T. Koschmann, D. Suthers, & T.W. Chan (Eds.), *Computer Supported Collaborative Learning 2005: The Next 10 Years!*
Mahwah, NJ: Lawrence Erlbaum Associates.

Measuring Motivation in Collaborative Inquiry-Based Learning Contexts

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Abstract. This paper argues that for understanding motivation in collaborative inquiry-based learning settings, there is an urgent need to develop new instruments that can capture the impact of the changes from the learning of well-defined content to open-ended inquiry and from individual learning to group-based learning on learning motivation. It reports on the development of such an instrument, the Collaborative Inquiry-based Project Questionnaire (CIPQ). Confirmatory factor analysis of the CIPQ data on six independent groups (n=269, 235, 173, 192, 300 and 254) of students who participated computer-supported collaborative learning (CSCL) projects has consistently yielded a five-factor model of motivation (Project Work, Social Learning, Task, Reinforcement and Social Pressure factors). The validity of CIPQ was indicated by the empirical relationship found between the five factor scores and independent measures of the levels of project engagement of the students.

Keywords: Motivation, collaborative inquiry-based project work, scale development

INTRODUCTION

Why do some students try harder than their classmates in learning? Why are some students more willing to strive for difficulties and challenges? Why is it that some students rarely engage themselves in deep learning? Motivation is a construct that refers to the inner psychological process that provides a behaviour its energy and direction (Reeve, 1996). Studies of motivation that aim to answer these important questions have become an important research area since 1970s. A number of well known theories about motivation have been developed, such as self-determination theory (Deci & Ryan, 1985), goal models (Ames, 1992; Pintrich, 2000), expectancy-value theory (Eccles et al., 1983), self-efficacy (Bandura, 1986; 1997) and self-theories (Dweck, 1999). They were theories about learning motivation in traditional settings in which learners engage in well-defined learning tasks individually, following detailed instructions provided by teachers.

In recent years, collaborative inquiry-based learning, often organized as project work in schools, has become increasingly prominent as a response of schooling to the challenges of the 21st Century (Scardamalia, 2001; Law, 2004). This new form of learning setting differs from traditional settings in several important ways: instead of learning individually through short and specific subject-related tasks, students have to work with others in teams and inquire into ill-structured questions over extended periods of time; learning outcomes depend not only on individual efforts but even more on group collaboration; instead of learning with well-defined goals, learners have to cope with many uncertainties in their inquiry processes and often have to determine their own benchmarks for assessment. What are the impacts of such changes on students' motivation? Would the motivation structure remain the same? If not, how is motivation structured in collaborative inquired-based learning settings? How should the concept of motivation be operationalized and measured in these new contexts? It is argued that the current motivational approaches and their instruments developed in traditional learning settings are insufficient to capture the impact of inquiry and collaboration on learning motivation. There is an urgent need to develop an instrument for measuring motivation in collaborative inquiry-based learning contexts as the first step to develop an explanatory model on motivational structure in these new contexts. This paper reports on the development of an instrument to address this need. More specifically, this study aims to develop an instrument for revealing the latent motivational factors of students in the new learning settings and to investigate their construct validity through triangulation with other indicators of students' engagement in the collaborative learning tasks.

THE ONTOLOGICAL STATUS OF MOTIVATION IN DIFFERENT MOTIVATION THEORIES

As mentioned, there has been a lot of exciting theoretical developments in studies of motivation such as the self-determination theory (Deci & Ryan, 1985), goal models (Ames, 1992; Pintrich, 2000), expectancy-value theory (Eccles et al., 1983), self-efficacy (Bandura, 1986; 1997) and self-theories (Dweck, 1999) over the last two decades. Underpinning these different theories are different ontological and structural assumptions about motivation, leading to differences in the stability of motivation as measured across situations as well as the dimensional aspects captured in understanding motivation (Murphy & Alexander, 2000).

Some theories conceptualize motivation as a personal trait which remains constant across situations. For example, one of the major claims of self-theories is that motivation is very much dependent on whether the learner believes that intelligence is malleable (incremental) or fixed (entity) (Dweck, 1999). Learners who perceive intelligence as a changeable quality through learning would be more motivated than those who perceive intelligence as a fixed innate quality. On the contrary, some other theoretical approaches, such as self-efficacy and expectancy-value theory, conceptualize motivation as task-specific states which change from task to task (Bandura, 1997; Eccles et al., 1983). Self-efficacy is a motivational construct associated with a person's *belief* in his/her self-competence in completing a specific task and a stronger belief in self-competence would result in a higher motivation for that specific task (Bandura, 1997). In Wigfield & Eccles's (2000) expectancy-value theory, the *expectancy* construct is similar to Bandura's self-efficacy and the *value* construct refers to the students' value judgment towards a task, including the perceived importance, intrinsic value and utility value of the task and the effort they are willing to pay to accomplish the task.

