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Multimethod approach for analyzing students' motivational profiles and their participation in virtual collaboration

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Abstract

In new complex learning settings, the conventional research methods are not entirely applicable, and new means for investigation are needed. The aim of this study was to apply multimethod approach to explore how 43 students with different motivational and individual profiles participate in a distance-learning environment. Three types of questionnaires were used, and a selection of learners' postings for the group assignments was analyzed. A detailed analysis was conducted for three cases, which showed that students with different motivational profiles had different participation patterns, and yet, they ended up at same grading level of course performance. This may indicate that inquiry-based learning makes possible for the students to participate in varied, but still productive ways. However, more exploration of the qualitative data is needed to confirm these findings. The qualitative analyses of the study offered valuable information about the dynamics of students' participation.

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Nowadays learning settings are understood as complex learning environments where numerous factors occur in relation to the other factors (e.g., De Corte et al., 2003). In these learning settings, the conventional research methods are not entirely applicable, or at least not sufficient by themselves, and new means for investigation are needed (Winn, 2002). More process-oriented and context-sensitive information could help to understand how students with differing characteristics adapt to a new learning environment and how the features of the learning environment affect students' participation and involvement. The importance of examining how different students perform in general in new learning environments has also been stressed by Hartley and Bendixen (2001), who emphasized the need to examine how the individual characteristics of learners influence their success in new environments. The need for new methods is also acknowledged in educational psychology in general, where emphasis has shifted towards investigating meaning of the learning context (e.g., Anderman & Anderman, 2000). This acknowledgement of a need for new approaches can be seen as an influence of the situative (or social-cultural) approach (e.g., Greeno, 1998) that stresses the importance of social context in learning.

Context sensitive qualitative methods

Investigators of the situative view (e.g., Greeno & MSMTAPG, 1998; also called *situated cognition*, or *situativity theory*) have introduced qualitative methods for studying cognition and learning that were not so much applied in educational psychology, as in other fields, such as sociology and anthropology. Even though this broadening of perspectives, especially, related to units of analysis and number of methods applied, has been welcomed, the criticism has been made that investigators have commonly been «tempted to provide micro-level descriptions without considering more overarching temporal and physical constraints of these activities» (Roth, 2001, p. 58). The reference is to overreliance on descriptive studies of micro-phenomena at the expense of deeper level analysis. However, as Lehtinen (2003) argues, the detailed qualitative process description and ethnographic data are valuable in designing learning envi-

ronments, since they can bring novel ideas and empirically tested information.

The value of qualitative methods has lately received recognition in educational psychology in general (e.g., Perry, 2002). A reason for this recognition is that the educational research has changed progressively from laboratory settings to real life classrooms (e.g., Volet & Järvelä, 2001). This change results from increasing interest in context (e.g., Anderman & Anderman, 2000). Also in the field of classroom motivation research, there has been a growing interest in investigating motivation in contexts (e.g., Urdan, 1999). There have been number of publications devoted to qualitative methods of data gathering, ranging from interviews to experience-sampling and observation to study motivational and self-regulative aspects of learning. The arguments for using context-oriented qualitative data are multiple: 1) Since the phenomenon itself is context-bound, it should be studied within its context; 2) the meaning or effect of the context is best seen in processes; 3) it gives the possibility for more detailed interpretation of the results; 4) it reveals dynamics behind development.

Multimethod approach

In his review of contemporary socio-constructivist perspectives and motivation Hickey (1997) argued that some of the differences between social-cognitive models and Vygotsky's views are based in methodological issues. As an illustration he referred to Tudge and Winterhoff, who claimed that social-cognitivists who rely on strict experimental research design are focusing on one-way transmission rather than complex reciprocal relations. From a sociocultural point of view, an alternative to this is to use more naturalistic, context sensitive, qualitative methods. Hickey proposes, that if something can be defined in terms of individual-level representation, it is relevant to use more conventional methods (e.g., self-reports) to study it, whereas issues that are clearly defined by context should be examined by contextualist methods (e.g., case studies).

This type of proposal leads to a way of conducting research that combines qualitative and quantitative methods (Tashakkori & Teddlie, 1998), and that has been characterized as the multimethod approach.

The combination of self-reports and a more profile-oriented approach (e.g., use of observation during the actual learning process) can be helpful to find relations between individual and situational variables (e.g., Hickey, 1997; Turner et al., 2002).

This study adopts a multimethod approach that uses a combination of self-report questionnaires, and the material that students produced to networked learning environment's database. The different sources of data were analysed focusing on cases of students.

Aims

The aim of this study was to explore how students with different motivational and individual profiles participate in a distance-learning environment, especially, when the learners are asked to collaborate in an asynchronous discussion forum.

