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Explore the Effectiveness Factors and Improvement Strategies of Collaborative Learning

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Abstract: Collaborative learning is a widely used learning method in classroom learning. Collaborative learning has received increasing attention over the past few decades and has become an important area in educational research and practice. Some studies have shown that the effectiveness of collaborative learning may depend on a number of factors, such as the organizational environment of collaborative learning, the degree of interdependence among group members, as well as the nature of the tasks being performed, personal characteristics, etc., so collaborative learning needs good organization and management. Based on a review of relevant literature, this paper analyzes collaborative learning from multiple perspectives and concludes that collaborative learning is applicable to online learning, distance learning and cross-cultural learning. Collaborative learning is faced with problems such as lack of learning motivation of members, super cognitive load and lack of teacher supervision, and strategies such as team incentive mechanism and metacognition are used to help improve the results of collaborative learning. This paper aims to improve and inspire students to make better use of collaborative learning to improve their learning ability, help educational practitioners better design and implement collaborative learning activities, and improve education quality and students' learning experience.

Keywords: collaborative learning, distance online learning, cognitive load, metacognition

1. Introduction

Collaborative learning can not only promote communication and interaction among students, but also cultivate their innovation, thinking and problem-solving abilities, which has a wide range of application prospects in different disciplines or courses. With the progress of society, the formation and mode of collaborative learning have also changed, but its characteristics and purpose are also to promote learning outcomes. Collaborative learning focuses on students' active participation and independent inquiry. However, due to the different ways and conditions of collaborative learning, the effectiveness of collaborative learning is easily different. Therefore, the impact of collaborative learning on student achievement is a complex issue, which contains many uncertain factors. Online collaborative learning has become one of the learning methods for many students. With the development of society, learning methods are also improving, and the research on traditional learning methods is no longer suitable for analysis. The mechanism, challenges and learning effects behind it are worth in-depth research and discussion. This paper analyzes the connotation of collaborative

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learning, its scenarios and emerging methods, the challenges faced by online collaborative learning, aiming to explore better collaborative learning strategies, and then improve the effectiveness and results of collaborative learning to achieve the fundamental purpose of learning.

2. Collaborative Learning

Collaborative learning is a style of learning that emphasizes teamwork, interactive communication, and self-directed learning, where students work in small groups to achieve common goals. It can cultivate students' social communication ability, teamwork spirit, communication ability and independent learning ability, so as to improve the learning effect and academic performance. The fruitful and effective collaborative learning often does not occur spontaneously [1]. Small learning groups are used to facilitate collaborative learning, encouraging students to support one another and enhancing their learning potential. It is founded on the constructivist learning theory and the idea that individuals may actively create knowledge for themselves via interaction with their environment and personal experience [2]. In this community, participants can learn from each other, share thoughts and ideas, and gain more knowledge and skills from them. The emphasis on students' active participation and independent inquiry is consistent with the theoretical basis of independent learning. Self-directed learning emphasizes that students actively manage their own learning, find solutions to problems, and reflect on their own learning. There is a close relationship between student achievement improvement and collaborative learning, and studies have found that students who work cooperatively perform better and are more cohesive in a team than those who work alone or competitively [3]. Collaborative learning methods have significant potential in cultivating self-regulated deep learning, and they can be highly beneficial for higher education [4].

3. The Scenarios Apply to Collaborative Learning

3.1. Distance Learning and Online Learning

Technology is becoming more and more crucial in improving education throughout the teaching and learning process. Face-to-face instruction is the foundation of traditional educational and training techniques, which are currently being replaced by distant learning (D-learning) [5]. In D-learning, collaborative learning can be implemented with various online tools and platforms. These tools can include online conference software, discussion forums, instant messaging tools, etc., which enable students to collaborate and communicate anytime, anywhere. Most online knowledge-building, collaborative capacity-building, and emotional communication activities are carried out through collaborative learning, and the technologically enhanced online environment is continually improving to support richer interactions and better collaborative participation [6]. Collaborative learning has been a key teaching strategy since the early 1970s, whether it's traditional learning, a mix of online and offline classes, or whatever. Existing studies have proved that collaborative learning is favorably connected with learning outcomes [7].

3.2. Cross-cultural Collaborative Learning

Regardless of time or location, people from many cultures and countries can collaborate through technology to address real-world challenges [8]. Cross-cultural collaborative learning refers to the process of cooperative learning between individuals or groups with different cultural backgrounds. In today's globalized environment, cross-cultural collaborative learning is becoming more and more important, because people often need to cooperate with people from different countries, regions and cultural backgrounds. Through cooperative learning with people from different cultures, understanding and respect of other cultures can be enhanced, and stereotypes and prejudices can be

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broken. Researcher and educator interest in cross-cultural collaborative learning has grown recently. This approach can help students become more adept at communicating across cultural barriers in addition to giving them foreign exposure. In order to create a sustainable society, cross-cultural collaborative learning encourages the sharing and building of knowledge via teamwork and gives students the chance to gain international experience and global competency [8].

