WORKING WITHIN INNOVATIVE KNOWLEDGE COMMUNITIES AS A CONTEXT FOR DEVELOPING PEDAGOGICAL PRACTICES

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INTRODUCTION

Rapid changes in current knowledge society present new challenges to human competence. Productive participation in knowledge-intensive work requires that individuals, their professional communities, and their organizations develop new competencies, advance their knowledge and their understanding as well as produce innovations. This is reflected in developments in professional communities wherein work is increasingly focused on the deliberate advancement of knowledge rather than on the mere production of material objects (Bereiter, 2002). In parallel with these changes in society, conceptions on learning, knowledge practices, and social organization of learning also have to be transformed so as to facilitate corresponding competencies. Epistemological issues related to learning and knowledge advancement are becoming increasingly important. In order to conceptualize and understand the nature of work and activity in current knowledge society, one has to comprehend the various types of knowledge that intersect within complex and heterogeneous networks that consist of humans and various artefacts (Engeström, 1999; Latour, 1999). Consequently, this necessitates for an epistemological shift in those practitioners within the field of education who are interested in adapting the educational system to cope with these emerging challenges.

Educational institutions that make an attempt at addressing these structurally different knowledge practices in their pedagogical approach, are challenged to redesign (aspects of) their curriculum as well as to advance and support the practices and professionalism of their educators. This means that they are not only challenged to learn to go beyond their individual efforts and to collaborate within communities for the advancement of their knowledge practices, but moreover their role is changed from one of delivering knowledge or designing pre-formulated tasks, to a more open role involving providing process support to a groups of students. However, although we are in a period of change, educational practice still has many characteristics of the transmission scenario (Andriessen, 2006). This scenario, which corresponds to the premises of the acquisition metaphor to learning (Sfard, 1998) and that characterizes most formal education, centres on the acquisition of declarative knowledge and a limited number of critical skills, by a system of lectures, textbooks, and testing. Therefore, to cope with the cognitive, social, and motivational challenges of the emerging knowledge-based society, tools and methods are needed to improve the quality of learning and to transform the educational system accordingly.

Paavola & Hakkarainen's model of knowledge-creation (2005) provides a framework for educators to develop and advance their practices of learning and instruction. A central feature in the knowledge-creation approach is *mediation* (see Engeström 1987); meaning that people collaboratively create knowledge through the development and advancement of shared objects of activity. It is characteristic of this kind of knowledge advancement that it takes place within innovative knowledge communities which are organized around shared objects of activity whose creation and development defines their purpose (Star, 1989). The knowledge-creation view represents a 'trialogical' approach because the emphasis is not

only on individuals or on community, but on the way people collaboratively develop mediating and epistemic artefacts.

A distinctive application of this involves communities in which teachers, educators, researchers and other actors concerned are engaged in the *collaborative design* of curricular *artefacts,* such as instructional modules, assessment rubrics, educational ICT applications, and written educational reports. A central challenge in transforming pedagogical practices thus resides in its potential for educators to learn from and with their own learners and other professionals in the work place (the school setting) or training environment as they create and advance shared knowledge artefacts that are relevant for advancing their knowledge and professionalism (Eraut, 2000). Collaborative processes between partners from multiple fields of knowledge call for managing of a new kind of interagency supported by collaborative strategizing, in addition to creating conditions that encourage constant reflection on an individual level (Chitpin & Evers, 2005).

However, if we are to theorize about the significance of these kinds of knowledge communities on educators' practices, we must be able to demonstrate how these communities achieve their effects. The goal of this chapter is to report on an example taken from a case study which investigated the ways in which pedagogical ideas are transferred from the context of their design to their actualization in pedagogical practices.

COLLABORATIVE DESIGN AT UNIC

UniC is a secondary school in Utrecht in The Netherlands where students can discover and develop their talents. UniC values differences between individuals and prioritizes students' own learning needs. In their pedagogical approach UniC coaches towards the national school exam, thereby not only focusing on knowledge acquisition but also stressing developing competencies, skills and personal development. Students work on themes or assignments in their own pace, at their own level, and can choose their own learning methods and tools. There are no lessons in the traditional sense, students perform in working sessions. These sessions are taken together with students of comparable level, or individually. Every student can choose his/her way of working: on computers, with paper and pen, experiment, interviewing experts, or study cases in practice. The learning context fosters feedback and support between groups. The teacher only helps when requested, but explicitly does not take over the process. And only when requested will students receive central instruction. The physical context is adapted to students of the Internet-generation: UniC actively employs e-learning, using internet, email and multimedia, and there is a laptop available for every student.