Methods

Participants

The data were gathered during a virtual course that belonged to the first level university studies in Psychology, organized by Open University of Helsinki (Finland). The participants varied in their educational backgrounds (59.2 % of the students had higher education qualification), and, age (average 40.1 years, min 23/ max 66)¹. Altogether 49 enrolled in the course (9 males and 40 females), which of 43 students participated in the study (three students did not eventually participate in the course, and three did not fill in the questionnaires).

Setting

Collaborative learning occurred asynchronously, the learners did not know each other, and did not meet face-to-face during the course. Two teachers were tutoring the students throughout the entire course.

¹ Based on automatic registration information about the course participants.

The pedagogical principles of inquiry learning were applied in the course design and teaching. Inquiry learning emphasizes active learning, encouraging students to ask questions, formulate hypotheses, and experiment to test them (Hakkarainen & Sintonen, 2002; Veermans, Lallimo, & Hakkarainen, 2005). The different aspects of inquiry, from generating research questions, searching information, to revising working theories may be shared among students (i. e., shared expertise) in a computer-supported learning environment.

The technical and administrative core of the course was a networked platform in which the participants were provided with different learning materials (e.g., audio files, text material), and general structure for the course. Two types of assignments were used in the course, individual and group assignments. In individual assignments the students were asked to reflect course themes by writing a short essays on given topic. The group assignments were small group discussions about certain topic, and they were conducted in networked learning environment's discussion forum. During the eight weeks course time the participants were asked to do four individual assignments and three group assignments.

Data collection and analysis

A multimethod approach was applied for data gathering and analyzing, which included both quantitative and qualitative data sources, and several steps of analyses: clustering the questionnaire items, selecting student-cases for detailed analyses, and analyzing the cases.

Three types of questionnaires were used to gather quantitative data: 1) Attitudes towards collaborative learning (based on Dewiyanti, Brand-Gruwel, & Jochems, 2003); 2) Interest in learning and technology (based on pilot study by Veermans, 2003, not published); 3) part of the Motivation Strategies for Learning Questionnaire (MSLQ) (Pintrich et al., 1993). The questionnaires' statements were based on a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). The scales of the questionnaires are presented in the Table 1.

In addition, a selection of learners' postings for the group assignments were analyzed according to the principles of qualitative content analyzes (Hakkarainen, 2003). In the analysis, the students' postings

Table 1. Scales used in the study

Name of the scale	Example of an item	Cronbach Alfa	M	SD
Attitude on collaborative learning	Collaborative learning is challenging.	.90	3.71	.60
Group activity	I find it difficult to take initiative at the beginning of the group work.	.75	3.72	.63
Pre-knowledge	I can explain to someone what is Psychology of learning and thinking.	.79	3.13	.81
Interest in technology	Working with technology is interesting.	.90	3.83	.78
Interest in collaboration	Collaboration with other students is interesting.	.83	3.88	.67
Task value	It is important for me to learn the course material in this class.	.70	4.26	.40
Control of learning beliefs	It is my own fault if I don't learn the material in this course.	.70	3.67	.60
Self-efficacy	I'm certain I can master the skills being taught in this class.	.85	3.58	.55

were partitioned into ideas (i.e. propositions) that form a coherent unit of meaning. Therefore, an entire note (posting) could be composed of several ideas representing various categories of knowledge (example of detailed categorization, see, Lipponen, 2000). The percentage of congruence of the categorizations conducted by the two independent coders of a sample of 15 % of the data was 86, which can be considered high for the reliability of the categorizations.

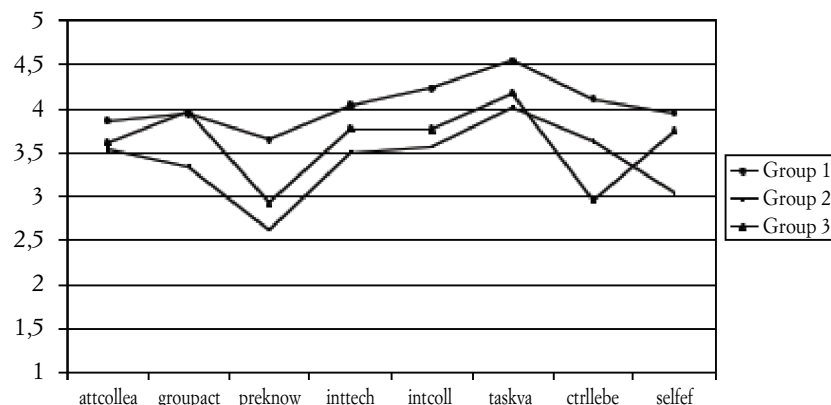
A cluster analysis was used to classify students on the basis of the questionnaire variables, and an ANOVA was performed to examine and describe the cluster profiles.

