A cognitive-situative approach to understand motivation: Implications to technology-supported education

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Abstract: Technology-supported education has become increasingly important and popular. Although it has long been claimed that a technology-enhanced learning environment is often more motivating than its traditional counterpart, not too many inspiring empirical studies have been carried out. In this article, the traditional approach in the motivation research field and its limitations are reviewed, based on which, a new perspective on motivation, a cognitive-situative approach, emerges. It is argued that this new approach might be more applicable for understanding motivation in technology-supported education settings, thus possibly bringing more implications for pedagogical improvement. The authors also propose a new research methodology be taken for studying motivation from a cognitive-situative perspective.

Key words: motivation; traditional approach; cognitive-situative approach; technology-supported education

1. Motivation research

1.1 Traditional approach and its limitations

Motivation is the internal process that initiates, maintains and guides external behavior, and has always been an important variable in education and learning (Slavin, 2003; Woolfolk, 2004). Traditional perspectives of motivation focus on how various motives explain human behaviors and this research tradition has long influenced the educational research addressing motivation. Three most representative perspectives on motivation are the behaviorist perspective, the humanistic perspective and the cognitive perspective.

The early behaviorist perspective emphasizes the empirical observation of external behavior but not the internal cognitive process. This paradigm denies the validity and reliability of studies on cognitive process. Behaviorists focus on the stimulus-response bond but ignore the internal cognitive process. Skinner's reinforcement theory (1953) is one of the most representative theories in this perspective and has been applied to the traditional classroom settings for decades. Emphasis on learners' potential incentives and its reinforcement might bring some implications to education (e.g., how to scientifically use rewards and punishment); however, extreme orientation to exclude learners' cognitive process and the contextual effects restrains generation of scientific explanations on learning behaviors.

The humanistic perspective regards motivation as internal dynamics for one to fulfill his/her needs and finally achieve self-actualization. Humanists believe such needs exist in all human minds and motivation is the mental dynamics to fulfill these needs. The "hierarchy of needs" (Maslow, 1968) is the most important theory in

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the humanistic world of motivation. This theory suggests that humans have a hierarchy of five needs, and motivation for need fulfillment develops in a sequential order from a lower-level need to a higher-level. Like the behaviorist approach, the humanistic views of motivation might fail to explain the contextual and cognitive factors in motivation, though it does bring forth a limited amount of implications to teaching and learning.

Unlike the previous two perspectives, the cognitive perspective explains motivation by looking at the internal cognitive processes and the interaction between mental thinking and the external context. It is the most influential approach in today's motivational research domain. Attribution theory (Weiner, 1992), expectancy theory (Edwards, 1954; Atkinson, 1964; Wigfield & Eccles, 2000), self-efficacy theory (Bandura, 1997), and goal-setting theory (Locke & Latham, 1990) are four main motivation theories advocating the cognitive perspective.

Attribution theory addresses the question of how learners attribute success or failure to external or internal reasons could influence learning behavior by affecting self-esteem, stability on goal-expectation, and controllability on emotion. Expectancy theory suggests that motivation is the product of individuals' expectancy and value appraisal about a behavior. Self-efficacy refers to self-evaluation of one's competence and abilities, and strongly affects one's expectancy towards success; therefore, it has a great impact on motivation. Goal-setting theory is one of the dynamic theories which suggest motivation as a dynamic process. The dynamic model of motivation stresses that motivation is not just a phenomenon at one point; rather, motivation can be explained as motivational states, changing continuously. The fundamental argument of goal-setting theory is that motivation is a function of discrepancy production and reduction (Locke & Latham, 1990). In the goal-setting process, factors such as expectancy on success, self-efficacy have regulatory effects. The focus on motivation as a dynamic process was a revolution in the field of motivation (Volet & Jarvela, 2001).

Systematical research on the relations between different motivational constructs and cognitive engagement has been carried out (Pintrich & Schrauben, 1992). Various motivational sources such as interests, goal orientation, self-efficacy and outcome expectancy can explain learners' behavior conduct, cognitive engagement and affective functioning. This traditional research generated many motivational models representing the relations between the motivational resource, either intrinsic or extrinsic, and learning behaviors. Various motivational models and frameworks have been developed and improved for instructional design or assessment on how motivating a learning setting is (HUANG, et al., 2004). How to sustain students' motivation is another question that has led to extensive discussion (Schunk & Zimmerman, 2008).

