Understanding the roles of online meetings in a net-based course

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Abstract

It is argued elsewhere that online learning environments constitute new conditions for carrying out collaborative learning activities. This article explores the roles of a series of online meetings in such an environment. The online meetings are arranged as part of a net-based course on object-oriented programming, and constitute a recurring shared experience for the participants throughout the semester. Through an activity theoretical analysis, we find that the meetings mediate the learners’ actions towards the construction and maintenance of a community of practice. Our finding has implications for the standardization of digital learning resources. This is an issue that will challenge designers of research-oriented learning environments, should they attempt to move their systems into wider adoption. We suggest that an awareness of the internal systemic connections among the components of the course design we studied is of importance when considering redesign, with respect to the reuse and standardization of learning resources.

Keywords

activity theory, apprenticeship, case study, groupware, networked learning, standardization.

Introduction

The background for the research in this article is the discussion of the standardization of learning technology and digital learning resources. The proliferation of ICT in formal education institutions is followed by a corresponding interest in improving the cost-efficiency in developing and deploying such resources (e.g. McGreal 2004). This is approached through facilitation for the reuse of learning resources, in the form of standardized reusable learning objects (Wiley 2000).

Our research is concerned with ICT-mediated, distributed learning environments. These have their roots in early efforts within distance education, where ICT was used to enhance student communication and collaboration across time and place (e.g. Harasim 1990; Kaye 1992). More recently, a number of innovative, research-oriented learning environments have been developed. These include environments such as CSILE, enabling knowledge-building discourse (Scardamalia & Bereiter 1994), WISE, facilitating inquiry-based science (Slotta 2002), Fle, designed to support learner- and group-centered work that concentrates on knowledge artefacts and design (Leinonen et al. 2002); Synergiea, supporting collaborative knowledge-building in classrooms (Stahl 2004), and a collaborative learning system backed by wirelessly connected handheld computers (Cortez et al. 2005).

Developers of such research-oriented systems are likely to meet the challenge of standardization if they attempt to move their innovations into wider adoption. We contribute to the discussion of deploying reusable learning resources by exploring the complexity of ICT-mediated learning environments. We contend that the transformation of digital learning resources into
reusable learning objects might have a profound impact on the communicative conditions of the learning situations in which they are used. Recent research has indicated that the use of learning resources is situated with respect to various interconnected aspects of the learning situations. These can include the characteristics of the knowledge domain, the learning objectives, the features of the ICTs used to mediate learning activities, the pedagogical approach, the target group, and institutional practices (Fjuk & Dirckinck-Holmfeld 1997; Fjuk & Ludvigsen 2001; Wasson & Ludvigsen 2003). We propose that the situated use of learning resources within this complexity should be understood when considering their transformation into reusable learning objects. Specifically, we analyse the roles of one resource – online meetings – in a net-based course on introductory object-oriented programming.

We start with a description of this course in terms of a brief introduction to the subject domain and a description of the course design. This is followed by a section describing our research method, including our empirical research approach and analytical framework, Cultural Historical Activity Theory. Our data are presented and analysed in the section ‘The online meetings’, followed by a discussion of our findings. This article is concluded with a summary and discussion of the implications of our research results.

Introduction to object-oriented programming

Our study was carried out on the course ‘Introduction to object-oriented programming’ (IOOP) at the University of Aarhus, Denmark. This university-level course has been offered as a campus-based course for more than a decade. We studied it the second time it was carried out as a net-based course. This organization was chosen to accommodate the target group: adult part-time students all across Denmark.

The knowledge domain, object orientation, denotes a specific approach to software construction. It is a way of understanding complex phenomena through the analysis and design of executable computer programs (Madsen et al. 1993). In line with the Scandinavian heritage of object orientation, the principal focus of the IOOP course is a systematic and conceptual way of modeling (Knudsen & Madsen 1990). That is, the emphasis is on constructs that describe concepts and phenomena, rather than on instructions for computers or on the management of program descriptions. Given this view, a central objective is to learn systematic ways of implementing general models and obtain a deeper understanding of programming processes. Hence, it is considered important that the students achieve hands-on experience and develop practical skills, as well as abstract knowledge on the basic object-oriented concepts.