Teachers' practices at UniC normally involve developing themes and assignments and providing guidance for students' self-directed learning process. In addition, teachers give workshops in case students require more necessary or background information concerning particular knowledge domains. There are no fixed testing periods, which means that students can deliberate together with their teacher when they have accomplished an assignment and when they can take a test to complete the assignment. The nature and the timing of the end result of any assignment is negotiated with the teacher.

Furthermore, the teacher community at UniC can be characterized as highly reflective, since teachers observe each others' pedagogical practices and provide intensive constructive feedback based on their enquiries. Additionally, development towards self-reflective professionalism is strongly fostered at UniC, since a great deal of opportunities is offered for participating in in-service teacher courses.

By clever organization of compulsory learning materials students have sufficient time left for developing their own talents and interests within or outside of the school context. Every week there is a part of a day reserved for such activities. The school supports the students and offers possibilities to carry out their plans. Every period, which last 8 weeks, students negotiate these plans with the teachers. All results and scores can be retrieved in personal portfolios.

However, the dean and teachers at UniC expressed the aspiration to challenge their students more during this period in specific. Therefore, via a project coordinator they contacted educational researchers at Utrecht University working in the Knowledge-Practices Lab project to join forces to redesign, implement and empirically test this module for their second and third year students. A multi-disciplinary team consisting of these researchers, teachers, students, dean, and external experts was arranged aimed at the redesign of this learning module based on principles of the knowledge creation metaphor, which was found to match UniC's general pedagogical approach and aspiration. The ultimate goal this community wanted to achieve was that students would create their own knowledge and develop agency during technology-supported authentic projects in which they collaboratively work in small groups around knowledge objects. Implementation of this module implied that a high demand is placed on the teachers involved, since they had to: a) comprehend the theoretical principles behind the knowledge creation metaphor, b) apply these principles in their practice, and c) reflect on their role as a teacher and transform their practices accordingly to scaffold students' knowledge building processes.

Several weeks before this module would commence, project partners had several meetings to get acquainted with each other, pedagogical approach and practices at UniC and with the model of knowledge creation. In addition, a preliminary curricular approach was taken to guarantee a high-quality implementation start of the project at UniC, also by involving both students and their parents. During the project partners organized several informal meetings which served to improve the design of the learning module based on experiences of teachers and researchers encountered during implementation of the module and based on theoretical insights from the trialogical perspective on learning. To accomplish this aim, the multi-disciplinary team at UniC has to create conditions for reflecting on and advance their practices in face of the interchange between the different modes of knowledge. However, how can we model developments of practices within the frame of the knowledge creation metaphor?

CONCEPTUALIZING DEVELOPMENT OF PRACTICES IN COLLABORATIVE DESIGN

A difficulty in discursive studies of communal communication concerns the conceptualization and operationalization of developments in knowledge practices. A fine grained analysis of naturally occurring interaction among members of a community should enable us to understand how and to what extent they afford opportunities innovation in pedagogical practice (Little, 2002). An analysis of data requires an integrative top-down and bottom up approach which means that analytic concepts are needed that fall in between both theory and specific data obtained. A theoretical framework which fits into the premises of the knowledge creation metaphor of learning and that is considered relevant for offers these intermediate theoretical concepts is Cultural Historical Activity Theory (Engeström 1987; Leont'ev, 1978).

CHAT advocates that learning is one form of human activity, which is based on actions in collective activity systems that take place within the larger socio-historical context. CHAT emphasizes the semantics communities attach to mediating objects and activities

(Engeström, 1987). To illustrate, the practical object-oriented activities performed by the multidisciplinary team at UniC relating to the design and implementation of a new learning module organizes the work in this community (cf. Leont'ev, 1978). Their activities are provided with focus and strategy which is afforded by the objects they develop. The object is the purpose of the community that motivates and defines the horizon of possible goals for its actions (Engeström, 1995; 1999). Objects capture and preserve the socially negotiated and shared knowledge developed within a particular community and mediate the individual subjects' relation with the other community members (Stahl, 2003). The artefacts used in an activity are not tools or signs in their own right, but they become tools and signs when they are used as such.