By reviewing the development of the motivational research field, from early behaviorist and humanistic perspectives to the cognitive perspective, it may be recognized that several shifts have taken place in this domain: (1) from overlooking internal process and contextual factors to an integration of all these factors; (2) from regarding motivation as instant phenomena to regarding it as a continuous process; and (3) from thinking of motivation as a simple facilitator to a complicated dynamic construct produced in the learning process. However, the shifts are far from complete.

The traditional perspectives on motivation, although having enhanced the educational improvement in the last two decades, increasingly show limitations for explaining students' learning behaviors, cognitive or affective engagement, as the educational settings and students' backgrounds become more diversified (Volet & Jarvela, 2001; Turner, 2001). Various learning contexts are possible for only a single course, utilizing a variety of instructional tools for better instruction, allowing different ways of communication and collaboration, and supporting diversified teacher-student and student-student relations. On this aspect, it might not be realistic to measure the relation between a single motive and its impact on students' learning behaviors. Meanwhile, the

students' characteristic profiles are also difficult to construct since students' backgrounds are more diversified than ever; Variables such as cultural values and prior life experience are difficult to be systematically utilized as explanations on students' motivations and behaviors. As the understanding of learning and thinking becomes more extensive and profound, it is now necessary to enrich the understanding of motivation theory and apply the theory to new learning settings such as a technology-supported learning environment. To attain this goal to which a cognitive approach might not be adequate, holistic, situated and dynamic views of motivation need to be utilized.

1.2 Current views of motivation in an educational setting: Holistic views regarding cognition in the context as a whole

The cognitive view of learning emphasizes individual perception and experience. Although the cognitive approach does emphasize the social-cultural environment for its influence on shaping learners' cognition and motivation (Anderson, Reder & Simon, 1996), the construction of motivation in the context is in lack of theoretical foundation (Jarvela, 2001). A holistic research approach might be necessary for understanding how learners' background and cognition interact with the learning context, and what motivational beliefs or orientations are generated in the interaction. In other words, the interaction between social-cultural beliefs and the context might most influence students' general affordances of a learning context, which again dynamically affects students' motivational states, cognitive and affective engagement. Different emotions aroused in the students might also be an important variable to track this dynamic continuous process.

A situated cognition school of thought (Lave, 1988) is popular among the contemporary cognitive theorists and the social-cognitive approach to study motivation is one of the hot topics. Some experts claim that what is social and what is cognitive do not have clear distinctions, because the causal relations are very complicated and hard to predict (Perret-Clermont, et al., 1991). For better understanding of social-cognitive interaction, more research needs to be carried out. For example, Carol Dweck's motivation theory focuses on how students' self-conceptions about intelligence influence their learning goals and how the environment contributes to the formation of either a growth or entity mindset (Dweck, 2006).

Research on multi-layered models of the learning contexts (Volet, 2001) is another example of the holistic perspective of learning and motivation. In Volet's article, he introduces a multi-dimensional cognitive-situative perspective for understanding the person-context experiential interface. In this model, students' cognition, rooted social cultural beliefs, instant motivation and emotions related to learning are defined as the initial state, the interaction between this state and the context produces an experiential interface, which arouses subjective beliefs and appraisals of this context with subjective and instant emotions. It is the congruency of the experiential interface that determines students' affordances of the learning context and whether this context supports cognitive and affective engagement. Such a situated-cognitive way of understanding learning gives motivation another definition: dynamic constructs produced from individuals' subjective appraisals of the learning context, which influences the subsequent series of learning behaviors. The context is recognized as a whole in which various factors are interrelated, and students with their own backgrounds engage in this context to find their own identity.

2. Technology-supported education

2.1 A constructivist view and social-cognitive approach of understanding technology-supported education

It has been generally agreed that the goal of designing technology-supported learning environments is to

stimulate students to learn in an active, constructive, meaningful and authentic manner (Vosniadou, De Corte & Mandl, 1994). Theories from the educational and psychological fields have provided strong foundations for technology-supported learning environment construction. A constructivist view of learning has also been popular in technology-enhanced education. For example, Jonassen, et al. (1998) argue that computers can be applied to the educational settings as mindtools rather than simple knowledge deliverers. By helping organize knowledge (e.g., concept mapping), construct mental models from complicated and ill-structured knowledge (e.g., expert systems), visualize and interpret the information (e.g., tool for visualizing chemical compounds), the computers act as the mentor that leads the learners to go into the desirable learning tracks, and improve the their learning performance.