There is a third group of theories which conceptualize motivation as a construct between the above two ontological extremes such that it is sensitive to the learning contexts and yet still carries some stability over time and situations (Pintrich, 2000). The achievement goal construct of the goal models and the self-determination theory are two examples. Achievement goal construct associates motivation with individuals' beliefs about the learning activities concerned, such as task purposes, criteria for success and what constitutes effective learning strategies to achieve the perceived successfulness (Pintrich, 2000). Self-determination theory conceptualizes motivation as a two-dimensional construct comprising the *task* and *reinforcement* dimensions. The task dimension accounts for people's intrinsic motivation to engage in a particular activity because of the positive feelings inherent in doing the task itself (White, 1959; Woodworth, 1921). On the other hand, the reinforcement dimension refers to extrinsic motivation associated with the external and environmental drives (Deci, 1972; Lepper, Greene & Nisbett, 1973). While the self-determination theory builds upon the classic model of intrinsic and extrinsic motivation, it also breaks away from the perspective of taking intrinsic and extrinsic motivation as competing dichotomous constructs. Instead, the theory proposes a taxonomy of external motivations with different levels of internalization of task values and autonomy of behaviour, from the least motivated "external regulation" to "introjection", "identification" to "integration" (Deci & Ryan, 1985). The theory also suggests some mediating factors influencing students' levels of motivation such as students' perception of self-competence and the value that they place on the tasks (Deci & Ryan, 1985).

The differences in conceptualizations of motivation between these approaches are also reflected in the designs of the respective self-report instruments. Dweck and Henderson's questionnaire (1988) for measuring respondents' belief on intelligence based on the self-theories paradigm is a context-free scale. The self-efficacy scale for academic achievement (Bandura, 2001) and the instrument for assessing children's ability beliefs and subject task values (Wigfield & Eccles, 2000) are context-specific instruments which always refer to specific subject domains in their designs. On the other hand, both the scales for measuring goal orientation developed by Niemivirta (1998) within the goal models paradigm and the Academic Self-Regulation Questionnaire (SRQ-A) developed by Ryan and Connell (1989) within the self-determination theory paradigm frame their questionnaire items within a general academic context such as studying for schoolwork or doing homework.

LEARNING MOTIVATION IN COLLABORATIVE INQUIRY-BASED TASK CONTEXTS

Despite the differences between their conceptualizations and instrument designs, all the discussed approaches operationalize motivation among three important dimensions in traditional learning contexts, including the *self*, *task* and *reinforcement* dimensions. Self-theories, self-efficacy and the expectancy construct in expectancy-value theories all capture the self dimension by stressing the importance of the learners' beliefs on self-intelligence or competence. The task dimension is integral to the goal models, self-determination theory and the value construct in expectancy-value theories, and refers to the intrinsic motivation derived from engaging in a task or the learner's perceived importance of the task. The reinforcement dimension is captured in the classic intrinsic-extrinsic dichotomy and is also integral to the self-determination theory as extrinsic motivation. However, when

school learning settings change to feature prominently collaborative inquiry-based activities, does the importance of the self dimension in motivation remain the same? Do beliefs on self-competence still matter? Would the perceived competence of groupmates influence the learner's attitude towards the learning tasks? Is reinforcement still an important dimension in learning motivation when the outcome pertains to the group instead of to the individual? Furthermore, when the learning task changes from being short, well-defined and with definite solutions to being extended, ill-structured, full of uncertainties and without clear unique solutions, what are the impacts of these changes on the task dimension of motivation? The existing instruments for the measurement of motivation cannot capture the impact of open-ended inquiry and collaborative learning.

There are a few published studies that investigated motivation in this kind of new learning contexts, for example, the work of Järvelä and Niemivirta (2001) and Veermans and Järvelä (2004). However, even for these studies, the research instruments adopted were still those developed for studying learning motivation in traditional classrooms. This further highlighted the need for a research instrument that can help us to understand more adequately motivation in collaborative inquiry learning contexts. This paper reports on some initial work done in the development of such an instrument.

