How Youth and Mentors Experience Project-based Learning in an Internet-based Shared Environment for Expeditions (iExpeditions)

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Abstract: This paper describes experiences of youth and their mentors with authentic problem solving in an Internet-based Shared Environment for Expeditions (iExpeditions). The key questions examined are in what ways and to what extent do youth become engaged in an Expedition. First we examine parentsí attitudes toward the iExpeditions project, and youthís motivation for these online activities. Then we present the design for youthsí first two-weeks of activities and then the reality of what occurred. After that, we present results of an active group of fourteen youth and analyze why they were more engaged than others were. We describe four cases from this group to further explore this question. Our discussion summarizes youthsí status of participation as a whole, factors that have affected youthsí engagement, and what we should do to ensure a good startup for the second round of the project.

Keywords: action research, computer-mediated communication, project-based learning

Introduction

The Internet-based Shared Environment for Expeditions (iExpeditions) project is both a development effort of the Center for Technology Innovations in Education (CTIE), University of Missouri, Columbia, and a research project conducted in partnership with Motorola, Inc. and a researcher at Brigham Young University. The project seeks to develop and understand the use of computer-supported collaborative learning (CSCL) technologies for supporting distributed learning communities via the web.

"Expedition" is a metaphor for participantís involvement in a team problem-solving activity. In the expedition reported on here, participants were challenged to come up with

solutions on how to design, develop and market telematics. Telematics is wireless communications designed for the car providing drivers with personalized information, messaging, entertainment and location-specific travel and security services. The entire expedition lasted eight weeks, with one milestone for each week. Each week participants needed to accomplish a milestone, which contains several problem statements called challenges. Challenges were distributed by the mentor to the youth participants as a special type of document inserted in their expedition log. Participants conducted their activities through a web site providing a coordinated set of CSCL tools facilitating their communication, information access, collaboration and knowledge representation.

Theoretical background

Computer-supported collaborative learning (CSCL) is considered as an emerging paradigm in instructional technology. It focuses on the use of technology as mediational tools within a collaborative methods of instruction (Koschmann, 1996). Pea and Roschelle (1999) summarized the discussion at a workshop on "Tools for Learning Communities," by emphasizing the difficulty of using the web and CSCL-type tools as a medium for constructivism. It is much easier to read, view and hear than to create and collaborate. They call for better understanding of the processes and better tools to support the processes of collaborative work and learning. In alliance with this, Koschmann (1996) argued that the central focus for research in CSCL should focus on the social factors in the process of learning, the use of technology, and the learner interactions. The group or social interaction nature of the online educational environment is one of the major themes theoreticians and practitioners in educational technology commonly address (Harasim, 1990b). Little research, however, has been done to assess and document technology-assisted cooperative learning. Though the interest in understanding the process from a participantís viewpoint is growing, there have been only a small number of studies of participantsí talk and the artifacts they generate (Koschmann, 1996). Furthermore, there is a lack of theorizing and conceptual models for creating guidelines for practice (Johnson & Johnson, 1996).

Because of the importance we place on building theory from the understandings of the participants in CSCL, the main purpose of this study is to better articulate the experiences of the youth and mentors in iExpeditions. The researchers examined the actions, reports, and impressions of the participants in iExpeditions. The emerging themes, e.g., origin of motivation, youthsí individual differences, social and intellectual interactions, engagement, learning outcomes in CSCL, have been integrated into a descriptive model of the observed practices (see figure 2). This model of CSCL-mediated project-based learning will be verified and further developed during the second pilot of the iExpeditions. In this way, the researchers hope to build new knowledge and generate principles for the future implementation of CSCL systems and tools.