Integrating collaboration and communication into the technology-enhanced learning environment has become a popular topic (Edelson, Pea & Gomez, 1996). The virtual school research is a good example of demonstrating the importance of a social-constructivist view, and the criteria derived from such view have been applied to the learning environment design (Ruokamo, et al., 2002). Computer supported collaborative learning (CSCL) has been recognized as one of the most promising directions in the educational technology field (De Corte, 1996).

2.2 Lack of motivational research in technology-supported education

The goal of an educational and psychological foundation for technology-enhanced education, as has been stated, is to motivate students to engage in meaningful, constructive, active and productive learning. However, although theories in the motivation field are an important perspective in technology-supported instructional design, there are not many empirical studies (Reber, 2005; Issroff, 1994). One reason might be that the technology itself is the most attractive domin compared to the traditional way of teaching, thus the potential of the technology for education enjoys most attention, which might cover the fact that a technology-based learning environment, like the traditional learning setting, is a complex context which students engage in. Another reason might be that the technology-enhanced learning environments are so diversified that the results from one field (e.g., video games) may not be applicable to another (Foster, 2008). Even in the same field, the motivational theory might be fragmented. This fact may discourage experts to take this research perspective.

A limited amount of studies addressing motivation and technology-enhanced learning followed the cognitive approach, emphasizing the effects of separate motives on learners' motivation and experience. For example, Reber (2005) argues that motivational factors need to be assessed and clarified. In Reber's case study of how using web building as an assignment motivates students to learn, questionnaires including a list of motivational factors were used, and students were asked to rank on a 1-10 scale to show how much they had been affected by the various motives. The cognitive approach supports the use of motivational profiles to test how the motives embedded in the technology impact learning behaviors, with questionnaires being the typical research methodology. Since the students' backgrounds are taken into consideration, a profile of the students might also be utilized. The research focus lies in the relations among factors including the motives in the context, the background of the students, students' motivational status and learning outcome. Passey, et al.'s (2004) study on the motivational effects of ICT (information and communication technology) on pupils falls into this category. Few qualitative studies have been carried out which focus on the motivational state construction, the new perspective in the motivational research field.

Having been pointed out in the first section of this review article, the cognitive approach of motivational research, although bringing implications to instructional design, has its limitations. As for technology-supported education, the limitations become even more evident. The diversified technology items lead to complex learning

contexts in which the motivational factors are hard to define, and such an endeavor might not only be tiring but also incomplete. Although the research results might show some relations between the motives and students' behavior, it is too arbitrary to make such conclusions since the impact could also be explained by some factors that are not defined recognized in the study. Meanwhile, characteristic profiles of the students become more complex to draw than in a traditional class, because more variables are included such as prior knowledge on using the computer and attitudes towards the technology. The difficulties are taking a cognitive approach for motivational study might be another reason that the motivation perspective enjoys less attention in technology-supported education.

Current views in the motivation research field might bring new inspirations for understanding motivation in a technology-based learning environment. Foster's new review article on video games and motivation (2008) supports a holistic and situative approach. The article integrates literature from science learning and instruction, social-contextual perspectives of learning, motivation and educational technology to address the issue of how video games can facilitate learning. Specifically, the article takes a constructivist view that learning is engagement, and values a situated perspective that students with their own backgrounds interact with the video game environment which they engage in. In addition to that, a congruency and affordance view is used to appraise the effectiveness of the video game environment instead of setting up relations between various motivational factors and students' behavior; a dynamic view is emphasized that students' motivational states, goals-setting and strategy-searching are a continuous process that takes place in the person-context interaction. Foster also points out that there is a lack of theoretical foundations for assessing the capabilities of video games in shaping students' identities in science learning, and consequently proposes that more empirical studies be implemented.

3. Proposals on future motivational research in technology-supported education

3.1 Reevaluate motivation by rethinking the nature of learning

The view that learning as engagement and motivation as the product of the identity searching process in the context could be inspiring. Such a constructivist and situative view implies that we need to focus on the context characteristics, students' background, most importantly, the continuous interaction between the two and the dynamic products of the interactive process including students' emotion, motivational states and affordance of the context.

Extensive research is needed for neutral and comprehensive appraisals of a technology-supported learning context. Different from analyzing the separate motivational factors, the neutral description of a context is not for predicting but for explaining the contextual effects on the learner when the learner is truly engaged in it. Another distinction is that this research view regards each individual as the center in a context. This not only avoids making arbitrary decisions on the effects of various factors, but also allows the objective analysis on motivations and behaviors of students with diversified backgrounds.