Driven by the needs of the target group and the learning objectives of the course, the pedagogical approach in IOOP was informed by facets of apprenticeship learning (e.g. Nielsen & Kvale 1997). This pedagogical approach focuses on the learner’s participation in a community of practitioners, where the teacher or a more experienced peer legitimizes the skills and knowledge of the individual learner. Mastery does not reside in the teacher alone, but in the community (of which the teacher is a part) and on the structuring of the community’s learning resources. Furthermore, the apprenticeship-inspired approach requires good communicative conditions for reflection-in-action and for making the actions of the teacher visible and a source of identification (Nielsen & Kvale 1997). The teacher should be allowed to articulate and think aloud in terms of both natural and scientific language, as well as in showing the pragmatics of programming.

IOOP course design

A series of online meetings was arranged for implementing the principles described in the previous section; they were usually conducted once a week. The intention of the course design was to treat topics based on the individual student’s experiences in solving the weekly assignment. This approach denotes a particular mode of engagement and student control, and at the same time the teacher legitimates and shows how programming/modelling processes associated with the weekly problem areas can be approached. The online meetings were mediated by real-time video streaming of a part of the teacher’s PC monitor. Through Windows Media Player, the students could see the teacher’s PowerPoint presentations and text documents, his actions in various programming and modelling applications, etc. There was a corresponding audio stream relaying the teacher’s voice. In order to support
interactions among the participants, a text-based Instant Messaging (IM) conference was set up in conjunction with the real-time audio and video streams. All participants used the Yahoo! Messenger application for IM. The IM sessions were set up as private conferences, where the students were invited to join at the outset of the meetings. IM entries from all participants were displayed in the main window of the application, preceded by a time stamp, and the contributor’s nickname. The list of participants in the conference was displayed in a secondary window. A teaching assistant also participated in the meetings; her role was to set up and maintain the IM conference, and conduct private IM sessions with the teacher (to provide reminders, for example) and with students experiencing technical problems. The video and audio streams (denoted ‘video stream’ in the following) from the meetings were captured, indexed with time stamps according to topics, and made available to the students on the course website.

The students were given 12 mandatory assignments, with one given in most weeks. A prerequisite for entering the exam was that the student had passed at least 80% of the assignments. The assignments were considered a fundamental means of interaction between the students and the teacher, and thus for legitimizing the student’s actions towards the problems. On the organizational side, one important mechanism for supporting social interactions among the students was the weekend seminars. During the course, the students met physically for three 2-day seminars. One central reason behind these weekend seminars was stimulating collaborative activities, while the students worked distributed.

Method

The empirical research was carried out as a case study on the IOOP course during the fall semester of 2003. The course started with a weekend seminar, where the participants met on campus. During the course, two additional weekend seminars were conducted and 14 online meetings took place. The data were gathered by observation of online activities, including 10 of the online meetings, and postings on the discussion boards. Recordings of the video streams, logs of the corresponding IM sessions, and observation notes comprise data from the online meetings. Documents and learning resources available on the course website were also gathered for analysis. In-depth audio-recorded interviews with nine students and the teaching assistant were carried out just after the final exam, with each lasting approximately 30 min. A 1-h interview with the teacher was conducted during the first weekend seminar, and a 90-min interview was conducted at the end of the course.

Eighteen of the 22 students who registered for the course in the fall 2004 semester completed it. Three of the students were female, and the ages of the students ranged from early 30s to early 60s, with the majority being in their mid-to-late 30s. Most students held full-time jobs during the course, many as computer programmers. Also taking part was one teacher – who was also one of the two course designers – and one teaching assistant. All students were informed by the teacher of the researchers’ presence at the outset of the semester, including an explanation of the aim and scope of the observations. All the informants signed an informed consent document during the study.