Research questions

The long-term research question is: "How do youth and mentors experience project-based learning in an Internet-based Shared Environment for Expeditions (iExpeditions)?" It is

derived from a review of literature on computer-supported collaborative learning (CSCL) (Koschmann, 1996), project-based learning (Blumenfeld et al., 1991), online learning environments and educational computer-mediated communication (Harasim, 1990). To answer this question, we examined three dimensions of this project-- the learning experiences of the youth, the teaching experiences of online mentors, and the function of the CSCL tools. This report presents in detail the data from the first two weeks, and focuses on what helps or hinders getting started on an expedition in the iExpeditions system. It then briefly describes a preliminary model of Youthsí Interest, Participation and Outcomes in CSCL-mediated Project-based Learning (Figure 2), which is derived from an analysis of the eight-week iExpeditions data.

Method

Participants

In this pilot of iExpedions (from April 28thóJune 15th, 1999), forty-five teenagers from 13 to 17 years old who responded to an invitation for the iExpeditions were selected to participate. Selection was based on the youth having sufficient access to technology (primarily a modern computer and Internet access). They were divided into 9 groups of 5 (labeled A to I), and approached the Expedition activities under the guidance of online mentors from Brigham Young University.

Method and data collection

Data were collected in various ways: non-participant observation (online), electronic surveys, questionnaires, interviewing (telephone and in person), chat room observation, recording of discussions in the forum, and project artifacts collection. The primary sources of data are the electronic logs and notes among youth and mentors as captured in the iExpeditions tool.

The researchers' inspection of system use and interviews with the youth and mentors were the primary instruments for data-collection. In addition, we used existing instruments, tests, and self-designed questionnaires and surveys as supplementary instruments for data-collection. The existing instruments used include: Collins Attitude Towards Computer Scale (CACS) for measuring youthsí computer anxiety level, Children's Nowicki-Strickland Internal-External Locus of Control Scale (Nowicki & Strickland, 1973) for measuring level of personal agency; Kolb's learning style inventory (Smith & Kolb, 1986) for measuring the individual learning styles, modified Spielberger's Self-Evaluation Questionnaire about Computer Anxiety (Gaudry & Spielberger, 1971) for measuring mentorsí attitudes toward computer. The researcher-designed tools include: questionnaire on technology infrastructure for selecting youth who had the potential to be successful participants, questionnaire on technology experience, youths' weekly self-report challenge cards, and mentors' weekly evaluation of youths' participation, such as persistence, enthusiasm, initiative and individual contributions.

As soon as the online activities started, the iExpeditions system captured all participantsí interactions, contributions, questions generated and the frequency of their participation. Youth were required to complete a weekly self-report challenge card to reflect on how they have progressed during the week. The challenge contains a link to a web-based survey on youthís level of interest and motivation toward activities during the first and second week, on the amount and types of support they received from mentors and iExpeditions staff, and on the functions of the iExpeditions system itself. Mentors were encouraged to kept open reflection logs on their well-facilitated moments, perceptions of participant improvement, the improvement of their teaching and computer skills, and their feelings of achievement.

Results

Parents-interviewing

Parentsí attitudes are considered one of the factors affecting youthís enrollment, engagement and outcome of participation. Ten of the parents were interviewed about their attitudes towards the iExpeditions project, what interested them about the project, and what were their expectations of their children in participating in it. Most parents were enthusiastic and supportive towards their childrenís participation in the iExpeditions, and most of them realized the value of the use of the Internet, the benefits of team work, and the importance of exposing children to problem-solving in the real world. Some of them commented on the use of iExpeditions as a new way of communication, and as an efficient information-gathering tool. To most people, the project is brand-new and unique, and they were impressed with what they have seen up to that point in the orientation. Most of them expected their children to achieve the aspects they valued about this project. Two parents hoped this project could be a starting point for their children to think about future careers. Three other parents hoped to learn from this project and apply what they learn to their own work.

Youthsí motivation toward iExpeditions

Youth were motivated to participate in iExpeditions by one or two of the following factors: telematics, teamwork, computers, Internet/Web-based, challenge, Motorola and business, hands-on practices, learning activities online, and experience.

