off".
TEACHER: Uhm. Should we do it like this?
PAULI: I don't know. I suppose it shouldn't do that. It should say: "a" port and then it
should listen to the six and then wait...
(Jukka talks with the boy next to him and does not pay any attention to the work.)
TEACHER: I wonder how we should solve this so that it wouldn't get interrupted?
PAULI: Yeah, and then start it up.
TEACHER: Yes. Or, for example, start it up if ... Does it rotate the wrong way round?
PAULI: Yes, but ...
TEACHER: Then we could try this...
(Both of them try it out and observe the functions of the model.
Jukka starts to show some interest in the work as well.)

TEACHER: There's still a problem of getting it to ...
JUKKA: ...to stop! (After following the teacher and Pauli working on the program,
Jukka starts to get excited about the work.)
TEACHER: That's right. How can we do that? Well, this is a good one. Let's have a look here. There's the word "waituntil" which we can use. Could we use it twice? (The boys think about the question.)
PAULI: That means it'd take ...
TEACHER: Let's continue from here. I give you a hint. Type in "waituntil" there. How would you continue it?
Good! This is a hard one to crack.
PAULI: "Waituntil off"...
TEACHER: And then comes sensor and ... I wonder what the mode should be? Think about that.
PAULI: It should be "false", of course!
TEACHER: Great! Let's try that. I'm not sure if it'll work. Do you think it'll work?
JUKKA: I think it should work now.
TEACHER: Well, try it. Press "enter"... All right, now it works again.
PAULI: We should still have something that makes it continue working!
TEACHER: Yes, that's true, but let's save that one for the next time. This one's pretty good, isn't it?
PAULI & JUKKA: Uhm.

Interview:
INT: Pauli, what did you think when the teacher was helping you? How did he help?
PAULI: Well, he sort of tried to get me to think.
INT: Is it a good way?
PAULI: Rather good, but I would prefer him to just tell me straight away. It would be easier.

INT: What are you thinking Jukka?
JUKKA: I'm thinking how could I fix caterpillar treads to my gadget.
INT: You were not interested in the programming work?
JUKKA: Not any more.

Researcher's interpretation:

Pauli is trying out the program, but he needs the teacher to help. Jukka concentrates on his own constructions, he is not involved in the work. It seems that Pauli is a bit unsure of taking responsibility for his own learning. Pauli has an active scaffolding discussion with the teacher. At the end of the episode, Pauli's self-directness has increased and even Jukka has got involved in the work. The interview, however, reveals strudents' extrinsic orientation

The interviews during the third lesson demonstrates how a student constructs his interpretions in a novel learning situation according to his prior learning experiences. In the interview at the beginning of a third lesson Antti expresses feelings of insecurity:

Interview (2 nd lesson):
INT: What were you thinking about at the beginning of the lesson?
ANTTI: Well, we've been told that we'll be having pretty difficult stuff now. At that point I wasn't too sure how to get through that lesson.

The second interview, which follows rather soon the first one, reveal signs on emotional conflict and low motivation which may base on his prior negative situational interpretions.

Interview (2nd lesson):
INT: What was the most interesting thing about this task?
ANTTI: Uhm… (laughs) nothing really interested me and some of it was so difficult that I didn't understand it anyway.

Experiment 2

Experiment 2 had a developmental perspective focusing to analyze how students with different orientation tendencies in traditional classroom learning develop their motivational orientation in the experimental learning environment (See Järvelä, 1996). Before the experimental lessons, the 14 students' motivational orientation tendencies in a traditional classroom were rated with the help of paper and pencil tests and teacher ratings. On the basis of that 6 students: two task-oriented, two ego-defensively disposed and two social dependency disposed were assigned to analysis. Detailed qualitative on-line data of the working processes and teaching-learning interactions were collected during the experiment. The project consisted of five lessons, each lasting three hours. The working of student pairs was videotaped and after each session the students were interviewed using a stimulated recall method. In a microlevel process analysis the students' motivational orientation and situational coping strategies were classified according to a predescribed system of categories.

Results

The results of the Experiment 2 indicate a tendency toward task orientation and working processes among the students during the experimental lessons. Students with strong tendency to non-task-orientation in traditional classroom situations tended to act in an increasingly task-oriented way during the experiment.