CHAT defines the concept of a knowledge practice as an patterned array of human activities on shared objects which are grounded in tradition and shared by a community of knowledge workers (Engeström, 1987; Schatzki, 2002). The practice of collaborative design implies a situated and socially mediated activity that is related towards the gradual and iterative advancement of a certain object (i.e., the organization and redesign of a learning module) within a certain community with its own rules, values and norms for collaborative work (Kaptelinin, 2002). All these components have an impact on the way this design process is carried out.

The concept of practice entails stability as well as change (KP-Lab, 2006): A practice is characterized by relative stability in the sense that it partly involves recurrent procedures, intentions, beliefs, underlying values and epistemological conceptualizations as well tools used. At the same time, practices are open to change in that each activity based on this practice has to be adapted to changing contexts and particular circumstances and therefore is transformed whenever an activity is carried out. In addition practices are characterized by their social nature, which means that practices are shaped by and evolve within a knowledge community, ultimately becoming part of the its identity.

Provided that for the main part the work of a community focused on collaborative design involve discursive activities, utterances of its members can only be understood within its conversational context. Bahktin (1981; 1986) refers to the concept of multivoicedness or dialogicality to capture how diverse voices of community members react and inform each other and their activities. These individual voices coming into play are informed by the broader socio-cultural historical context in which they are enacted (Akkerman, Admiraal, Simons, & Niessen, 2006). This multivoicedness thus provides the platform for further development in the shared and individual design practices of the community.

From the perspective of CHAT, a community attempting to transform their practices is necessary when these practices embedded within the activity system are not sufficient for solving and conceptualizing contradictions arising within the system or in relation to its socio-cultural environment (Engeström, 1999). Engeström (1987; 1995) proposes the concepts of disturbances, contradictions and tensions as the conditions that open up opportunities for creative efforts in activity and communication and are as such the driving force behind innovative communal practices. Changes in practices are due to external as well as internal disturbances. While practices might change when new tools become available or circumstances and contexts shift, they can also be deliberately altered by those carrying out the activities when they invent new strategies of working or activities (Béguin, 2003). In addition, members of a community may experience difficulties in constructing a connection between the goals or their actions and the object and motive of the collective activity, which may give rise to tensions (Engeström, 1999).

A more analytical approach to the development of practices from the frame of CHAT is advocated by Ludvigsen, Rasmussen, Krange, Moen, & Middleton (in press). They conceptualize that learning or development of practices occurs when different modes of knowledge meet and intersect and that consequently meaning potential becomes transformed to common objects. As such, members of a community represent a set of trajectories where individual experiences and negotiations between them contributes to construct their shared trajectories. To have an implication on the collaborative design practice and object participants have to make stance which corresponds to an idea for innovation (Gilly, 1997; Lemke, 2000).

Ludvigsen et al. (in press) conceptualize communities as activity systems that create social expansion through changes in the activity system's direction through their relation to the object. Trajectories are a way to view how these activity systems dynamically change their relationship towards the object, create new practices and discursive activities. These developments occur as a result of current practices prove to be insufficient in face of difficulties in the ongoing work and when trajectories within communities intersect. According to this line of reasoning, learning or development of practices occurs when members attempt to negotiate about how to adapt their knowledge practices as a results of these disruptions feeding into the shared object (i.e, "gap-closing").

Moreover, development of practices also necessitates for reflective activity of the members of a community related to ongoing object-related work and progression thereof. Thus, not only external tensions but also internal from within the sphere of the community is needed. The zone of proximal development can be articulated by the member of the community when they reflect on the history of their activity as well as foresee how to progress in the future (Engeström, 1999). Zones of proximal development may be understood as spaces of potential transformation of the activity system and its practices, achievable through resolving and transcending its contractions (cf. Ludvigsen et al., in press; Engeström, 1987) Both multivoicedness and tension-laden actions (e.g., intersection of knowledge and backgrounds) emerge into this zone of proximal development of the community and should be taken into account.

As practices inevitably change when concrete activities are carried out, the development and transformations of practices proves to be an ongoing and contingent process. Due to this dynamic nature of practices, the design of a new object might overcome shortcomings of former existing objects, but when they are employed as tools this will restructure the nature of the current practices and will in this manner create new opportunities but also new problems and challenges (e.g., Carroll, 2000). It has to be noted however, that objects obtain their epistemic semantics from within the context of their use in practioners' knowledge practices and that the advancement of these practices transcends that of their objects (KP-Lab, 2006).