At the outset, the research project was an explorative study, aimed at understanding the new communicative conditions of online learning environments. Using Cultural–Historical Activity Theory as our analytical framework, the online meetings came out as interesting in this respect. Those meetings did not play out as intended in the course design, but observations and interviews indicated that the students regarded them as important learning resources. Therefore, the emphasis of our analysis is on these meetings. The primary material used in this analysis is the data from the meetings, together with the interviews. From the approximately 12 h of meeting recordings, we have selected a 3-min segment for presentation in this article. This segment represents an example of a typical interaction pattern in situations where the interaction was initiated by a subject-domain question from the teacher.

The logs from the IM application constitute a complete record of all the entries made by the participants in the meetings we observed. These entries have been coded by topic. The purpose of this categorization was to get an overview of what kind of issues were discussed in the IM sessions. The categories were constructed by a process whereby we looked for concepts that could describe what kind of issues the entries addressed. The selection of cate-
gories was also informed by theory on computer-mediated communication, from the field of distance education. The categories ‘social’, ‘administrative’, and ‘object orientation’ (i.e. the subject matter) are taken from Fjuk (1998), and ‘moderation’ from Feenberg (1989). One IM entry is treated as one unit in the coding scheme, and the entries are labelled with only one code. Some entries might be interpreted as addressing multiple issues, but these are coded according to what we understood to be the main meaning of the entry. Our coding scheme is a rather coarse one, but we found it productive in terms of our analytical process.

The extracts from interviews with students and faculty presented in this article are chosen to inform the analysis with the participants’ subjective accounts of particular aspects of the online meetings.

**Analytical framework**

Cultural-Historical Activity Theory (Engeström 1987; Engeström *et al.* 1999) is founded on a sociocultural perspective of human development (Leontiev 1978; Vygotsky 1978, 1986; Wertsch 1991). The basic unit of analysis in Activity Theory is the activity, and activities are analytically isolated by the motive that elicits them (Leontiev 1978). Activities are driven by a motive: ‘An activity is a form of doing directed to an object, and activities are distinguished from each other according to their objects. Transforming the object into an outcome motivates the existence of an activity’ (Kuutti 1996, p. 27). The minimal meaningful context for understanding individual actions is the activity; in an activity system, proposed by Engeström (1987), the subject’s actions towards the object of the activity is mediated by both *instruments* (artefacts) and the people who share the same object, the *community*. The subject’s relation to the community is mediated by rules, and the relation between the community and the object is mediated by division of labour.

Our analysis is founded on Engeström’s systemic model of an activity. We set out by searching for areas of tension¹ in the processes we observed. These areas of tension can appear within the elements of the activity system, between them, between different activities, or between different developmental phases of an activity (Kuutti 1996). Tensions materialize as breakdowns, clashes, or disruptions in the activities. Guided by the identified tensions, we studied moment-by-moment interactions with the help of interaction analysis. As part of our analysis, we created categories from the data material (i.e. the IM entries from the online meetings) and coded the material according to these categories. Episodes of these interactions were selected for more detailed analysis. To gain an understanding of the systemic whole of the activity, our analysis iterated between studies of the individuals’ actions carried out in these interactions and the context in which they were carried out.

As described, an initial analysis of the IOOP course directed our attention towards the online meetings. This analysis is presented in the following.

**The online meetings**

The analysis of the online meetings starts with an examination of student activity from the perspective of the teachers, presented in the next section. This is followed by an exploration of possible accounts for low student activity. The analysis part of this article is concluded by a study of student participation.

**Student activity**

As discussed in the section describing IOOP, one intended role of the online meetings was to contribute to the collaborative aspect of the apprenticeship-inspired pedagogical approach. The main topic in the second interview with the teacher, carried out after the completion of the semester, was his experiences from this instance of the course. We asked if he had made any changes in the design of the course from the previous semester. He brought forth modifications to the online meetings as one important change: ‘I tried to experiment with making it [the online meetings] more interactive, by to a larger degree asking questions and introducing tasks – although without much success – as we went along. [...] The interaction, or dialogue, is one thing that I have worked on this semester’.² The other change he highlighted in the interview was what he called ‘making the online meetings more goal-or-

¹The term ‘contradiction’ is used by Engeström (1987).