INSTRUMENT DEVELOPMENT

The current project conceptualizes motivation as a construct that it is sensitive to the learning contexts and yet still carries some stability over time and situations, which is similar to the perspective adopted in the self-determination theory. More specifically, motivation is taken as the context-induced structural tendencies of the individual to a learning situation (Niemivirta, 2002; Pintrich, 2000). This conceptualization assumes that students' motivation in collaborative inquiry-based learning settings to be a kind of chronic structure which carries a general level of stability across situations, yet still sensitive and malleable according to contextual factors and dimensions, such as the specific group dynamics or inquiry topics involved.

In this study, a self-report instrument, Collaborative Inquiry-based Project Questionnaire (CIPQ), was developed in two language versions, English and Chinese. The questionnaire was designed to examine whether there are additional structural components of motivation in addition to the task and reinforcement dimensions. Its 24-item earliest version was modified to a 20-item version according to the participants' on-site responses as well as the statistical analysis which verified the validity of the instrument (Chow, 2003). Eight of the 20 items in CIPQ were adopted from the Academic Self-Regulation Questionnaire (SRQ-A) (Ryan & Connell, 1989).

Table 1 Question Stems and Response Items in CIPQ

Question stems & items
(A) Why do I try to do well in school?
1. Because that's what I'm supposed to do.
2. Because I will be scolded by my parents or teachers if I don't do well.
3. Because I enjoy doing my classwork.
4. Because I might get a reward if I do well.
(B) Why do I work on my class work?
5. Because I want the teacher to think I'm a good student.
6. Because I want to learn new things.
7. Because I'll be ashamed of myself if it didn't get done.
8. Because I enjoy doing my school work well.
(C) Why do I participate in project work?
9. Because I like to work with my classmates in group activities.
10. I participate in project work because it's fun.
11. Because it's important to me to do project work.
12. Because if I don't participate, the friendship between my friends and I will be affected badly.
13. Because working in group (compare with working individually) allows me to tackle more complex project topics.
14. Because participating in project work can help my academic learning.
15 Because if I don't participate, my groupmates will blame me.
16. Because compared to learning by doing homework, it is more effective to learn by doing project work.
17 Because I don't want to be perceived as a burden to my groupmates.
18. Because there are many chances for discussion and sharing of ideas by working in groups.
19. Because learning in a group allows me to have more courage to investigate more complex topics.
20. Because if I don't participate, my reputation will be affected badly.

SRQ-A is a self-report instrument developed within the self-determination theory paradigm that measures students' motivation by soliciting the reasons for students' engagement in school settings. There are four sets of questions in SRQ-A, including "*1. Why do I do my homework?*", "*2. Why do I work on my class work?*", "*3. Why do I try to answer hard questions in class*?" and "*4. Why do I try to do well in school*?" Each question is followed by eight similar items which list the possible reasons for their engagement in relation to the *task* and *reinforcement* dimensions in the learning settings. For example, the eight items in Question 1 are "*because I want the teacher to think I'm a good student*", "*because I'll get in trouble if I don't*", "*because it's fun*", "*because I will feel bad about myself if I don't do it*", "*because I want to understand the subject*", "*because that's what I'm supposed to do*", "*because I enjoy doing my homework*" and "*because it's important to me to do my homework*". The 32 items in SRQ-A comprise four motivation sub-scales (external regulation, introjection, identification and intrinsic motivation). Each respondent's score on each sub-scale can be calculated by averaging the item scores on the respective subscale, from very true (4) to not at all (1).

Table 1 lists three question stems and the 20 response items in CIPQ. The first two question stems and the associated eight response items are adopted from SRQ-A. To solicit responses specific to collaborative inquiry-based learning contexts, a new question stem (*why do I participate in project work?*) and 12 response items were developed, with four items on the inquiry aspect (*Item 10, 11, 14 & 16*) and the remaining eight items on the social aspect (*Item 9, 12, 13, 15, 17, 18, 19 & 20*) of the learning situations. Respondents are required to select their responses on a 7-point likert-scale, from 1 (strongly disagree), 4(neutral) to 7(strongly agree).