Now we turn towards the application of these concepts in a number of examples that were taken from the case study that was performed at UniC. Our rationale in selecting and reporting on these examples is to take a situated activity system as the basic unit of analysis (Goodwin, 1997), meaning that we attempted to discern the underlying rationale for discourse related to object-related activity (see also Little, 2002). We illustrate the development of a particular community's practices as a result of discursive activities reflecting tensions in their current practices followed by the community's attempt to overcome these tensions by adapting their pedagogical practices.

AN EMPIRICAL ANALYSIS OF DEVELOPMENTS OF PRACTICES AT UNIC

As shown in Figure 1, the activities of the partners participating in the design team cut across the practices occurring within the following two intersecting levels: a) that of the students engaged in learning activities, and b) that of the community consisting of project partners who collaborate on the (advancement of the) redesign of the module based on principles of knowledge creation.
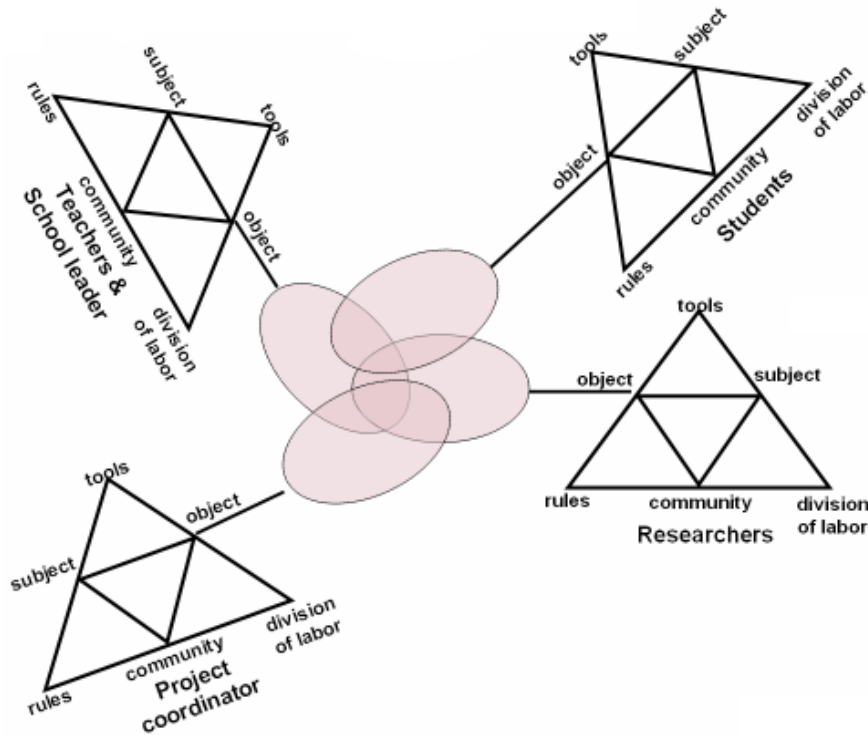
Figure 1. *Visualization of the various intersecting multi-disciplinary activity systems at UniC resolving around advancement of boundary object*

The design team at UniC consist of partners coming from diverse fields of knowledge, such as: educational sciences, practical pedagogy, psychology, and teacher education. The negotiating between the diverse voices and modes of knowledge originating from these fields serve the development and advancement of the shared boundary object (Star, 1989); that is the redesigned course module. The following are the names and roles of the project partners involved[1]:

- Researchers: Patrick (R1), Jerry (R2), Crina (R3), and Mirjam (R4)
- Pedagogical expert: Amélie (PE)
- UniC:
  - Teachers: James (T1), Mark (T2), Milla (T3), Ludivine (T4)
  - Dean: Sigmund (D)
- Project coordinator: Bo (PC)

At one of the very first meetings, each partner expressed their expectations regarding the multi-disciplinary collaboration. Whereas researchers expressed the aspiration of investigating various aspects related to the implementation of principles of knowledge creation and practices in education, teachers and the dean at UniC wanted to create new

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[1] For reasons of anonymity, the names presented under the labels 'pedagogical expert', 'teachers', 'dean', and 'project coordinator' are pseudonyms; in parentheses the abbreviations of the roles of the team members are provided and which are employed in the selected protocol fragments.

ways to provide some of their underachieving students with an extra challenge. This was not exactly in line with the expectations of the researchers who wanted to focus on a broader range of students to participate in the redesigned module. Rationale behind this inclination, was that researchers reasoned from the perspective of generalizability of their research findings which would be confounded employing such a specific sample of participants.