The case-based data shows that two students who originally showed task-orientation tendency increased their task-orientation during the experiment. The two students, whose dominant orientation was ego-defensiveness during the traditional classroom lessons indicated task-orientation during the experimental lessons. However, another student also maintained his ego-defensiveness. One student whose initial orientation was social-dependence, expressed ego-defensiveness and the other student indicated task-orientation and some ego-defensive orientation.

The analyses of the task-oriented students' learning processes reveal some long, intensive on-task periods, which involved multiple higher-order cognitive activity and task-related social interaction. On one hand, the teacher was accepted by the students as an expert partner in joint problem solving; on the other hand, task-oriented students were able to benefit from the teacher's instructional methods, such as modelling and scaffolding. Cases of ego-defensive students indicate that a marked change in the system of learning and social interaction in the experimental lessons may have been a relief for an ego-defensive student and helped him to activate his task-related interest instead of other-related interpretations. Example 3 demonstrates Jari’s task involvement and learning goal-orientation. In traditional classroom Jari indicated ego-defensivess, but in the experimental lessons he demonstrated task-orientation.

Example 3 (4 th lesson)

A student pair is working in the 4th lesson to construct a model for an automated door in super market. Jari is testing the Lego model. His partner, Pasi, observes Jari but does not take part in the interaction.

JARI: (Thinking aloud) Oh no! Damn! It spins in the wrong direction every second time! Wait, wait...now it goes that way (observing). Now I have to get it function (concentrates on testing the model for some minutes)

JARI: Hey, teacher, come and see this! Can you see, the gate goes up now, but why it doesn't go down?

TEACHER: Should you set the 'go down' time longer?

JARI: Hmm...yeah...(mumbles by himself, fixes the orders and soon starts experimenting)

Interview in the end of the 4 th lesson:

INT: It's the end of the lesson? What are your feelings ?

JARI: I was a little bit tired.
INT: What is the situation with your work?
JARI: We tried to get the gate function, because it functioned only every second time.
We tried to solve the problem with the teacher, but we didn't manage...Ash! Even the customers of the supermarket would suspect that kind of gate!
INT: Were you satisfied with you working during the lesson?
JARI: No.
INT: Why not??
JARI: I did not accomplish the task.

Cases of social-dependence oriented students indicate that a marked change in the system of learning and social interactions may cause an emotionally threatening situation for a socially dependent student and activate ego-defensive coping behavior, because he or she is not able to utilize the familiar features of the social system he or she is used to. In general, the open learning environment based on technology involved exploratory activities that may have facilitated task-related social interaction and shared problem solving among all students. In interviews are seen Mika’s situational interpretations of the lesson. Mika indicated social-dependency in traditional classroom lessons, but expressed ego-defensiveness and task-orientation in the experimental lessons. The interview in the 3rd lesson demonstrates ego-defensive interpretations, such as negative self-judgements and unsureness in the face of new situation, while the next interview in the 4th lesson points out task-oriented interpretations.

EXAMPLE 4
Interview in the 3rd lesson:
INT: How would you describe your working during the lesson? Were you satisfied, or ...?
MIKA: I don't know... I was rather satisfied, or actually... I don't know.
INT: What did you learn?
MIKA: Nothing.

INT: What about the task? How did you like working like this?
MIKA: Well, it was a bit silly in the beginning. It was a a new and difficult idea. We had also a new teacher...but when we started to work, it was rather nice.

Interview in the 4th lesson:
INT: Mika, what happens now?
MIKA: We are continuing our work, and... we just got some ideas on how to progress. We are just getting full speed! Now we are thinking about how to set the motor in. We have a nice phase going on.
INT: What was your feeling toward the work ?
MIKA: I felt very O.K. When I get started, I feel good.

Conclusions

In this study students interpreted and experienced the new learning environment very differently, and only some students' interpretations correspond to the implicit assumption of educational designers (see Järvelä, 1996a). Students' subjective learning goals together with their interpretations in a different situations activated different coping strategies; either made the students negatively anticipate learning situation or supported spontaneous involvement in a learning task. It turned out that the spesific instructional activities (e.g. teacher's modelling) or certain features of a learning environment (e.g. self-responsibility) *did not lead to the aimed effects among the all students, but caused also contradictory effects*. This argument bases on an assumption that learner's cognitive performance consists of his or her emotional and cognitive interpretations, which are actualized during a task performance (Olkinuora & Salonen, 1992).