RESEARCH SETTING

For the purpose of establishing the scale structure and validity of CIPQ, the instrument was administrated to students who participated in the Learning Community Projects[1] (LCP) organized by the Centre for Information Technology in Education (CITE) at The University of Hong Kong. LCP is a set of design experiments on computer-supported collaborative learning (CSCL) using Knowledge Forum®[2] (KF). From July 2002 to May 2004, four rounds of collaborative inquiry-based projects were organized, including Peer Tutoring Project (PTP; Jul-Oct, 02), Assessment for Better Learning Project (ABL; Jun-Sept,03), Promoting Higher-order Thinking Through Knowledge Building Project (PTP; Oct-Dec, 03) and Go Up Stay High Project (GUSH; Mar-May, 04). In each of these four rounds, there were about 200 to 300 grade 9 to 12 student participants, coming from several secondary schools in Hong Kong. The students from the same class were organized to form groups varying in size from four to six to work on a study topic for about six to eight weeks, with their teachers as the facilitators. The topics of study for the projects were generally assigned by the teachers, in subject areas ranging from the sciences to humanities.

STRUCTURE OF MOTIVATION IN COLLABORATIVE INQUIRY-BASED LEARNING

Two rounds of the 24-item CIPQ (pre-PTP, n=269; post-PTP, n=235) were administered to the LCP participants. Based on the item statistics, four item responses were removed to form a reduced 20-item version of the CIPQ (Chow, 2003). Four rounds of this 20-item version was subsequently administered (post-ABL, n=173; pre-PHT, n=192; post-PHT, n=300 and post-GUSH, n=254). Investigations of the motivational structure began with an exploratory factor analysis using SPSS (SPSS, 1999) and followed by the construction of confirmatory factor analytic models with LISREL (Jöreskog & Sörbom, 1993). Exploratory factor analysis is a statistical procedure for exploring characteristic features among a set of variables for detecting their underlying latent factors (Byrne, 1998). It is widely recognized as a useful method in the early stages of empirical data analysis for examining uncertain links between variables and latent factors (Jöreskog & Sordom, 1993). With the information gathered from exploratory factor analysis as prior information, sequential confirmatory factor analysis was conducted. It involved more rigorous statistical techniques to construct measurement models for confirming or disproving hypothesized underlying latent variable structures (Byrne, 1998). To further ensure the robustness of the instrument, the models constructed for the two versions of CIPQ in the current study were each validated with an independent set of data.

A five-factor model was repeatedly founded according to the CIPQ responses collected from PTP, ABL, PHT and GUSH. To determine the statistical adequacy, each model was evaluated by a set of goodness of fit statistics: Root Mean Square Error of Approximation (RMSEA) developed by Steiger (1990), non-normed fit index (NNFI) developed by Bentler & Bonnett (1980) and comparative fix index (CFI) developed by Benlter (1990). It is generally suggested that a model with RMSEA lower than 0.1 and both NNFI and CFI being larger than 0.9 is taken as statistically well-accepted (Kelloway, 1998; Diamantopoulos & Siguaw, 2000).

[1] Details of these projects can be found at http://lcp.cite.hku.hk
[2] Details about Knowledge Forum® can be found at http://www.learninginmotion.com/products/kf/index.html

An examination of the goodness of fit statistics of the validated models in Table 2 reveals that the 20-items version offers a better statistical fitness than the 24-items CIPQ (e.g., from RMSEA=0.091 to RMSEA=0.070, 0.076 and 0.078).

Table 2 Goodness of Fit statistics of the Validated Five-Factor Models

Instrument & Data used	RMSEA	CFI	NNFI
24-item CIPQ:			
Pre-PTP (n=269), validated by post-PTP (n=235)	0.091	0.92	0.92
20-item CIPQ:			
Post-ABL (n=173),validated by pre-PHT (n=192)	0.070	0.94	0.94
Pre-PHT (n=192), validated by post-PHT (n=300)	0.076	0.94	0.94
Post-PHT (n=300), validated by post-Gush (n=254)	0.078	0.94	0.93

Table 3 lists the five latent factors and the associated response items in the final 20-items model. By examining the meanings of their respective items, the five factors were labelled as Project Work factor, Social Learning factor, Task factor, Reinforcement factor and Social Pressure factor. The Cronbach's Alphas which indicate the reliability among the items of the factors are also listed in Table 3. Indeed, controlling the length of the scale while maintaining a reasonable reliability are both critical in scale development. According to Loewenthal (2001), a scale with less than 10 items with its reliability above 0.6 is considered as well-designed. In this regard, the five scales of CIPQ, each comprising of four items, were found be reliable across the different sets of data collected.