JET	I noticed that there is a difference, just like we had at the start, that Unic has a two different interest, students need to learn trialogical learning but another goal needs to be reached at the same time. I think you discuss both of these interests in different meetings. We should look into that, I think that is important.
R	Yes.
A	But what would be the suggestion to handle this? We have both have different views. We should discuss this although it is difficult because the researchers look at it differently, well maybe we could combine it. We can start from there.
JE	It depends on what you expect. I think it would be interesting to see what everyone expects what is going to happen and when.
M	It would be good, as supervisors, to put those expectations in writing. We should write down what we expect to happen with the students that are working below their level and what we are hoping to happen. That would be very useful when supervising those students.
D	And if it is possible to help those students. It is possible that it doesn't work for all students […]
A	I would suggest to discussing that first with the teachers first without the researchers. You will have a better understanding what you are observing and what you think important aspects are, there should be more focus on those issues […]
P	Exactly, we are working on what is happening on a more general level. That is purpose of this pilot. What is happening and how can we improve trialogical learning.
JET	You are working on that yes..
P	It would be good to make a overview of the groups, to see what is happening and then to compare with the views and learning objects of the supervisors. So we can discuss these together.

Protocol meeting co-design team; January 2007

This example shows how the intersecting contradictory trajectories created a tension between the knowledge modes and reasoning of researchers at the one hand and teachers and dean at the other (i.e., activity systems). The way that was decided upon to overcome this tension was to select the 30 most underachieving students, based on results obtained from a valid research instrument. The dependency relation between the partners which was related to having a sustainable fertile platform for examining knowledge creation principles in practice and to learning from each other respectively played an important tacit role in the process of negotiating which eventually led to this agreement. Also, for UniC maintaining a reciprocal and intensive relation with researchers is important and complies with a more general activity which relates to be able to provide substantiated evidence against possible criticism from other educational institutions or from governmental agencies on their innovative pedagogical approach.

Design practices were first based on relevant design principles which were based on the knowledge creation metaphor. Researchers introduced these principles as both guidelines for the redesign as well as criteria for empirical evaluation. These design principles, that were obtained and adapted from Hakkarainen (2006), describe at a very general level requirements for the pedagogical redesign of the module and were to guide the development of practices. Researchers presented these design principles as an evolving

group of general guidelines to be adapted to the particular context at hand. From the design principles discussed by Hakkarainen (2006) the researchers considered the following ones to be relevant for application at UniC:

1. Students' activities should be organized around collaborative knowledge advancement and shared objects. It should be made possible for a student group to perceive the evolution of these objects or to visualize the created knowledge artefact (i.e., authoring of cognitive trails);

2. Students work on an authentic project, involving skills, knowledge and competencies comparable to those used by professionals and experts in the work field. The intention here is to bring students in contacts with such authentic work problems and to scaffold them for creative collaborative work in their future professional environment;

3. Students' activities need to be of a complex nature, which means that they have to involve multiple sources of knowledge and it should be challenging and motivating for students to learn from the activities they perform;

4. Students have to be encouraged to use and apply their own knowledge and skills during the activities they undertake. In addition, conditions have to be created for students to foster reflective activities resulting in transformations of their shared practices. For instance, externalization of tacit knowledge requires participants to explicate connections between their ideas, and thereby inconsistencies can be identified by others; these inconsistencies represent incentives for new understanding and new knowledge;

5. Students can exchange and reflect upon each other contributions using a collaborative computer-supported learning environment (i.e., FLE3). Moreover, the learning object students produce should be useful as a tool for later use, either by other students, and/or in actual practice.

In short, the challenge of the design team was to elicit students' epistemic agency and to stimulate them to actively build, create and share emerging knowledge. An issue that was often followed up by the team was an idea posited by the pedagogical expert that the type of students addressed (most of them were also high-gifted) needed a so-called top-down pedagogical approach instead of the bottom-up approach usually employed in traditional education.