Youth who have high computer skills were more attracted to the concept of teamwork and problem solving. Youth who were not satisfied with their computer skills found the technology aspect of the project appealing. They considered this as an opportunity to learn new software and computer knowledge. Among the 30 youth who completed the "Technology Experience" survey during the orientation, nine expressed interest in telematics technology; nine were interested in team work with other people; nine said they were attracted to the project because of the use of computers; seven liked the project because it is Internet-based; two were interested in the challenge; two wanted to learn more about Motorola and business; two hoped to gain hands-on practices; two were interested in the learning activities, "the learning type over the Internet." And one

expected that working with computers and other people would be a good experience for her.

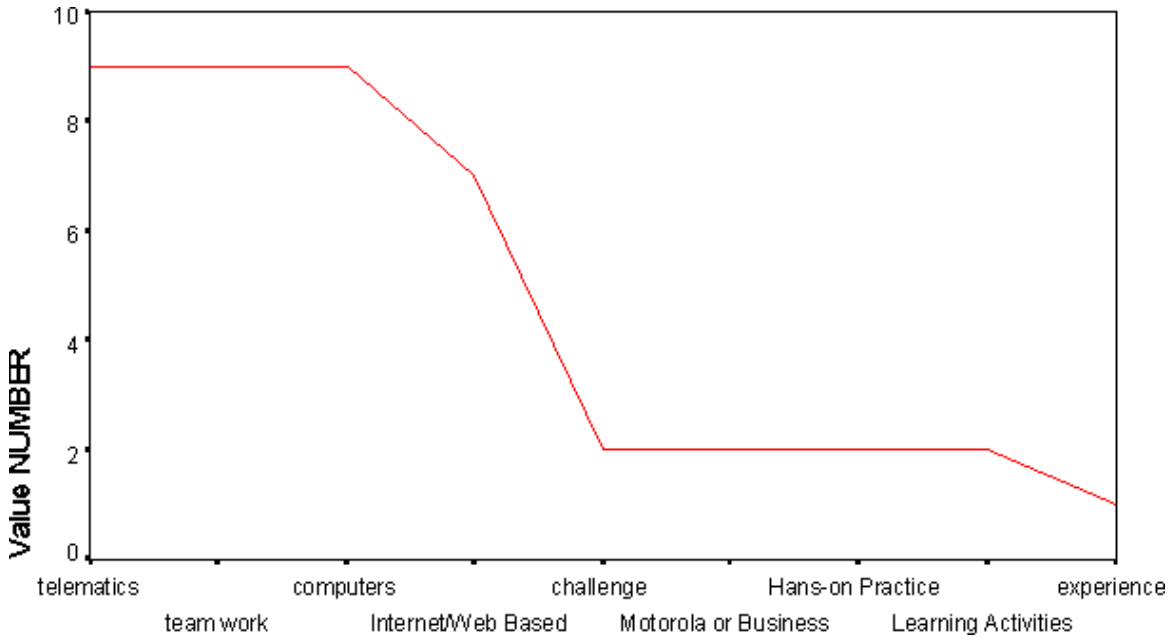

Figure 1: Youth's motivation toward iExpeditions

First two-weekís activities

From April 28th to May 12th, forty-five youth undertook their first and second week Expedition activities led by their mentors. They needed to reach Milestone 1, which contains 3 challenges. Challenge 1, "Meet your Team", was designed to have youth take initiative to know their team members and mentors. In Challenge 2, youth checked out the Motorola CEOís speech on telematics, which is the charge for the duration of the Expedition experience. Youth were required to generate an initial "What to Do" list, and categorize a list of "What We Know" and "What We Need to Know." They were then to create a problem statement about telematics. In Challenge 3, youth were encouraged to come up with a "first-cut" problem statement based on the telematics charge. In Milestone 2 for the second week, youth started their information seeking activities to solve their "first-cut" problem. At the end of each week, youth were sent a "Self-report Challenge Card" to reflect on their activities. They were asked to reflect upon "How is the team doing?" and "How are you doing?" A web-based survey was linked to this document, in which youth gave feedback to the project team, about their level of interest in the Expedition activities, the functions of the system, the availability of support from mentors or technical staff, the effectiveness of teamwork, and their suggestions on how to make the iExpeditions more enjoyable.