Table 3 The Latent Factors in the Five-Factor Model (20-item Version CIPQ)

Factor	Response Item	Cronbach's Alpha
Task Factor	Because that's what I'm supposed to do.	Post-ABL (n=173): 0.748 Pre-PHT (n=192): 0.638 Post-PHT (n=300): 0.681 Post-GUSH (n=254): 0.694
	Because I enjoy doing my classwork.	
	Because I want to learn new things.	
	Because I enjoy doing my school work well.	
Reinforcement Factor	Because I will be scolded be my parents or teachers if I don't do well.	Post-ABL (n=173): 0.674 Pre-PHT (n=192): 0.657 Post-PHT (n=300): 0.632 Post-GUSH (n=254): 0.673
	Because I might get a reward if I do well.	
	Because I want the teacher to think I'm a good student.	
	Because I'll be ashamed of myself if it didn't get done.	
Project Work Factor	I participate in project work because it's fun.	Post-ABL (n=173): 0.828 Pre-PHT (n=192): 0.862 Post-PHT (n=300):0.808 Post-GUSH (n=254): 0.855
	Because it's important to me to do project work.	
	Because participating in project work can help my academic learning.	
	Because comparing with learning by doing homework, it is more effective to learn by doing project work.	
Social Learning Factor	Because I like to work with my classmates in group activities.	Post-ABL (n=173): 0.853 Pre-PHT (n=192): 0.891 Post-PHT (n=300):0.807 Post-GUSH (n=254): 0.848
	Because working in group (compare with working individually) allow me to tackle more complex project topics.	
	Because there are many chances for discussion and sharing ideas by working in groups.	
	Because learning in group allows me to have more courage to investigate more complex topics.	
Social Pressure Factor	Because if I don't participate, the friendship between my friends and I will be affected badly.	Post-ABL (n=173): 0.792 Pre-PHT (n=192): 0.873 Post-PHT (n=300): 0.803 Post-GUSH (n=254): 0.760
	Because if I don't participate, my groupmates will blame me.	
	Because I don't want to be perceived as a burden of my groupmates.	
	Because if I don't participate, my reputation will be affected badly.	

As can be seen from Table 3, the adopted items from SRQ-A were all clearly clustered together under the Task and Reinforcement factors. This outcome aligns with the classic intrinsic-extrinsic perspective which identifies both task and reinforcement as important dimensions in learners' motivational structure. However, the emergence of the other three factors shed light on changes in learners' motivation structure when learning takes

place in collaborative inquiry-based settings. The Project Work factor was constituted by items pertaining to positive values associated with the task nature of project work and could be understood as an extension of the task dimension. The differentiation of the Task and Project Work factors indicates that students considered project work as activities distinct from general school work, possibly reflecting their identification of the inquiry nature of project work. On the other hand, the Social learning and Social Pressure factors indicate that the social aspect of the new learning contexts has an impact on learning motivation as well.

CIPQ MOTIVATIONAL SCORES & PROJECT ENGAGEMENT: EMPIRICAL EXPLORATIONS

Caution on the validity of self-report instruments in assessing motivation has been raised by many researchers (Brown, 1988; Boekaerts, 2001). The validity of the instruments lies with their applicability in understanding and explaining learners' behavior in the learning process. In this study, the five motivational factor scores of students were analyzed in relation to their observable learning behaviors in two ways: the quality and quantity of their engagement in the computer-supported collaborative learning tasks in LCP.

CIPQ Factor Scores and the Quality of Engagement

PTP was a reward scheme[3] in which students had to work in groups to complete an inquiry-based project over the summer holiday. The winners of the nine awards (these include both group and individual awards) were selected based on a list of criteria associating to various aspects of knowledge building (Scardamalia & Bereiter, 1999), including the social aspects (i.e., Best Peer Tutor, Most Supportive Collaborator), the quality of inquiry work of students (i.e., Best Research Award, Most Innovative Award, Most Reflective Journal Award) and good uses of KF functions (i.e., Best Use of KF Functions to Support Collaborative Knowledge Building Award, Best Use of Scaffold to Support Critical Thinking Award, Best Design of Views and Database Structures in KF, Best Use of KF for Scholarly Communication Award). The award winners were therefore the students who engaged in the projects with a higher quality of learning outcome than their counterparts.