> According to Amélie (PE) students are usually approached on a bottom-up fashion in regular education. This means that first details/ elements are taught through which the big concepts becomes clear (i.e. deduction). Gifted children have more needs for a top-down approach. They first seek insight, understanding of the concept after which details get their place in the whole. The consequence of this discrepancy in this approach is that a great deal of gifted children experience difficulties in education. Decreased motivation and underachievement could result from this.

> There is a reasonable amount of gifted children on UniC (which has not yet been officially determined). The question that had arisen from a satisfaction study is whether UniC provides sufficient challenges to its students in general and its gifted children in specific. Sigmund (D) is curious to which extent gifted students will show up well by means of this project.

> We have to talk about which ways we are going to address these students and how teaching/ supervising should look like. Important is that students are involved from the start and that we explain at the conceptual level what we are up to and expect from the participating students. This means that we explain the concept of trialogical learning, what the aims are of this project and what the benefit could be. If students have attained this frame, they can start thinking of a topic. Supervising of the student would be more on the metacognitive level, not so much on the content level.
> *Protocol meeting co-design team; January 2007*

The artefact here that became part of the groups activity system involved the negotiating between the different modes of knowledge represented by the different partners to redesign the module using the idea of top-down approach. This was accomplished by explaining students (and their parents) the theoretical approach behind the newly designed module and to involve them in the collaborative development process. This nicely illustrates how multiple actors originating from different trajectories attempt to reach a shared understanding regarding the design and implementation of a particular curricular module by converging their practices into a direction towards object advancement (cf. Ludvigsen et al., in press).

Most development in knowledge practices were observable on the boundary of the activity system of students' activities and teachers' pedagogical practices showing how they balanced on institutionalized or traditional and newly developed practices. For instance, although teachers tended to fall back to their traditional 'deliverer-of-knowledge' mode, they were aware of this and attempted to resolve this issue in subsequent encounters with their student groups. Although teachers acknowledged the importance of changing and adapting their pedagogical role according to the particular student group they encountered, their role mainly corresponded to a more directive and coaching role. This was mainly reflected in the finding that they and their students reported that they did not have sufficient insight into the object progression of the student groups. Thus, teachers were not able to precisely and consistently monitor their students' activities.

This may be due to the fact that, in their social cultural context, it was not common practice to interfere with students' content-related activities. However, they closely followed up on individuals, especially the problematic students (on a cognitive or behavioural level), in order to check if they were doing their work and feeling comfortable with the group and its functioning. Actions of the teachers that subsumed under the main design activities focus on the conceptualization and advancement of their pedagogical practices during the implementation of this module.

Teachers acknowledged the importance of monitoring individual and collective students' reasoning and understanding. Still, it seemed that the teachers, although they had a different role from what was formerly adopted, placed themselves outside the collaboration process which was found in their interactions with their students. This may be related to teachers' holding the epistemic stance that their role should be to facilitate the process at a distance instead of being part of the knowledge-creation process.

> T3 And where does this go? Is it going to be one product what is going to be part of your documentary? Or are they going to become three independent products? How do I have to see this? Can you tell something about this? Or do you not know how you want to see this?
>
> S[2] Well it has something to do with the film, but it was really his own idea
> Nou het heeft wel met de film te maken, maar het heeft eigenlijk zijn eigen idee.
>
> T3 Is it more like, a book of reference after the film? Next to the documentary? You were talking about a story, that it would become a story? Or?
>
> S Well… Yes. In principle I made of that whole story and than I had a piece of the film that was placed in the future. And then I make an idea around this, you know, that is what I am going to show in those films […]
>
> T3 Okay, you are going to show them in the film? Your ideas of the future?

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[2] The 'S' signifies a student

> T3   Yes! So I have heard you saying that, you have a documentary and there is a piece from Stijn about applied automation, robot techniques in daily life. Than there is a piece on the future. Probably this is going to be next. And then the movie captions you made ar placed last

Protocol meeting T3 with student group, January 2007

> But yeah eventually my supervising become more trialogical and I focused on particular issues, such as the object or the client. Is that clear for the specific group? And if that is clear than it is due to something else. I as my students: 'Don't you have three objects and how come? Do you collaborate, do you share your opinions to make something? There are a lot of entries on a particular moment if you have that clear. […] If some students do not have a clue about what they want to do than it may come in handy to first talk with them about this. And they don't want to speak with each other than it is maybe more wise to first focus on that. So in this way, this is very different between groups. This is what makes it difficult also. Only if you are conscious of the possibilities, than it is a challenge. For instance, what are the characteristics of that group and what is the next step I have to take? What are the essential elements that I have to tackle to get the learning process back on track.