Most mentors sent welcome notes to their teams to arouse attention, and then sent out the challenge files. Some followed up on the challenges and gave youth more instructions on how to complete those challenges. At the end of each week, each team scheduled chat sessions, and conducted evaluations on their activities and performance in the past week. Mentors sent out chat agenda ahead of time, so as to have youth participate in the chat with prepared thoughts.

The active group

Since the iExpedition program and the iExpedition system are new, we expected numerous problems to surface during the pilot phase. The most significant has been the number of youth who for one reason or another have not participated. At the end of the second week there were 14 active youth, thirteen that had some level of participation, and the rest was still inactive. The reasons for inactivity include technical problems with iExpeditions, inexperienced mentors, insufficient home systems, busy schedules for the youth, low interest, and perhaps others. This paper will report on the youth that were active in the system.

Most of the 14 active youth (9 males, 5 females) attended the face-to-face orientation meeting on April 23rd. Learning style is one of the main variables that may affect youthís engagement in the project and the outcome of their participation. Youthís learning style was measured by using Kolbís Learning-Style Inventory. Four youth of this group have the learning style of an accommodator (good at concrete experience and active experimentation). Three of them have the learning style of a converger (good at abstract conceptualization and active experimentation). The common characteristic of the two types of learners is an ability to do active experimentation. Their Attitude Towards Computer (ATC) scores range from 109 to 119 (of a total 119), which indicates their high positive attitudes and low levels of computer anxiety. Youth's locus of control was measured to determine whether personal agency would make a significant difference in their engagement and achievements. Most of their external scores on the locus of control scale are lower than 10, which indicates high internality. Nowicki and Strickland (1973) reported significant correlation between internality and higher academic achievement for children from grades three through 12. Locus of control has been related to other personality variables in a theoretically consistent fashion.

Most of active participants use computers daily, for school, fun or exploration. Although the 45 youth as a whole all have proficient skills with computer software and technology, the 14 active ones have more extensive computer experiences. Youthís experience with software or computer technology was assessed on a scale of 1 to 4, with 1 being never using, and 4 being using very often. Most of the active group rated themselves as 4 or 3 in using word, email, chat room, Web search engines, presentation software, spreadsheet, Web authoring and multimedia authoring software.

Another noticeable commonality of the youth is their team consciousness and their interest in team building. Three of them rated the activity in getting to know group members as the most interesting part of the first-week Expedition. Being the only one active in his team for the first week, Y005 was puzzled by the inactive status of other

members in his team, and sent a note asking, "Where is everybody?" Nevertheless, he felt the iExpeditions was still interesting and he was looking forward to meeting his team members. Below are beginning case reports of four of the most active youth. Three of the successful participants shown in our case reports, Y001, Y002 and Y003, all have strong team-consciousness. Their ideas on what team is and how a team should work together were mature and insightful. Those ideas help explain their active participation and initiative in team building.

Case study of 4 youth

Of the 14 successful participants from Team A, B, C, H, F, and I, three of those youth are in Team I. By analyzing team I daily activities, we found that the mentor has played an important role in getting team members engaged. At the beginning, team I mentor Mrs. C sent a warm welcome note to each team member, sent a "Things to Do" list to remind them to complete their personal profiles and challenge 1, and sent notes with encouraging team-building messages, e.g.,

> "Here's a rule that I have as a mentor: There is only one stupid question and that is the question that is not asked. So don't be shy or feel embarrassed to ask. Each one of us has weaknesses as well as strengths. So, let's help each other without any reservations."

After sending out each challenge, she observed carefully what youth were doing, and gave them step-by-step instructions on how to insert answers to a challenge. She also sent reflections on each chat session, so as to keep team members updated about what has been discussed, and what are the plans for the future. Importantly, she encouraged them to keep up with their iExpeditions work. She even set up a "Stressssssss-Relief Corner" in the team forum to solve youthís participation problems. In this way, Mrs. C has established an enthusiastic, caring and patient mentor image.