²All direct quotes are translated from the original Danish version by the authors.
oriented’. In the previous semester, one part of the meeting was about presenting how students should approach the assignment (i.e. interpreting the problem description and choosing strategies for solving the problem). Another part was about the teacher making general comments on the students’ solutions to the previous week’s assignments. He decided to leave these two parts out of the meetings. Instead, he recorded these two parts before the meetings and made them available to the students as pre-produced learning resources. ‘There were some parts that were one-way anyway’, the teacher said, ‘so they could just as well be offered asynchronously. And then we could use the synchronous event for dialogue’.

He proceeded by commenting on the outcome of his design intentions: ‘That this has not worked out, to any extent, is another side of the story. It is not like there have been questions to . . . ‘what you just said, how come . . .’ and so on. But that was the intention, anyway’. He also made this point strongly later on in the interview, as a part of his response to a request for him to describe his perspective on the ideal form of the course: ‘And then that the synchronous activities, that they come to be about that it is important that we are together, or are there at the same time. In relation to, well, some times they [the students] could just as well let it be, they might as well [join the chat and then] watch the news. Then they could view it [the recorded meeting] afterwards, because there was no interaction whatsoever, or discussion, or anything else’.

The teaching assistant expressed a view on student activity during the online meetings similar to that of the teacher. When asked in our interview if she could see any clear potential for improvement with regard to the tools used in the course, she responded: ‘There are some conditions that could have been better. About the text-based chat, it really takes a lot before people [the students] gets active. It is like [the teacher] puts it, like speaking out into the blue’.

Both the teacher and the teaching assistant have stated that student activity in the online meetings was lower than they had hoped for. In the course design, the IM conference was intended to mediate the students’ actions towards the other participants. A measure of the level of student activity, as perceived by the teacher and the teaching assistant, is therefore the number of entries in the IM conference. In the 10 meetings observed by us, there were a total of 768 entries. Out of these, students contributed 428, the teacher made 292, and the teaching assistant submitted 48 entries to the shared IM conferences. In order to provide an impression of the level of intensity of the IM interaction, we provide an example of how the entries were distributed over time in one meeting. Figure 1 shows the number of IM entries (vertical axis) for each 1-min time segment (horizontal axis) of the seventh online meeting, which is chosen as a typical example. The figure shows the highest IM activity occurred during the first 5 min, and towards the conclusion of the meeting. It also indicates that most of the IM activity was grouped in four ‘clusters’ along the time axis.

Accounts for low student activity

According to the teachers’ accounts, the figures above represent low student activity. What could be the reasons for sparse interaction during meetings? During our observation of the meetings, we noted a feature of the combination of the text-based IM and the video stream that might be problematic. The transcript in Table 1 shows an extract of interactions that developed approximately 40 min into the 12th meeting. The audio from the video stream is translated and transcribed in the fourth column. The text in the fifth column is a translation of the entries from the IM logs.

The teacher explains the Model-View-Control pattern, which is a commonly used and powerful architecture for constructing graphical user interfaces. A graphical representation (a UML class diagram) of the pattern is visible on the teacher’s screen. In line 1, the teacher writes a question about the relation between two classes in the diagram. This is a reformulation of a question he raised 2 min earlier. His comment in line 2 refers to a reply to this first question. Barbara’s reply to the question, in line 3, is submitted almost simultaneously with the teacher’s prompt for replies in line 4. Jack suggests another answer to the question in line 5. The teacher acknowledges Barbara’s proposal in line 6. There is a delay on the video stream of about 20–30 s, while the IM is close to instantaneous. Even though the teacher comments on Barbara’s entry at once, the students hear this comment 30 s later.

The extract shows part of a typical Initiation-Response-Follow-up (IRF) structure often found in classroom settings (Wells 1993). The time delay re-
presents disruptions in the IRF structure – for example, when Barbara’s suggestion is apparently ‘ignored’ for 30 s. In co-located settings, follow-up comments usually come immediately after responses. Several students reported the time delay as problematic when we discussed the online meetings with them in the interviews. One of them put it this way: ‘I did not ask questions […] I really had problems with the time delay […] I felt that the question [the text] was communicated to the others after it was relevant’. Other issues that were brought up by students were problems because of typing speed or reluctance to ‘speak in public’.