It was hypothesized that the learners' motivation was highly associated with the quality of their learning outcome. Therefore, a t-test was done to check the differences on the five motivation scores between the PTP award winners (n=64) and their counterparts (n=132). The analysis results found that both before and after the project, the award winners scored significantly higher in the Project Work factor, Social Learning factor and Task factor than their counterparts by 0.274 ($p \leqq 0.05$) in the pre-project data and this difference was even larger in the post-project data, which became 0.367 ($p \leqq 0.005$). This suggested a positive connection between the motivational scores for the Project Work, Social Learning and Task factors and the quality of students' project engagement.

CIPQ Factor Scores and the frequency of engagement

Another indicator of the extent of a learner's engagement in the computer-supported collaborative learning task is the frequency of online reading and writing activities. The Analytical Tool Kit (ATK) is a peripheral software of KF designed to provide data for the monitoring of the online activities within the platform, for example, the number of notes created and scaffold supports used by a participant (Burtis, 1998). The ATK information of the PHT participants (n=300) was used for investigating the correlations between their CIPQ motivational scores and their frequency of engagement on KF.

Table 4: Correlation Matrix of the 5 Motivational Scores and usages of KF (n=300)

Engagement indicators	Project Work	Social Learning	Task	Reinforcement	Social Pressure
Notes created	.170**	.150**	.148*	-.030	.010
Notes read	.179**	.125*	.196**	-.019	-.022
References in notes	.182**	.193**	.159**	-.008	-.054
Scaffold supports used	.210**	.247**	.248**	-.072	-.073

** p< 0.01, *p<0.05

Table 4 lists the correlations between the five motivational scores and the engagement of the PHT participants as reflected by the four engagement indicators provided by ATK: the number of notes created, the number of notes read, the number of references and scaffolds used in the notes created by each participant. The

[3] Details about the PTP award scheme can be found at http://lcp.cite.hku.hk/Activities/PTP/Awards/

Project Work factor, Social Learning factor and Task factor were all found to show significant positive correlation with all of the four engagement indicators. This finding provides consistent triangulation with the significant correlation found between the Project Work, Social learning and Task factors with the quality indicators of project engagement reported earlier.

CONCLUSION

This paper argues that as learning in schools change from the traditional model of individual attainment of well-specified learning goals to collaborative inquiry-based formats, motivational research should seek to develop new motivational models and instruments which are more attuned to capture the newly introduced inquiry and social aspects of the new learning contexts. The current study has developed an instrument that measures motivation in collaborative inquiry-oriented learning contexts, which yielded five motivational factors, including the Task and Reinforcement factors generally found in the established motivation instruments, as well as three new factors, the Project Work, Social Learning and Social Pressure factors. The emergence of these new factors reveals the new dimensions in learning motivation brought about by the changes in learning organization.

Repeated administrations of CIPQ to independent student groups have yielded statistics that indicate strong robustness of the instrument. The validity of the five-factor model and the potential utility of the CIPQ motivational scores were demonstrated by the empirical relationships found between these scores to both the quality and frequency indicators of the learners' engagement in the LCP projects. Although CIPQ and its five motivational factor model was developed along with the data collected from different computer-supported projects, as the respective items of each factor did not necessarily refer to any computer-supported settings, the researchers would understand CIPQ as a generic instrument applicable in either computer-using or non-computer-using collaborative inquiry-based situations.

Based on the findings of this study, it can be concluded that CIPQ is quite a valid self-report instrument in understanding motivation in the new learning contexts. The researchers see its potential in generating quantifiable information (i.e., the factor scores) for measuring the levels of respondents' motivation regarding the five latent factors. Nevertheless, the reported study is only the beginning of a larger project. To further investigate and validate what actually the five subscales are assessing, the next phase of the study will conduct analysis on the factor scores in relation to the interaction and learning processes of the LCP participants, for example, their self-regulated learning behaviour. In the long run, it is hoped that this instrument will be found to be useful for investigations aimed to further our understanding of learning motivation in CSCL contexts. For example, how does an individual's motivation affect his/her behavior in groups? How would individuals with different motivational score profiles interact with each other when they work in the same group? How does motivation relate to the inquiry process of the learners, such as the depth of idea interaction, their self-regulated behaviour and affective sharing patterns?

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