Case 1 Y001

Y001 is a 16-year old, with a learning style of converger (good at abstract conceptualization and active experimentation). He shows a very positive attitude towards computers (a score of 116), and high internality on the locus of control scale (an external score of 5). He uses computers daily for school, 2-3 times/week for fun, and daily for exploration. His skills with word, email, WWW search engines, presentation software, multimedia authoring and web authoring are all advanced. He indicates his major interest is in the challenge and fun of working with a team over the web. Y001 completed the Milestone 1 Challenge 1 and "Things to Do" challenge soon after he received them and replied immediately to the mentorís inquiry for available times for chat sessions.

In his response to Challenge 1 on conceptions of teams, Y001 states that "teams should strive to achieve a common goal and each person voice and state their opinions on how to achieve their goals." He believes that teams can help produce success because multiple people will bring different perspectives and ideas of how to solve a problem. Y001 also completed his self-report challenge, in which he indicated his interest in the first week

Expedition activities was high (4). Things that have most interested him in the first week were to meet team members and to anticipate the new challenge.

Mentor Mrs. C commented on Y001ís participation. "We contact each other frequently. Very helpful (helped in General Forum), good computer knowledge, I like his fiery picture frame. . . Very patient guy, On task with his challenges."

Case 2 Y002

Y002 is also a 16-year old boy, with a learning style of accommodator (good at concrete experience and active experimentation.) His ATC score is high (110), and his external score on locus of control is low (7). He uses computers once a week for school, daily for fun and once a week for exploration. He is familiar with word, email, WWW search engines, and presentation tools. What has motivated him in participation is "learning about the world through the Internet." Before the project officially started, Y002 created a reflective log in his logbook, titled as "Me", "This log is mostly about me and my exploration log." His initiative of reflection is remarkable.

Y002 replied immediately to the Self-Report Challenge, in which he indicated his level of interest in the Expedition was 5 (the highest). Things that most interested him were the logs he could make. Tools that have worked well for him were the notes and challenges. He, however, had some technical problems. He rated the difficulties of the iExpeditions tools as 5 (the most difficult). That was why he hasnít completed any of the challenges. In his suggestions for change, he hopes to have a bigger team. According to Mentor Mrs. Cís record, Y002 was the first to contact her, and they frequently kept in touch with notes. "I am proud of having him and Y001 on my team. They are a mature group who don't give up easily but are anxious to help each other succeed."

Case 3 Y003

Y003 is a 16-year old girl. Her learning style is undetermined, but she holds a very positive attitude towards computer (116 of 119). Her locus of control is internal (6). She uses computers 2 to 3 times a week for school, 2 to 3 times a week for fun, but never for exploration. The software she has used includes word, email and web authoring. She is the only one who indicated her motivation for participation is to gain experience. "I enjoy working with computers and other people and hope that this will be a good experience for me."

Y003 completed her challenge 1 and Self-Report Challenge. Her answer to challenge 1 questions shows her deep insights into teamwork and team building:

> "I believe that working well with people is extremely important and thatís exactly what teams are for. Teams are consisted of numerous people all striving to achieve a similar/specific goal. Within the team many different perspectives are contributed and thoughts begin to feed upon one another. Others in the group can analyze the unique ideas and thoughts of their team members by providing positive/negative aspects and thinking of

areas in which it can be improved. As a result there can be various sophisticated ideas within a group. Teams can then reach a solution and achieve their goals successfully."

Her level of interest in the past week was 3. Getting to know her team was one of the activities that really interested her. She was also active in participating in the chat sessions, and volunteered to send messages to the team, informing other team members about the setup of another chat session. All of the Expedition tools and resources worked great for her and she did not have any problem in using them. She learned to use the system by playing with the system and referring to the CD tutorial when having problems. Mrs. C commented on her as very consistent, helpful and a willing worker. She was apt in computer skills and on task with her challenges. They kept frequent contacts through notes and chat.