The grouping variables for the cluster analyses were Control of the learning beliefs and Self-efficacy, since those variables are thought to grounding for a self-knowledge, which is important factor of the quality of learning.

Results

The results of the cluster analysis clearly showed that each of the three groups had a rather distinct motivational profile.

Figure 1. Cluster profiles



(attcollea = Attitude on collaborative learning; groupact = Group activity; preknow = Pre-knowledge; inttech = Interest in technology; intcoll = Interest in collaboration; taskva = Task value; ctrllebe = Control of learning beliefs; selfef = Self-efficacy)

As seen in Figure 1, Group 1 had overall high values within all scales; especially with the scales Task value, Self-efficacy, and Control of the learning beliefs. This group showed also interest towards both technology as well as collaborative learning. Group 2 had lower values in many scales. The most striking differences were that Group 2 didn't have pre-knowledge of the topic and it had more negative view of own group activity and low self-efficacy. The profile of Group 3 had values that are between the Group 1 and Group 2; more similar to Group 2 with a difference that Group 3 has lower Control of the learning beliefs than two other groups.

A more detailed analysis of the nature of students' participation in asynchronous discussion forum was conducted. A description of the analysis categories is presented in Table 2.

Table 2. Descriptions of the analysis categories of database postings

Category	Description of the analysis category
Own working theories and explanations	In the message, own hypotheses, and explanations are brought up concerning the problem and domain area under studies.
Own experience	Own experiences are represented concerning study area.
Example	An example is given of the studying task or problem.
Deepening knowledge	Scientific or other reliable source of information, with references. Also teacher's clarifications without specific reference information.
Critics: discrediting	Previous message is criticized, with the aim of disproving or overruling it.
Critics: constructive	Previous message is criticized, however with intention of building upon it.
Specifying problem	Specifying questions of the problem under task. Either clarifying or more rhetoric by their nature.
Repetitive message	Repetition of the study material or other information source. Straight citations accompanied with own explanations or other discussion is not considered repetitive.
Supportive	Assent or support to previous message. Includes mostly elements of both domain specific and social support.
Summary	Connecting elements of previous messages with the intention of coming up with new inferences.
Invitation to knowledge building	An explicit request to join in and/or continue with knowledge construction.
Metacomment	Metalevel evaluation or discussion of own and/or group activity.

The analysis of the asynchronous discussion postings was conducted for three student cases, each of them representing different motivational profile (i.e., representing cluster groups 1-3): 35-year-old female, Liisa, who had higher education qualification in technological field (engineering), and was working as consult (Group 1); 37-year-old male, Sami, who had lower level vocational qualification, and was working as head of bus drivers (Group 2) and 44-year-old male, Paavo, who had higher education qualification, and was working as legal judge (Group 3). The selected students participated in same small group for the group assignments in the discussion forum.

Table 3. Case students' messages in the database and propositions found

Total of database messages						
	Liisa		Sami		Paavo	
	N		N		N	
	24		22		24	
Propositions found in messages						
	N		%			
	Liisa		Sami		Paavo	
	n	%	n	%	n	%
Categories:						
Own working theories and explanations	16	31.4	13	38.2	16	33.3
Own experience	7	13.7	7	20.6	13	27.1
Example	3	5.9	1	2.9	1	2.1
Deepening knowledge	1	2.0	0	0.0	2	4.2
Critics: discrediting	2	3.9	1	2.9	0	0.0
Critics: constructive	3	5.9	1	2.9	1	2.1
Specifying problem	5	9.8	1	2.9	9	18.8
Repetitive message	0	0.0	0	0.0	0	0.0
Supportive	8	15.7	9	26.5	4	8.3
Summary	0	0.0	0	0.0	0	0.0
Invitation to knowledge building	4	7.8	0	0.0	0	0.0
Metacomment	2	3.9	1	2.9	2	4.2
Total of propositions found in messages	51	100	34	100	48	100

While examining the case students' postings one may see that quantitatively all three students produced almost equal amount of messages: Liisa 24, Sami 22 and Paavo 24 (see Table 3). The analyses of the message types showed that all three students had contributed most to the category Own working theories and explanations. This is not surprising, indicating that the students had succeeded to produce forms of own thinking and combining it with domain specific elements. This was supported by the form of assignments, which were question driven and rather open ended by nature. However, there were differences between the students in the type of messages they wrote as well as in the richness of the messages, which indicates participants' patterns of activity in knowledge building. By richness of messages we mean that a large variety of categories, as introduced in the tables 2 and 3, were used in student's messages. It can be assumed that genuine knowledge building requires variety of thinking focuses and levels, which are indicated by different message types. These include domain specific elements, but also metalevel thinking (Muukkonen, Lakkala & Hakkarainen, 2005), and participation to socio-cultural learning activity (Lipponen & Lallimo, 2004).

