Analysis of Negative Factors in the Application of Group Awareness in CSCL Environments: A Study of Facilitation Strategies for Group Awareness Tools

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Abstract: Group awareness information in CSCL environments can help learners cooperate with group members smoothly, thus improving the efficiency of collaborative learning. The introduction of group-awareness tools can enhance the group awareness of learners in CSCL environments and solve the problems existing in the CSCL field. By summarizing a large number of current empirical studies on group-awareness tools, the paper deeply examines the negative factors in application status underlying these effects of group-awareness tools. Based on the group awareness theory, this paper studies the promotion strategies of group-awareness tools for negative factors, according to which the potential research direction in the future is put forward.

Keywords: CSCL; Group Awareness; Cooperative Learning; Group-Awareness Tools

1. Introduction

"Whenever a new technology is introduced into educational practice, great expectations often come along with it."(Richard Meyer) At the beginning of the 21st century, the development of information technology has promoted drastic changes in the field of cooperative learning education, and researchers in the field of scientific learning and educational technology have gradually integrated computer technology into cooperative learning. CSCL has become a popular field for educational technology researchers at home and abroad. With the maturity of research, the application of CSCL has demonstrated certain significant defects. For example, learners are hard to perceive the contextualized learning engagement information of other group members online, which also creates difficulties for learners to monitor and adjust their learning status effectively, resulting in a cooperative learning experience with poor interactivity and low learning efficiency.

To solve this problem, the theory of "group awareness" was introduced into the field of CSCL. "Group awareness" refers to the perception and understanding of other members' behaviors by individual members in a group. The application of the group-awareness theory in the field of CSCL is triggering mutual perception, promoting interactions, facilitating the occurrence of cooperative learning by providing learners with information about behaviors, knowledge, and social activities of their peers with the support of computer technology. The application of group-awareness tools is an effective measure to help learners establish group awareness in CSCL environments.

Currently, group-awareness tools mainly include cognitive, behavioral and social, which correspond to the division of learning engagement in current studies, namely, cognitive engagement, behavioral engagement and emotional engagement. Although group-awareness tools have been widely applied in the field of CSCL, there are still many negative factors from the perspective of its application status and effect presentation. The article referred to a large number of studies on the empirical analysis of group-awareness tools, focused on the experimental data on the application of group-awareness tools and conducted relevant analyses and summarizations, and then discussed the major problems in the applications of group-awareness tools and examined negative factors. Finally, promotion strategies for the design of group awareness tools were provided.

2. The application status of group-awareness tools in CSCL environments

Although group awareness has not been applied in CSCL for a long time, it is gradually rising in the field of CSCL. Researchers have published important papers in major conferences and senior journals in related fields. Ouyang Jiayu screened and summarized 30 papers (relating to the 21 different groups perceive tools), and compared the characteristics of

cognitive, behavioral, and social group-awareness tools in the CSCL field. From the perspective of data statistics, the representation of group-awareness tools is complex and diverse yet the source of information is generally self-evaluation. A series of negative factors that may affect the effect of CSCL can be excavated behind such information.

2.1 Cognitive overload

Experimental studies exist to support that large amounts of information, stress and complexity can put a strain on our working memory. However, working memory plays an indispensable role in learners' understanding of knowledge and problem solving. The group-awareness concept refers to the information obtained by group members about the behavior, cognition and social background information of their fellow team mates. When all these elements are presented to learners in various forms with the support of computer, it will put great pressure on learners, which entail the phenomenon of cognitive overload. From the perspective of existing research, there are various ways to the representation of group awareness tools. They come in column charts, bar charts, spheres, text annotations, radar charts, etc. Dehler et al. employed the yes/no judgment design and Buder et al. adopted 2D array, scatterplot, etc., which achieved a variety of representational forms. It can be said that there are various forms of representation. Nevertheless, no matter how diverse the forms are, the contents expressed are generally homogeneous, almost all of which are the presentation of learners' learning times, learning duration statistics and other quantitative data. Although learners know more information, there will also be situations that make learners cognitive overload.