Students who are dispersed across several areas might collaborate in groups during distance learning to enhance both their own and each other's learning. The use of technology may boost student group engagement and cooperation, enhancing the fun and effectiveness of collaborative learning [9].

4. The Challenges of Online Collaborative Learning

Online learning environments during the COVID-19 epidemic give dispersed student groups adequate room to communicate and work together on learning, which is "an umbrella term for various educational approaches that involve students or students and teachers working together [9]." In institutions of higher learning, more and more, social interactions among students are being supported through web-based collaborative learning. However, there is limited information available about the elements that affect collaborative learning in online learning settings. Students' social influence and motivation have a direct or indirect influence on collaborative learning [10]. Establishing consensus and good coordination are essential for attaining effective information sharing in collaborative learning tasks, which peer collaborative interpretation activities encourage [11].

4.1. Lack of Motivation to Learn

Collaborative learning won't be successful if the group members aren't sufficiently motivated. Consequently, collaborative learning techniques must be a significant component of the lesson plan and not merely a passing exercise to assess students' understanding; Secondly, group dynamics are a crucial factor. Without enough focus, students might quickly start a collaborative process. Learners may believe that dividing up tasks so that group members may work individually is more efficient than debating a topic as a whole [4]. Some students may be less inclined to participate in group discussions, often due to a lack of confidence or ability.

4.2. Virtual Environments and Cognitive Load

In contrast to traditional collaborative learning, the virtual and varied online environment prevents continuous interaction. In addition, Online collaboration is more difficult because there isn't clear direction or communication. These all contribute to high amounts of mental strain and effort, which results in cognitive overload. The overall amount of working memory needed for learning activities is referred to as cognitive load. Processing new memories requires working memory, which can result in an excessive cognitive load if the amount of information acquired much exceeds the capacity of working memory. Additionally, it has been discovered that computer-supported collaborative learning (CSCL) is more prone to cognitive overload because of the complex and varied interactions [6].

In contrast to the school's traditional offline learning environment, where students must divide their limited time and energy between their roles at home and in the course, other household or family issues will occupy their time or energy in the course, leading to cognitive load during their online study; Second, a poor work-life balance can also cause students to experience unpleasant emotional states like stress, worry, and so on. In the modern day, excessive student role overload will result in excessive cognitive load when learning online [9].

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4.3. Lack of Regulation and Uncertainty

In that there is less direct supervision in online collaborative learning than in CSCL, it is more difficult to control student conduct. Online group projects should be made available in advance to allow for preparation. While doing educational duties, it is difficult for teachers to guide online learners one by one, so timely, continuous and personalized support is needed to improve learning efficiency. Secondly, due to the non-spontaneity of online learning, collaborative learning needs specific arrangements and supports. The physical isolation of online collaborative learning environment will lead to the uncertain state of learners, insufficient effective participation and low sense of presence [6].

4.4. Assessment Methods for Collaborative Learning

Assessment methods for collaborative learning can be conceptual or abstract (e.g., using exams that derive learning from collaborative learning, reflective journals, or individual work) to assess the contribution of individual team members, rather than physical outputs (group presentations or co-authored articles) [4]. Teachers might consequently need to participate in the process more actively, by emphasizing collaborative learning as building skills and understanding rather than focusing on collective output.

5. The Strategies to Improve the Effectiveness of Collaborative Learning

Collaborative knowledge production, group performance, core behavior, learning engagement, and social interaction are difficulties for many learners. Integrated learning analysis techniques can enhance knowledge creation, group performance, core behavior, engagement in metacognitive learning, and social interaction compared to conventional online collaborative learning [1]. Students are delighted to be adopting a web-based platform for collaborative learning to encourage student engagement in projects [10].

5.1. Group Incentive Mechanism

Numerous research have shown that a major challenge in collaborative problem-based learning(CPBL) is effectively encouraging constructive interaction between individual group members and group accountability, Group incentive mechanism (GIM), Group Incentive Mechanism, this mechanism is based on considering several factors that affect peer interaction in collaborative learning and group accountability in order to improve learning performance, interaction, and group effectiveness of learners' cohesion. Learners using this mechanism demonstrate greater learning performance, group efficiency, and pleasant interaction compared to those using the individual incentive mechanism (IIM) [3]. The advantages to participants may also change based on the student's drive and aptitude. Students with lower learning abilities do not always gain the most from collaboration, often because they give less, but they may also gain more by thinking deeply about certain problems. Students with higher learning abilities may provide more insight and input into collaborative discussions and seem to gain less, but they are constantly training their metacognitive processes in explaining their ideas to less able students. Consequently, students with varying levels of ability can gain from collaborative learning in various ways; The benefits of collaborative activities depend mostly on participation and motivation [4].