Understood in terms of an activity system, the issues we have discussed here represent a primary area of tension in the mediating instruments. That is, the tension is positioned within the instrument component of the system. The instruments mediating the student’s actions towards the learning community were MS media player (for the video stream) and Yahoo! Messenger (for the IM communication). The tension is found in the combination of the instruments; it appears in the time delay between the IM conference and the video stream. This tension seems to contribute to the low interactions.

The student’s activities towards the other participants were mediated not only by instruments, but also by the rules of the activity. In our analysis, the rules include the norms and expectations present in the pedagogical approach the learning activity is based on.
apprenticeship. Even though the intention in the course design was to use the meetings for discussions, all students might not share this ambition. When discussing the form of the meetings with a student, he said: ‘I am comfortable with lectures. Many prefer dialogue, [and] that one do exercises and such, and that is fine too, but I am comfortable with just getting a lecture – I am happy with that. And that is the online meeting; it is perfect for just that’. This student referred to the online meetings as ‘lectures’ repeatedly throughout the interview. It is possible that there was a tension between the IOOP collaborative approach and the learners’ expectations. To the extent this tension is rooted in the students’ history and experience with learning in educational settings, this constitutes another primary area of tension, and it is found in the apprenticeship-motivated pedagogical approach.

Participation
The data presented so far have indicated that the online meetings did not play out as intended in the course design. This should not be taken to mean that the students regarded the meetings as of little value. Almost all the students we interviewed pointed to the meetings as one of the important elements in the course design for their learning. Said one: ‘It is obvious that the meetings with [the teacher] and the weekend seminars have had primary significance for my OO understanding. I used the textbook only for the Java-specific things’. Another issue indicating the usefulness of the meetings is the attendance rate. On average, approximately 70% of the students took part in the meetings. Participation in the meetings was not a formal requirement. Many students shared the teachers’ view that there was little activity in the IM conference. When asked if he had used the IM conference for raising questions during the meetings, one student replied: ‘Yes, I have asked four questions. And I don’t think there’s too many who have done that. People have been a little slow in that respect’. Another student stated that ‘we could have done without Yahoo! Messenger [. . .] it is too slow, sitting there pressing keys’.

The online meetings were captured while they were in progress. The recordings of the video streams were indexed and made available to the students for download within hours of the end of the meeting. The IM log was not distributed with the recordings; however, the teacher often included the text-based dialogue in the video stream, explicitly for the purpose of making the recordings more understandable. An example of this can be seen in the extract presented in Table 2, which took place immediately before the episode presented in Table 1. The question, slightly rephrased, is posed in both the IM dialogue and the video stream.

Table 2. Extract 2 from the 12th online meeting.

<table>
<thead>
<tr>
<th>Time</th>
<th>Contributor</th>
<th>Video stream</th>
<th>IM</th>
</tr>
</thead>
<tbody>
<tr>
<td>21:10:55</td>
<td>Teacher</td>
<td>If we should find the necessary knowledge from up here [indicates class ‘Observable’ in UML-diagram with the mouse] needed by this ‘CounterView’ we have down here [pointing with the mouse]. Which methods should ‘Counter’ call in ‘CounterView’?</td>
<td>Which methods should Counter know of CounterView?</td>
</tr>
</tbody>
</table>

IM, instant messaging.
meetings, he said: ‘No, I might have asked a few simple questions, but not a lot. Because, many times, I have prepared for the meetings, and then you more or less know it yourself, the things that are offered’. His accounts can be taken to mean that even though he regarded it worthwhile to participate in the meetings, they did not contribute much to his understanding of the subject matter.