The analysis of the idea propositions in the messages showed that Liisa produced variety of different message types, on average 2.1 message types per one message. She also had large variation as she used all the message categories, except Summary. One should acknowledge that none of the students in the course wrote Summaries in the way explained in Table 2. In four messages Liisa used Invitation to knowledge building. It can be concluded that Liisa was active collaborator since she also wrote Critics and Specifying problem. In Sami's messages also different messages types could be found (on average 1.5 message types per one message), however, the most of his messages (85.3 %) belonged to three categories: Own working theories and explanations, Supportive, and Own Experience. Typical for Sami's participation was to express his own ideas and experiences, and supporting other people's views. Critics existed only in one of his message, and Deepening knowledge did not exist at all. Also Paavo's messages were rich (on average 2.0 message types per message), however, he wrote mainly Own working theories and explanations and Own experience and Specifying problem (these categories were together 79.2 % of all message types). He also supported other learners, wrote Metacomments, and Deepening knowledge.

The students were required to write a final essay as part of the course in which they had to consider the whole course they participated. They had to write a synthesis of the whole course and what they had learnt during the course. All three cases wrote very broad and thoughtful essays, and they all were graded as Excellent.

Discussion

No causal connections can be made concerning the differences of students' messages and their profiles. However, some typical connections between students' initial views (based on the questionnaire data) and quality of the messages can be discussed. The profile that Liisa represented had high values in Pre-knowledge, which may give input to the numerous Critics messages she wrote since she was familiar with the topic. Stronger self-efficacy and interest in the topic and collaboration was reflected as active participation in the group, for instance with Invitation to Knowledge building. Also the great variation with message types tells about the same issue. The profile of Sami had lower values in Pre-knowledge, Interest, Task value, and Self-efficacy, which could be assumed to stand for more modest and careful participation; most of Sami messages were his own views or supporting others' views, he did not show any criticism nor invitations to knowledge building. Paavo's profile was similar to Sami's, but had higher values in general; except the scale Control of learning beliefs. Not believing one's own effort in learning, but still having high values in Self-efficacy may be shown as need to specify problems: 19 % of Paavo's message types fell in that category (Specifying problem).

The three individual cases showed that students with different motivational profiles had different participation patterns, and yet, they ended up at same grading level of course performance. This may indicate that problem-based/inquiry-based learning makes possible for the students to participate in different, but still productive ways. However, more exploration of the qualitative data is needed (e.g., learners' motivational interpretations collected by interviews) to confirm these findings.

Task-related motivation research has traditionally focused on classroom learning situations. With the help of technology, learning can also take place outside of classroom, for instance, at home or in the library -

virtually. There is research that shows how various ICT-applications can motivate students to start doing a task, to facilitate their involvement participation, but it is not yet clear what role these new features of the classroom are playing in the complex process of learning. This type of more context-sensitive research would reveal if the applications are also having a positive effect on maintaining students' interest in learning tasks and a sense of their meaningfulness, their involvement, and if so, how these phenomena may be facilitated. This would be especially helpful for those students who have difficulties to find the meaningfulness of the learning tasks by themselves.

The databases were analyzed qualitatively. These qualitative analyses offered valuable information about the nature of learning; without qualitative analysis of the discussion forum data, the dynamics of students' participation could have not been examined. However, as always with qualitative analyses, one could raise the question about validity and reliability. Even though intercoder reliabilities were calculated in this study, and agreed to be high enough, it is argued that reliability and validity issues should be re-considered: when unconventional are applied, statistical methods, validity and reliability cannot be treated in the usual manner (Schoenfeld, 1992). This is a special need for innovation in technical analyses when examining complex learning environments that cannot be reduced into classical experimental designs. Several qualitatively oriented researchers have proposed that instead of using the concepts of validity and reliability, different terms should be used to describe quality of unconventional analyses. For instance, Anfara, Jr., Brown, and Mangione (2002) proposed concepts of credibility, transferability, dependability, and confirmability, whereas Cobb, Stephan, McClain, and Gravemeijer (2001) have spoken about trustworthiness, replicability, and commensurability, as well as usefulness. More problematic than the issue of terminology is that there are no common agreed criteria for how qualitative research should be evaluated; though, that is a vital issue. It is expected that use of qualitative methods will grow, and therefore investigators should develop and agreed upon ways to evaluate quality of qualitative research. A core issue related to the reflection on validity of qualitative analysis is to make it open and public as possible (Anfara et al., 2002); and to use rich descriptions of the data (Denzin & Lincoln, 2000).

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