2.2 Assess concerns

In face-to-face situations, group awareness information is generally available directly, but the interaction of computer-supported group awareness information depends on the necessary technical support. In addition, team members are supposed to upload their own progress information and share information with other team members actively to achieve effective information interaction, so as to improve the efficiency of online collaborative learning. In practice, many research reports indicate that the initiative of sharing information among team members is not intense, and there is a lack of reciprocity and mutual benefit among team members. Some learners even withhold information to save time and maintain a leading position in the amount of knowledge they possessed. In Kimmerle's research, it is hardly surprising that, from a psychological perspective, learners are reluctant to share and interact with group members because the transmission of information is often perceived as a loss of power. Group-awareness tools will also make the dimension of learning evaluation open and transparent. When learners realize that their learning performance is under supervision at no time, and the ability level of group members is quite different, learners' acceptance of group-awareness tools will drop significantly, resulting in the situation of assess concerns.

2.3 Analysis and presentation of group awareness information

Since the group-awareness tools in the current CSCL situation are difficult to capture the cognitive group awareness information of learners with high frequency changes, the current group awareness information is mainly derived from self-evaluation rather than automatic evaluation by the system. As for behavioral group awareness information, it is almost collected by the system, but in the process of information processing and presentation, most studies did not refine and process the information. Researchers such as Kimmerle and Jermann have used the form of bar charts to present the behavioral group awareness information, presenting the statistical results of learners' data such as the number of contribution behaviors and the number of information words respectively. In addition, there are also representational results such as the number of learners' operations, visits, comments and duration statistics. Despite there are many kinds of data, in-depth analysis of learners' collaborative learning process is extremely lacking.

3. Facilitation strategies of group-awareness tools in cscl environments
3.1 Focus on the information of collaborative learning process

Focusing on the cooperative learning process rather than merely data processing and simple presentation of learners' performance plays an essential role in improving learners' cooperative learning efficiency. Collaborative process refers to the process in which learners actively interact with other group members and share information to promote problem solving. Only when team members provide useful information to each other and realize intense interaction of information can the cooperation process be more efficient. Therefore, it is of great significance to focus on the cooperation process, study the

interaction and feedback of cooperation among members, and effectively organize and refine the processing of group awareness information. Especially for information processing, it can neither bring learners cognitive load nor enhance their group awareness consciousness. The group awareness of learners can enable them to provide feedback information continuously in the process of cooperation, so as to adjust the learning state of themselves, their peers and their groups. Only by enhancing learners' consciousness of group awareness can group-awareness tools effectively cooperate with learners to improve the efficiency of collaborative learning.

3.2 Stimulate the vitality of the members by combining the real experience of learners

It's indispensable for the developers of group-awareness tools to continuously track the collaborative learning experience of learners in CSCL environments, and effectively compare their expected perception criteria with the real experience of learners, thus improving and designing group-awareness tools specifically. To stimulate the vitality of collaborative members, they need to actively cooperate and share information with their partners. In a way, it is profitable for individual members to withhold information about themselves, but if all group members act in this way, the teamwork will be inefficient and the group-awareness tools will not be functional at all. Therefore, the effectiveness of tools requires mutual cooperation, and without people's initiative, tools are difficult to play a role. Researchers of group-awareness tools development need to combine user awareness and demand to seek development direction. People's behaviors and experiences are determined by the interaction of characteristics of the current situation, personal characteristics and situational interaction. The method of interaction should also combine personality factors and situational factors as well as their interaction factors. The application of technology is not the fundamental goal, but the integration of people and tools is the direction we are willing to pursue. Hence we need to have a deeper understanding of the psychological mechanism triggered by group awareness.

3.3 Stimulate the vitality of the members by combining the real experience of learners

Based on the current application of group-awareness tools, the source of group awareness information still mainly relies on learners' own metacognition and peer mutual evaluation mechanism, which brings learners cognitive load to a certain extent, and the effectiveness and availability of its information are still remained to be investigated. Subjected to technical means, it is challenging for group-awareness tools to scientifically evaluate the learning effect of learners from their behavioral information. In the future, with the continuous updating and iteration of technology, we can utilize motion capture technology, eye movement tracking technology and othes to assist group-awareness tools to record and analyze the behavioral perception information of learners, reduce the burden of teaching workers, and provide learners with scientific, intuitive and effective collaborative learning tools.

4. Conclusion

The rapid development of information technology has led to tremendous changes in the field of education. With the continuous integration of computer technology and education, the research on CSCL learning analysis tools based on group awareness is becoming increasingly mature. Nowadays, the application of technology is heading towards customization and combined more with learners' own personality characteristics and situational interaction information to explore the design direction of group awareness tools.

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