A more thorough examination of the IM dialogues might illuminate the students’ motivation for participation. We have therefore studied what topics were discussed in the IM sessions. We have categorized all IM entries from the logs. The categorization is both data driven and informed by theory from computer-mediated communication (Feenberg 1989; Fjuk 1998). We found that many participants submitted a greeting when they joined the conference, at the outset of the sessions; similarly, many submitted a greeting before they logged off the sessions. We have labelled these entries as social. Another pattern that emerged was that the teacher often started off the meeting by asking the students about the quality of the audio and video transmission. We have labelled these questions, along with the responses from the students, as technical. During the sessions, the teacher submitted entries stating the next topic to be discussed, and asked the students if they found a preceding explanation sufficient; the teacher also asked if anyone had any questions. These entries, along with the students’ replies and other comments on the progression of the meetings, have been categorized as moderation. Questions, replies, and comments on the subject matter itself have been labelled as object orientation. Entries regarding issues, such as how to submit assignments, where to find learning resources, how to sign up for new courses, or practicalities regarding the next weekend’s seminar have been categorized as administrative. Finally, some entries that seemed to result from typing errors – such as entries without text or two identical entries submitted almost simultaneously – have been categorized as error. A further distinction has been made according to who submitted the entry: the teacher, the teaching assistant, or a student. Entries generated by the IM application itself are not included in this overview. The number of entries in each category is presented in Table 3.

There were approximately the same number of entries in the categories moderation, object-orientation and administrative, and half as many in the categories social and technical. We regard the technical entries primarily as a means for conducting the meeting, to clarify if the students had any problems receiving the video stream. As such, these entries can be assumed to be of marginal interest to those students who only viewed the recordings. We interpret the moderation entries in a similar manner, that they are mechanisms for moving the meeting along. The number of entries in the category administrative indicates that the students used the opportunity presented by the meeting to clarify more pragmatic issues concerning the course. This aspect was not included in the intended role of the meetings; such issues were expected to be treated in an asynchronous discussion forum.

A large number of the entries categorized as object-orientation were specific questions from the teacher and the students’ related replies. Thirty of the 116 entries from students in this category were phrased as a question.

Most of the entries in the social category were greetings from a participant joining or leaving the conference. These were not strictly necessary in informing other participants of one’s actions (e.g. having joined the session), as this information was provided by the IM application. It is therefore interesting to note that many participants chose to make their presence explicitly known, or maybe acknowledge others’ presence. The social aspect of participation will be taken up in the following section.
Discussion

The course design aimed to create learning opportunities by providing resources in the learners’ environment, as well as occasions for dialogical interactions. The interplay between these is a core issue in apprenticeship. However, the data presented in the previous section show that the participants regarded IM activity during the online meetings as being low. Further, we have indicated that about half of the IM entries can be expected to have only limited relevance for viewers of the recorded meetings. In addition, we have shown that the teacher, to some extent, included parts of the written dialogue in the video broadcast. An argument can therefore be made for considering individual viewing of the recordings as being roughly equal to participation in the online meetings, with respect to learning outcomes on object orientation. That is to say, the aspect of apprenticeship where the teacher demonstrates the skills and the systematic approach to the programming process of an experienced programmer are both maintained by the recordings.

Student flexibility with regard to time and place for studies is a central issue in theories on distance education (Paulsen 1993). Our interviews with the students indicate that this was also an important issue for them. Several stated that the distributed organization of the course made it possible for them to take part at all: most of the students held full-time jobs, and several of those we interviewed lived with their families between 1 and 4 h away from the university campus. The organization of the meetings represented a large degree of flexibility with regard to place, but they were not flexible with regard to time. The recordings provided flexibility in this respect too, as they could be viewed individually at any time after the meeting.

If the recordings are of equal value to participation in the meeting, and the recordings provide greater flexibility for the students, one possibility is to convert the online meetings into pre-produced videos. This would represent a transition from the dynamic, shared events constituted by the meetings, to reusable learning resources. One advantage of such an approach would be cost savings for the educational institution. A meeting could be recorded once, and supplied with metadata according to, for example, the SCORM specification (e.g. Chang et al. 2004). This learning object could then be reused in subsequent semesters at a low cost. Another benefit would be increased flexibility for the teacher, as he could produce the ‘meetings’ at a time most convenient for him.