The dynamic view of learning suggests that motivational states are based on students' subjective interface experience in the learning context and are also dynamic. Instead of predicting the motif-motivation relations, scrutinizing the flowing motivational states in the learning process might be more scientific.

3.2 Reevaluate the methodology

A neutral and comprehensive understanding of a technology-enhanced learning context requires the collaboration among designers, psychologists, educationalists and the social-cognitive experts. The experts from

different fields may work together to articulate the rationales underlying the design, from technological, cognitive and social perspectives, to appraise and improve the learning context from different perspectives. A flexible model describing the context might enable more valid improvements to be made. For instance, a designer adds a motivational factor (which might be from a cognitive perspective) to a video game environment (Garris, Ahlers & Driskell, 2002), the effect could easily be tracked if there is a comprehensive model describing the learning environment. In addition to that, such contextual models have referential values across the whole technology-supported education field.

Since the research focus becomes the dynamic interaction between the individual and the context, it is time to question the effectiveness of questionnaires. More qualitative studies are essential for explaining the dynamic interaction between the individual and the learning context. Students' emotions, subjective appraisals of the technology-supported learning contexts, the goal setting, strategy taking and self-identity searching could be regarded and researched on continuously as a dynamic process. It is more applicable to a technology-enhanced learning environment because technology can make this process tracking possible. Explanations for the empirical results should come from different perspectives, cognitive or non-cognitive, and be embedded in a multi-layered contextual model.

The computer-supported collaborative learning (CSCL) will be taken as an example to show how the new motivational research perspective might be more applicable. CSCL is a very good example of the constructivist approach of education, requiring that the students learn in a collaborative and meaningful way. One of the problems is how to motivate students to collaborate with one another, which has been discussed in the CSCL field since the appearance of this educational setting. The cognitive approach is popular. Theories such as self-efficacy and expectancy have been used to assess the CSCL environments (CHEN, 2006; Ertl, et al., 2006). The collaborative nature of the CSCL environment has aroused attention on its social context. For example, Ertl, et al (2006) argued that social-cognitive support could increase students' motivation. This study indicates a combination of conceptual and social-cognitive support would best benefit learners, and stress the interaction and inseparability of the cognition and the context. However, these studies, generally speaking, follow the cognitive approach, regard the context as secondary to human cognition, and pay little attention to the interface experience of the students and the dynamic motivational change in the learning process. Thus, similar studies might occasionally fail to explain individuals' behavior and performance in a comprehensive way. For example, the study of Ertl, et al (2006) also showed that increased collaborative learning outcome does not imply better individual learning outcome. Because the interaction among the students and the learning context is not clear enough, and the research focus is not on the interface experience and students' subjective appraisals of the environment, it might be hard to explain their motivational states and the learning patterns. The main concept of a cognitive-situative approach is to research the interface experience in the CSCL environment, and at the same time, to understand the dynamic motivation construct in the context during the learning process. A comprehensive understanding of the CSCL context is essential. The designers, psychologists and teachers may work collaboratively to describe the actual learning setting from different perspectives. Both quantitative and qualitative methodologies can be used complementary to one another for a comprehensive view of students' affordance of the learning environment. Questionnaires might still be useful to get a brief view of students' background information and general motivation towards the learning environment. Additionally, the students can be asked to express their subjective emotions and feelings in the learning process. At the same time, a learning management system (LMS) might be able to track learners' behavior by recording various useful information, such as log-in frequency,

number of articles posted, total idling time and total viewing time. In this way, it might be able to explain individuals' behavior and motivation from various perspectives rather than just using motive-motivation causality.

4. Conclusion

How to build effective technology-supported learning contexts is a question that advocates extensive research from the teaching-learning perspective, the motivation perspective, the technological perspective and the social cultural perspective. The term "motivation" is not easily defined not only because its various manifestations and its unclear causal relations to learning behaviors and performance. Learners' diversified backgrounds and the complexity of the technology-supported learning environment lead to more difficulties for motivational research. A situative-cognitive perspective of learning and motivation might help us find a way out from this difficult position. By focusing on individuals' experiential interface in the whole context, it might be easier to find explanations for the learning phenomena. By holding the idea that motivation is a dynamic construct in the learning process, it might be much easier to bring forth suggestions on how and when to provide scaffolds and intervention. The authors propose that more motivational studies need to be carried out in technology-supported education with a situative-cognitive approach, and new research methodology needs to be evaluated and implemented.

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(Edited by Nicole and Lily)