Interview segment T3, March 2007

In some cases this led to the problem of some students reporting that they sometimes experienced their teachers' support as being disruptive in the context of their activities. These observations suggest that an effective balance has to be found between what can be interpreted as top-down instruction at one extreme and social distancing at the other and as such highlight the importance of the social dimension in supporting collaborative learning and work.

The intersection of trajectories of these activity systems fed back to the design team leading to advancing their practices flowing into the main object. The activities of the project partners and of especially the teachers involved indicated a great deal of agency on their part. They showed responsiveness to feedback of the other partners, reflected on their own practices, were prepared to change their practices accordingly, evaluated their own practices and those of other teachers involved and were very engaged in coming up with new ideas based on their own knowledge and experiences and testing them in practice. For instance, during meetings teachers expressed the need to change their practices in order for these to be more in line with the new pedagogical model and to agree on how to organize their pedagogical practices more structurally.

> D   You just said that you noticed that it is not clear for the supervisors what is expected during the whole pilot and how they should supervise..
> T3   […]I do not have solution at the moment if there is even a solution. You just have discover the best way of supervising
> D   […] Students have to know what the assignment entails […]
> PE   […] So I would suggest that the supervisors can focus on helping to students create these structures. […]
> R3   Students could concretize their ideas in a plan
> T2   So I would like to coach them to make it clearer like what the object is and its requirements. So far, we have maybe been too reserved.
> PE   That is very important, and then those group members will follow their own work structure. […]
> R2   Still, it is not a bad thing that it going like this, if they first muddle a little, […]
> PE   But you shouldn't let that continue too long..
> T1   But, what you see now. That we should give a little more structure. […]
> T2   Apparently that is needed
> R3   So, it is our observation that that is needed, yes.

> T2   Well, that is clear by now. This shows that a good start is necessary. There has to be concrete object and once that it there, it will go well.

Moreover, at UniC, the role of researchers' participation during the project changed as a result of teachers' articulating that they required more directive feedback on their practices, activities that can be related to the community developing and advancing a shared object. This was initiated by the teachers' stance, which was explicated during a meeting halfway the project, that they expected researchers to participate as teachers. Mark even asked Patrick whether he retained a hidden agenda when observing their practices. The researchers, on the contrary, reasoned from the perspective that they should observe ongoing practices from a distance in order to not contaminate teachers' activities and to obtain an objective observation of occurrences. This tension was resolved by revising the traditional research paradigm into one corresponding to action research. This meant that the researchers actively provided feedback on teachers' practices but that they did not act as teachers themselves.

> T3   Nevertheless, it is important get more assistance during trialogical learning because now we're only with the three of us,.that is my first concern
>
> D   It should be fixed then, we need teachers for this class […]
>
> T1   Sometimes you {Researchers} are a little blunt It is not criticism but I noticed that you have you own agenda You don't really help us supervise, we just have to take care of it. In my opinion that is not really being an actor!
>
> R1   Well, the idea was that we didn't want to participate as a teacher because we don't have that expertise though we are here to provide you with some advice and answer your questions, if you have any
>
> T1   […] I am teaching the trialogical project on my own which is not an ideal situation, I just want you to think with me. Clearly we don't expect you to teach […]
>
> R1   Well, I believe that is a good thing to hear, I am glad that this came forward
>
> PE   The researchers are used to stay in the background to be able to observe the process as objectively as possible
>
> T2   There is a big culture difference because we are used that everyone is involved You are think as observers
>
> PC   It is a type of participation when you are observing […]
>
> T2   You could divide one group into two groups so that T1 has to supervise his own groups but that T4 and T1 meet each other during class to discuss any problems or to ask each other for advice […]
>
> R1   Yes, that would be perfect {everybody agrees}

In addition, after several meetings between researchers and teachers, the importance of defining the objects and the criteria for completion with the students was discussed and agreed upon. Furthermore, teachers came to acknowledge that they should explicitly address and evaluate student responsibilities in meeting the requirements they created for their task, but also that they wanted to be more responsive to each student groups' needs to be able to foster these groups' practices.