5.2. CSCL and MCSCL

Computer Supported Collaborative Learning (CSCL) encourages collaborative learning while utilizing technology to maximize student involvement and writing. For example, teachers can provide

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students with a blog, which contains links to websites and learning content; secondly, teachers can let students use the blog to write learning reflections or learning stories; in addition, web-based applications can be used to allow students to process common documents in a synchronous or asynchronous manner [5]. The term "Mobile Computing Supported Collaborative Learning" (MCSCL) refers to the practice of using mobile computing to motivate students to engage in conversation within the context of group projects. MCSCL fosters and manages learning activities, facilitates learner negotiation, and helps organize and manage learning material. M-learning gives students additional options for learning collaboration, allowing them to take a more active role in the educational process [5].

5.3. Teacher's Guidance and Input

Strong teacher support, frequent teacher-student engagement, and organizational abilities are crucial components of successful collaborative learning. Teachers are thought to play a vital role in promoting online collaborative learning. Input from the teacher is crucial to collaborative learning. With collaborative learning, the teacher becomes a facilitator of learning as opposed to a knowledge provider. Teachers should refrain from participating in or leading conversations as a result, but they are crucial for "scaffolding" learning activities to encourage teamwork and communication [4]. Without scaffolding, groups could find it difficult to focus on the right ideas or have a meaningful discussion of the subject. Teachers must therefore provide a suitable learning environment so that students' actions can be properly steered and yield positive results.

5.4. The Higher Group Member Familiarity

Group composition is highlighted as a key consideration when designing collaborative learning. The amount of interpersonal interaction amongst group members was used to define group familiarity. Working with known people improved students' collaborative learning experiences in traditional face-to-face and mixed situations, especially in terms of emotional learning outcomes (greater team cohesion) [7]. Groups made up of familiar individuals are more successful at combining knowledge they have acquired individually and developing a sense of trust among the group; In a group with more familiar members, students are able to express their disagreements better and more comfortably, resulting in more effective communication. Grouping familiar people in the same group, driven by group members' familiarity, will contribute to CSCL's increased effectiveness in online settings [7].

The best way to create new information is to combine and integrate the various backgrounds of the group members. Because it gives students the chance to create interpretations and be exposed to many viewpoints, collaborative learning is advantageous because it may allow students to develop their own internal knowledge manifestations [11]. In order to think critically and create a novel perspective, students must cooperate with others and control themselves in these tasks.

In this collaborative situation, attention must be paid to the cognitive learning process, considering "how the learner constructs knowledge from the perspective of others." Students must successfully collaborate with one another and establish self-monitoring habits during the exercise. Additionally, students must be successful in finding common ground through discussion of their disparate knowledge and fostering mutual understanding by fusing their various points of view.

5.5. Collaborative Learning and Metacognition

Metacognition encourages students to reflect and criticize themselves, and learn to evaluate and balance information, in the group, students' thinking collision, brainstorming, students will be more in-depth than their own understanding of a subject. It will also become more crucial to develop the metacognitive and analytical skills necessary to evaluate information needs. A key component of the

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development of metacognition is collaborative learning, which is an essential skill for students in all subject areas [4].

6. Conclusions

Through the discussion and analysis of the above parts of collaborative learning, it can be concluded that collaborative learning is an important educational concept and method, which emphasizes the interaction and cooperation between students and the process of building knowledge together. Current collaborative learning has evolved into new ways, distance learning and online learning, which expand the communication scope of collaborative learning through the use of modern technology, and students from different countries and backgrounds can participate in it, providing them with international experience and global perspective. Of course, the emerging collaborative learning faces many challenges, such as the monitoring of group dynamics, the participation of students, and the uncertainty of virtual environments. Students who are less involved may be generally less confident and competent. The evaluation system and method of collaborative learning should be paid attention to. Teachers should actively participate in it and evaluate the contribution of team members. Finally, there are some strategies to enhance collaborative learning, such as team incentive mechanism and computer-supported collaborative learning, which can be appropriately adopted to promote student interaction and improve group efficiency. When designing collaborative groups, more familiar group members can be used to help improve team cohesion, encourage students to use metacognition for self-reflection and criticism, and learn to learn and evaluate themselves. Metacognition plays an important role in collaborative learning, so that students can understand and regulate their own learning process and master the principles and skills of collaborative learning. Promote meta-communication among team members.

Due to the information technology industry's rapid development, future collaborative learning research can focus on how to develop and apply new technologies and tools to facilitate collaborative learning processes. For example, technologies such as virtual reality, augmented reality and artificial intelligence can provide richer interactive ways and intelligent support for collaborative learning. Explore how to develop teachers' educational skills in collaborative learning and design an effective teacher support system so that teachers can better guide students in collaborative learning. Across multiple subject areas, future research could foster integration and collaboration between disciplines, combining collaborative learning with innovation and creativity research to explore how innovative thinking and problem-solving can be fostered in students through collaborative learning

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