Case 4 Y004

Y004 is a 16-year old boy, with a converger learning style, a positive attitude towards computer (115 of 119), but has the highest external locus of control score (16). He uses computers daily for school, fun and exploration, and his experiences with word, email, search engines, chat, web authoring and multimedia authoring are extensive. The major reason he participates in this project is to learn about computer work and business. As early as April 27th, we noticed that Y004 put a log of star wars movie in his logbook. As his mentor Mr. C observed, he basically has participated in all activities except completing the challenges. The fact that he was the only person active in Team H may have frustrated him.

To keep active single-handedly is a challenge in itself. The mentor has tried to maintain his interest. In the note replying to Y004ís inquiry about the chat time, the mentor sent him a well-designed, movie-like banner, in which there is dessert, helicopters, and the snapshot of a little boy, with a sentence beside him, "I HAD A DREAM I WAS An Expeditioner." This banner successfully romanticizes iExpeditions and tries to engage the youth emotionally.

Discussion

In the first two weeks, fifty percent of the 45 youth took some actions to participate. Those were mostly from the 32 youth that attended the physical orientation. Youth were engaged first because of their self-motivation, and their diverse interests in Expedition-type projects. Most youth were slow in completing their challenges. But many were active in contacting their team members and mentors by notes and emails. In this process, mentors played important roles in maintaining youthís engagement by giving immediate feedback, inviting them to chat sessions, and providing help as needed.

The 14 youth who have been most active and productive indicated that the Expedition tools were easy to learn, and they either learned them intuitively, by playing with the system, or by using the CD tutorial. The 13 youth who were active but havenít completed some of their challenges experienced some technical difficulties. For the youth who have

not logged in to the system since the orientation, most were still motivated and interested in participating.

Overall, technical problems and lack of team formation turned out to be the primary reasons that have slowed down youthís participation. The iExpeditions tools are most accessible for youth that are at a high level of expertise. Youthís individual differences in technology infrastructure and technology experience need to be taken into consideration. A longer orientation period may be needed for youth to learn the system, e.g., to give youth the CD tutorial one-week before the formal iExpeditions start. As one youth commented, "it is hard to get things done. The training provided was really nothing."

Teambuilding is an essential part of iExpeditions, but has only been successful for 2 teams. In most teams, there were only two or three youth being active. Many felt frustrated because of the lack of interactivity among their team members. According to one project stakeholdersí prior experience with face-to-face classroom Expeditions (known as Explorations), youthsí willingness to work hard depends on their peers making the same commitment. The first two-weekís Expedition activities were isolated experiences for most youth, which explains youthís slow starting with the Expedition challenges. For the next Expedition in Fall 99, instead of assigning youth to randomly-established teams, we may have youth interact with each other online (an electronic party), then have them form spontaneous teams, or to self-select the teams they join.

A descriptive model of the pilot iExpeditions was constructed from detailed, recursive analysis of the eight-week iExpeditions data (see figure 2). This model of Youthsí Interest, Participation and Outcomes in CSCL-mediated Project-based Learning describes the major themes (constructs) that emerged from the pilot including youthsí personal attributes, environmental context, youthsí attributions (the senses youth make out of iExpeditions), interest and participation, team functioning, learning and performance outcomes, and suggests how these constructs are or could be interrelated. The pilot data and related literature suggested significant relationships between major variables within one construct, and between constructs. For instance, personal attributes and environmental context significantly affected youthsí perceptions and understandings of the iExpeditions activities, which in turn affected their interest and participation patterns. Youthsí individual functioning contributed to team functioning, which influenced their learning and performance outcomes. Since the model was generated from the data collected within a limited period of time and in a specific setting, it needs to be further verified through an extended period of study. The model will therefore become a starting point for continuing research efforts in validating the relationships among the variables. Further investigations on the components of the model will help us better understand how to create the best possible CSCL-mediated environment for project-based learning.