In addition, the design principles were revisited to lead to more usable and appropriate guidelines for design. For instance, from interacting with their students, teachers deduced that the more concrete their object is the more focused students' practices are toward successful production. Teachers also acknowledged that the presence of an external client functions highly effective in motivating the student groups and providing them with a sense of ownership and collective responsibility. Teachers took these idea up in their pedagogical practices.

11

T1	For who are you doing this project? Who is your client and do you have a client at all?
S1	Yes, not that I know of
S2	Sigmund {the Dean} a little
S2	If Sigmund does not approve it than it is our project
S1	It is just a little our project since it is not exactly what Sigmund wants, I don't know, but it is just what the students want and not what Sigmund or the teachers want
T1	Yes I know, but would Sigmund attach much interest to what students want?
S1	Yes but that is what I don't know, it should be really great but that is what I am wondering
T1	But is that something you have to ask yourselves or something that you have to ask Sigmund?
S1	Yes, we have to ask that to Sigmund
S3	We will do that next week probably.
T1	Okay […]

Protocol meeting T1 with student group, January 2007

Also, teachers reflected on and emphasized making the differences between the normal way of working during the old module more comprehensible for their students. On the basis of the collaborative experiences of the project partners the design principles of knowledge creation used at the start of the project were collaboratively revisited and made more utilizable for teachers by breaking it down into 6 elements, which will be used to train subsequent teachers and which will be further developed in next implementation rounds: collaboration, knowledge objects, complex problems, presence of client, tools & expertise, and use and sharing of existent knowledge.

DISCUSSION

In the UniC case, it was illustrated that interaction between different knowledge trajectories occurred on both the individual and collective platform of the design team and how participants stabilized out of flux by changing their practices accordingly (cf. Ludvigsen et al., in press). During meetings practical pedagogical enacted knowledge of teachers intersected with knowledge concerning the knowledge creation metaphor which originating from socio-cultural context of the educational researchers. Tacit knowledge (represented as the network of implicit epistemological beliefs, attitudes and knowledge) was explicated during group meetings of the various teams, and ideas expressed were often taken up by the group and integrated within existent practices, or became the driving force behind the development of relatively new pedagogical practices. What occurred at UniC can be called practice bound hybridization of concepts (i.e., design principles) borrowed from the knowledge creation model of Paavola & Hakkarainen (2005). However, a question remains that relates to how we can analyze the extent to which contexts in which trajectories intersect relate to transformations in shared practices. Also, an unresolved issues is that the analytical concepts employed in the study reported above does not allow for describing unplanned or emergent insights which cannot be linked backwards to a tension (cf. Eraut, 2000). In future studies, we also intend to follow up and holistically describe how ideas evolve, are taken up and continue to influence ongoing practices.

We assert that although goals not always converge, productive collaborative work is possible. We observed that the work around the shared objects served to elaborate and refine existing knowledge practices, and develop new ones. This direction towards more innovative practices as far as pedagogy is concerned was evident in the current context. However, it was found that teachers still have their individual guiding style and way of adapting their teaching to the knowledge creation perspective to learning. Therefore, the

positioning of individual voices within the frame of shared collective situated practices has to be taken into account within our analyses (Carbaugh, 1999).

Since collaborative design practices at UniC will take place longitudinally, spanning several modules, teachers' can be advised and supported based on the results reported from the empirical case. At this point, the project team is able to move forward and learn from the issues that are raised above and achieve more focus on shared objectives. In concrete terms this for instance relates to a better focus on group activity, and to monitor progress of students' group through a focus on their knowledge objects, and to focus less on individual functioning. In addition, students need to establish more structure to their work, and here collaborative technology can play an important role. Although such technology is available, dedicated training is necessary. In the current learning context, neither students nor teachers were not sufficiently familiar with the existence and use of such technology. The research observations regarding tool mediation suggest that new technological tools (being developed in KP-Lab) will advance the collaborative design work of the groups in all the cases and provide additional opportunities for reflection and discussion; however, as indicated in the results reported above, integration of these tools in pedagogical practices at UniC will require extensive pedagogical support.

REFERENCES

[to be inserted]