The interpretation of the data from the point of view of an individual student also arouses a question: Is it possible that instructional designs that differ very much from traditional forms of school learning may result in deep changes in the motivational tuning of students? The *features of the open learning environment may inspire a student to different activity and interaction* than he or she has used in his or her previous learning situations. In this study task-oriented students' working processes were inspired by the ”culture of expertise” -created by the goal-oriented discussion between the teacher and students. Non-task oriented students, instead, were provided with novel experiences of personal choice, freedom to explore and apply individual approaches to learning process.

What is, then, the possible origin of a change in the students' motivational orientation in a new, constructivist learning environment? Merely a belief on a power of the new educational concepts, such as ”open learning” or ”classroom as a learning environment”, is not enough to develop individual students' learning. On the basis of the results of this study, we assume, it is a systemic change in students' and interaction processes, interpretations and activity. Accordingly, the interaction process is directed to the current task to be solved, which may relieve student's ego-related or other-related interpretations and help a student to activate task-related interpretations. The teacher can, then, offer process-relevant support in student's ”zone of proximal development” (Tharp & Gallimore, 1988). This provides a student with the possibility to get a new kind of experience of understanding, coping and self-regulation.

Although the application of new learning environments and instructional methods have made progress in schools, it is important to understand that the essential components of learning, motivation and goal-orientation, are not built in the learning environment. Students' subjective interpretations are important variables that interact with variables in instructional environment.

References

Anderson, J.R., Reder, L.M., & Simon, H.A. (1996). Situated learning and education, *Educational Researcher*, *25* (4), 5-11.

Bereiter, C. (1994). Constructivism, socioculturalism, and Popper's world 3. *Educational Researcher, 23*(7), 21-23.

Brown, A.L., & Campione, J.C. (1994). Guided discovery in a community of learners. In K. McGilly (Ed.), *Classroom lessons: Integrating cognitive theory and classroom practice* (pp. 228-270). Cambridge, MA: MIT Press.

Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher, 18* (1), 32-42.

Bruer, J.T. (1993). Schools for thought. A science of learning in the classroom. Cambridge, MA: MIT Press.

Collins, A., Brown, J.S., & Newman S. (1989). Cognitive apprenticeship: Teaching the craft of reading, writing, and mathematics. In L. Resnick (Ed.), *Knowing, learning, and instruction: Essays in honor of Robert Glaser* (pp. 453-494). Hillsdale, NJ: Lawrence Erlbaum.

Cognition and Technology Group at Vanderbilt (1993). Anchored instruction and situated cognition revised. *Educational Technolog*y, *33,* 52-70.

DeCorte, E. (1995). Forstering cognitive growth: A perspective from research on mathematics learning and instruction. Educational Psychologist, 30 (1), 37-46.

Honebein, P.C., Duffy, T.M., & Fishman, B.J. (1993). Constructivism and the design of learning environments: Context and authentic activities for learning. In T.M. Duffy, J. Lowyck, & D.H. Jonassen (Eds.), Designing environments for constructive learning (pp.87-108). Berlin, Heidelberg: Springer-Verlag.

Järvelä, S. (1995). The cognitive apprenticeship model in a technologically rich learning environment: Interpreting the learning interaction. *Learning and Instruction*, *5*, 237-259.

Järvelä, S. (1996a). *Cognitive apprenticeship and technology: Extending a learning environment with analyses of students' socioemotional interpretations.* Manuscript submitted for publication.

Järvelä, S. (1996b). New models of teacher-student interaction - A critical review. *European Journal of Psychology in Education*, in press.

Lamon, M., Secules, T., Petrosino, A., Hackett, R., Bransford, J., & Goldman, S. (1996). Scools for thought: Overview of the international project and lessons learned from one of the sites. In L. Schauble & R. Glases (Eds.), Innovations in learning. New environments for education. (pp). Mahwah, NJ: Lawrence Erlbaum.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation.* New York: Cambridge University Press.