This operational view of the online meetings, which underlies the line of reasoning in the previous paragraph, is contrasted by the findings in our analysis. The analysis has suggested that the meetings had meaning for the students beyond their outcome concerning object orientation. Analysis of the meetings at the level of the students’ goal-directed actions gives more insight into this. The categories we found in the IM interactions indicate that participation in the meetings was directed towards at least three objects for the students: that related to the subject matter, social issues, and administrative issues.

One of the aims of the meetings in the course design was to help students solve the weekly assignments (i.e. to develop a better understanding of the subject matter). The data presented in the previous section indicate that some of the students’ actions during the meetings were indeed directed towards this objective. Other actions – including the IM entries categorized as social – can be understood as being directed at establishing and maintaining social relations with the other participants; meeting participation in itself could to some extent also be taken as being directed towards this object. That is to say, the action of participation might be regarded as a statement of commitment to the group of students. Finally, the practical execution of the course can be considered the object of the actions represented by the administrative IM entries.

The short-term, goal-directed actions discussed so far are difficult to understand without a frame of reference created by the corresponding motive-driven, longer term activity. A key issue in constructing an activity system as an analytical framework is to identify the object of the activity. The object of activity is one of the most basic concepts of activity theory, and it can be regarded as ‘the sense-maker’ (Kaptelinin 2005). Transforming the object into an
outcome motivates the existence of an activity (Kuutti 1996). In Leontiev’s structure of activity (Leontiev 1978), activities are isolated through analysis according to the motives that elicit them.

In using these theoretical considerations in the analysis, the projected outcome of the activity we analyse here might be increasing job opportunities for the students. By including object-oriented programming in their repertoire, the students can qualify for new tasks in their current work, or meet the requirements of other positions. We propose that the shared object of the activity, which is transformed into an outcome, is the creation and maintenance of a community of learners on fundamental object-oriented concepts and techniques.

This proposal is also founded on a sociocultural perspective of learning and human development. In this perspective, learning is understood as a fundamentally social process (Vygotsky 1978). In this analytical framework, an online meeting becomes one of several instruments mediating the students’ actions towards the object of the activity system. Other instruments include weekend seminars, textbooks, assignments, ad hoc IM dialogues, etc.

From this perspective, the students’ actions during the meetings should be understood as being directed towards the community of practice. Communities of practice are bound together by a collective developed understanding of what the community is about; they are built by the mutual engagement of the participants, and they have produced a shared repertoire of communal resources (Wenger 2000). This implies that interactions of a social or administrative nature are not only legitimate but they are central parts of constituting the community.

This finding indicates that a transformation of the online meetings into reusable learning objects might disrupt important aspects of the students’ learning processes. While issues regarding the subject domain might be maintained, such a transformation affects the students’ opportunities with respect to constructing and maintaining the community of practice. This insight is founded on an awareness of internal systemic connections in the activity system we studied. When considering redesign of an ICT-mediated learning environment with respect to reuse and standardization, sensitivity towards such connections may be of profound importance.

We have shown that the shared events had a meaning for the IOOP students, which was not anticipated in the course design. We propose that designers of CSCL systems for distributed learning situations consider providing opportunities for such shared events, even though they might not be crucial with respect to knowledge–domain interactions.

Conclusion

This article has explored the various roles of online meetings in the IOOP course. The study informs our understanding of the conditions in a specific learning situation, and contributes to the accumulated knowledge of what constitutes conditions for a productive online learning environment.

The apparent area of tension that has guided our analysis is that, despite the modest interactions during the online meetings and the opportunity to use recordings of them as an alternative, most students preferred to participate. Moreover, many students stated that they regarded the online meetings as an important resource in the course. We have identified primary areas of tension in the ICTs used and the pedagogical approach, which could facilitate more active student participation if resolved. More importantly, we suggest that the online meetings should be understood as a mediating instrument toward their community of practice. IM entries concerning the subject domain, social issues, and administrative issues are considered as contributions towards constructing and maintaining this community of practice.

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