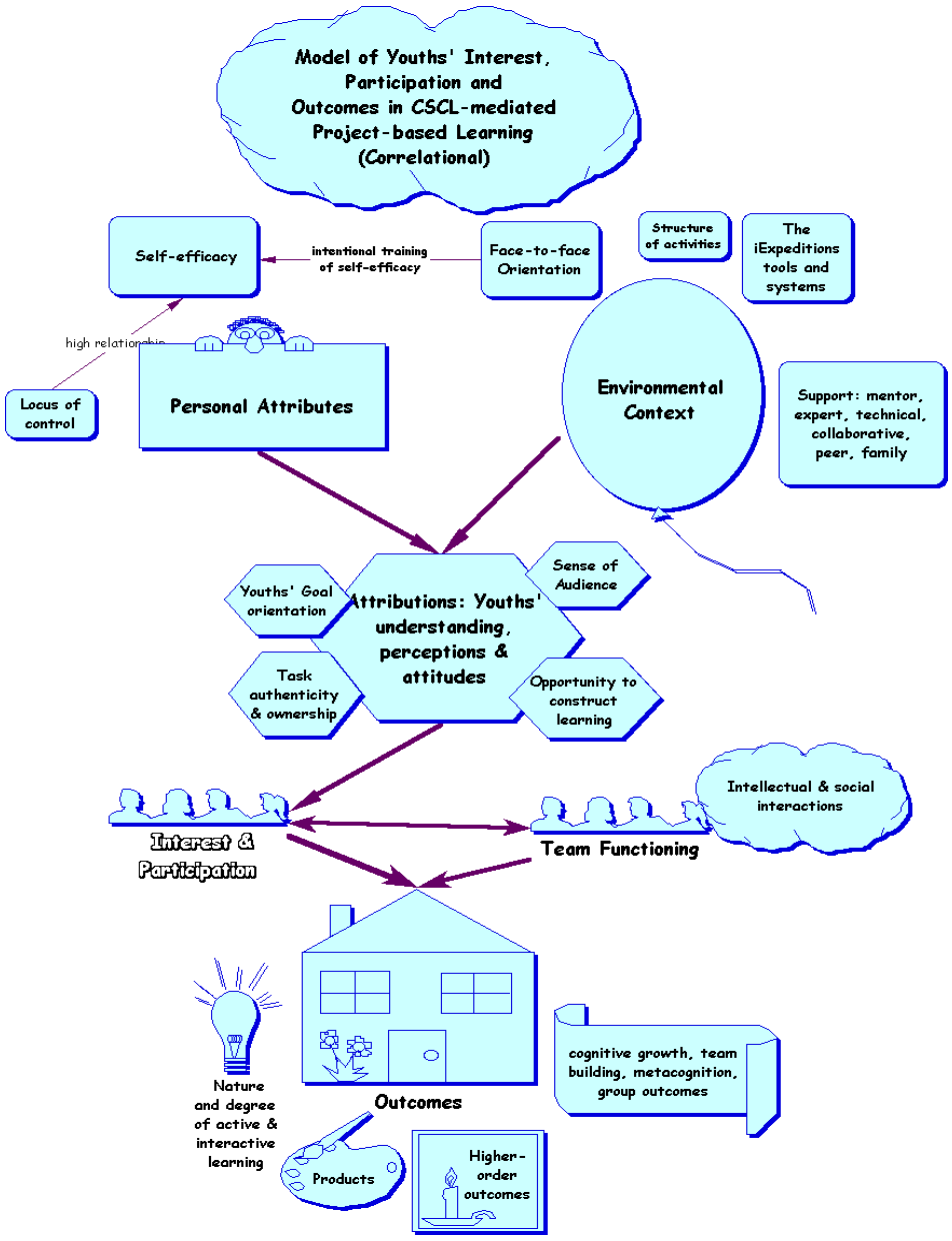

Figure 2 The Model of Youthsí Interest, Participation and Outcomes in CSCL-mediated Project-based Learning

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