Lehtinen, E. & Repo, S. (1996). Activity, social interaction, and reflective abstraction: Learning advanced mathematical concepts in computer environment. In S. Vosniadou, E. De Corte, R. Glaser & H. Mandl (Eds.), *International perspectives on the Design of Technology-Supported Learning Environments* (pp. 105-128). Hillsdale, NJ: Lawrence Erlbaum.

Lehtinen, E., Vauras, M., Salonen, P., Olkinuora, E., & Kinnunen, R. (1995). Long-term development of learning activity: Motivational, cognitive and social interaction. *Educational Psychologist, 30,* 21-35.

Leinhardt, G. (1987). Development of an expert explanation: An analysis of a sequence of subtraction lessons. *Cognition and Instruction, 4*, 225-282.

Lin, X., Brandsford, J.D., Hmelo, C.E., Kantor, R.J., Hickey, D.T., Secules,T., Petrosino, A.J., Goldman, S.R., & The Cognition and Technology Group at Vanderbilt (1995). Instructional design and development of learning communities: An invitation to a dialogue. *Educational Technology, 5,* 53-63.

Lowyck, J., & Elen, J. (1994). Student's instructional metacognition in learning environments (SIMILE). Unpublished paper. University of Leuven, Centre for Instructional Psychology and Technology.

McGilly, K. (Ed) (1994). Classroom lessons: Integrating cognitive theory & classroom practice. Cambridge, MA: MIT Press.

Mehan, H. (1988). Educational handicaps as a cultural meaning system. Ethos, 16 (1), 73-91.

Palincsar, A.S., & Brown, A.L. (1984). The reciprocal teaching of comprehension monitoring activities. *Cognition and Instruction, 1*, 117-175.

Pintrich, P.R., Marx R.W., & Boyle R.A. (1993). Beyond cold conceptual change: The role of motivational beliefs and classroom contextual factors in the process of conceptual change. *Review of Educational Research, 63,* 167-199.

Resnick, L.B. (1991). Shared Cognition: Thinking as social practice. In L.B. Resnick, J.M. Levine & S.D. Teasley (Eds.). *Perspectives on socially shared cognition* (pp. 1-20). Washington, DC: American Psychological Association.

Rogoff, B. (1990). *Apprenticeship in thinking*. New York: Oxford University Press.

Rogoff, B., & Gardner, W.P. (1984). Guidance in cognitive development: An examination of mother-child instruction. In B. Rogoff, & J. Lave (Eds.), *Everyday cognition: Its development in social context* (pp.95-116). Cambridge, MA: Harvard University Press.

Rueda, R. & Mehan, H. (1986). Metacognition and passing: Strategic interactions in the lives of students with learning disabilities. Anthropology & Education Quarterly, 17, 145-165.

Salonen, P., Lehtinen, E. & Olkinuora, E. (in press). Expectations and beyond: The development of motivation and learning in a classroom context. In J. Brophy (Ed.), Advances in Research on Teaching, Volume 7. JAI Press. Submitted for publication.

Steffe, L.O., & Gale, J. (1995). *Constructionism in education*. Hillsdale, NJ: Erlbaum.

Teasley, S.D., & Roschelle, J. (1993). Constructing a joint problem space: The computer as a tool for sharing knowledge. In S.P. Lajoie & S.J. Derry (Eds.), *Computers as cognitive tools* (pp. 229-257). Hillsdale, NJ: Lawrence Erlbaum.

Tharp, R.G., & Gallimore, R. (1988). *Rousing minds to life*. Cambridge: Cambridge University Press.

Wilson, B.G. (1996). *Constructivist learning environments: case studies in instructional design*. Englewood Cliffs, NJ: Educational Technology Publications.

Vosniadou, S. De Corte ,E., Glaser, R. & Mandl, H.(Eds.)(1996), *International perspectives on the Design of Technology-Supported Learning Environments* (pp. 105-128). Hillsdale, NJ: Lawrence Erlbaum.

Young, M.F. (1993). Insructional design for situated learning. *Educational Technology Research and Development*, *41*, 43-58.