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Collaborative Concept Mapping: A Dtudy of Group Work Satisfaction in Vocational Higher Education

[1]Malikhatul Lailiyah, [2]Karlina Karadila Yustisia*,
Universitas Merdeka Malang, Indonesia
Email: [1] malikhatul.lailiyah@unmer.ac.id, [2],karlina@unmer.ac.id*
* correspondence author

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ABSTRACT

Collaboration is gaining traction in today's educational environment. Thus, teachers' primary concern is assisting students in experiencing group knowledge collaboration. As online education continues to grow in popularity, there is an increasing need to promote and understand collaborative learning processes. Its success is contingent upon implementing online collaborative learning strategies that foster critical thinking abilities while also providing meaningful collaborative learning opportunities. Collaborative concept mapping is one tool that could be used to foster student collaboration. Rather than creating and visualizing ideas on an individual basis, collaborative concept mapping involves two or more students working collaboratively to create one or more concept maps. In collaborative learning, interactions between learners are critical sources of idea generation. The purpose of this study is to examine students' satisfaction toward the implementation of the strategy in Second Language Reading class. The recent study advances our understanding of how to effectively use collaborative teaching tools in the classroom, as well as how to improve student learning through group collaboration. The study's findings indicate that students demonstrated positive attitudes toward group collaboration as evidenced by collaborative concept mapping. In addition, the collaborative learning processes embedded in concept mapping learning platforms support and facilitate reading comprehension achievement, resulting in successful foreign language learning for higher education students. The interaction in collaborative concept mapping, which is lacking in individual concept mapping, has facilitated individual and group knowledge building. As a result, implementing this strategy may benefit both group and individual learning.

Introduction

Recent approaches to teaching and learning in higher education focus on activities that take place in collaborative settings. A plethora study on computer-mediated collaborative learning highlight that collaborative learning strategies offer many potential benefits in supporting students' academic performance (Muindi et al., 2017; Stump et al., 2011; Tyran & Shepherd, 2001), learning process satisfaction (Lailiyah et al., 2021), creativity (Tseng et al., 2009), and social interaction

(Cheung & Vogel, 2013; Komis et al., 2002; Soller, 2001). In addition, a study found that computer-mediated collaborative groups showed a positive attitude towards collaborative learning and performed far better than participants working alone (Uribe et al., 2003).

Higher education learners face major obstacles in developing their exploration skills when they need to probe and convey their ideas to others (Lailiyah & Wediyantoro, 2021). Therefore, collaborative learning is essential, since it can lead to the development of critical thinking skills, communication and coordination, and better knowledge-building mechanisms (Komis et al., 2002; Wediyantoro et al., 2020). The research mentions that promoting students' critical thinking and collaboration skills requires a meaningful learning activity (Bixler et al., 2015). This meaningful learning, as described by Jonassen and Strobel (2006), must be active, constructive, intentional, authentic, social, and collaborative. And one of the strategies that facilitate meaningful learning is collaborative concept learning (Farrokhnia et al., 2019).

In online collaborative learning, the employment of strategies that accelerate the development of critical thinking abilities while also providing meaningful collaborative learning opportunities is important to the success of the attempt (McNeil et al., 2000). One of the potential tools for fostering students' online collaboration is collaborative concept mapping. To construct idea maps or diagrams, a method of organizing, representing, and producing knowledge is used in this strategy. While in individual concept mapping ideas are created by the individual and presented in the form of pictures, in collaborative concept mapping two or more students work together to create one or more concept maps for the purpose of learning and knowledge building (Gao et al., 2007). And this learner-to-learner interaction is an important source of idea formation in a collaborative learning setting (for example see Gijlers & de Jong, 2013; Kwon & Cifuentes, 2009).

When participants collaborate on shared representations, such as using a concept map, they inevitably activate prior knowledge to connect what others present. And this activation of prior knowledge, in which to make connections with existing knowledge structures, makes learning more meaningful to everyone involved, thus, providing both individual learning and group knowledge building (Gao et al., 2007), and increases students' autonomy in solving learning problem (Tseng et al., 2009). To add more, A study in this area found that there was a correlation between the performance of group concept mapping with the amount of group complex interaction, in which they work together in a long-term process to develop the collaboration product (Chiu et al., 2000). Therefore, collaborative concept mapping is a potentially effective educational strategy to facilitate both learner group knowledge building and individual learning.

A study on effective collaboration mentioned that merely assembling participants into a group does not make them collaborators. It requires experiences that ought to be learned and

developed (Tseng et al., 2009). Thus, it is necessary to provide kinds of learning experience using various kinds of strategies to develop students' collaboration skills. Lailiyah et al. (2021) in their study explored students' experience in a collaborative learning setting. The result revealed that although collaborative learning was perceived positively, however, the participants indicated that collaboration in online learning is more difficult than in face-to-face learning due to the lack of variety of strategies provided in the class. As a result, studying in a virtual, online-based learning environment presents a greater challenge than learning in a traditional physical classroom setting. The aforementioned findings regarding students' perception of effective collaboration are provided as the basis of this research. Therefore, the aim of this study was to investigate group work satisfaction in the online collaborative learning setting by implementing a computer-mediated collaboration concept mapping strategy in vocational higher education. The research questions that guided this study are as follows:

1. How do students perceive their experience with collaboration concept mapping group work?
2. What are the barriers that may prevent participants to use computer-mediated concept mapping in group collaboration? How could these barriers be overcome?

Method

A mixed-method approach using multiple techniques to collect quantitative and qualitative data was employed to explore the effect of group collaboration on students' group work satisfaction. In what follows, the participant, procedure, data collections, instruments, and data analysis of the study are enlightened.

Participant

This study involved vocational higher education students enrolled in the same synchronous online course, Critical Reading class at a university in Malang, Indonesia. Apart from learning to second language reading, the course also requires students' participation in an online collaborative discussion to develop students' autonomous learning and problem-solving skills. There were 66 students administered to the class, however, only 64 participants completed the survey. Table 1 depicts participants' demographic information. Among all the participants, 42 were female (67.7%) and 22 were male (34.3%), and their ages ranged from 19 to 23. Meanwhile, the participants were homogenous in terms of their level of competence and years of study in English. Additionally, there was no difference between the participants in terms of computer experience, with an average of 6 years of computer experience.

Table 1. Participants' demographic information

Attribute		F	%
Gender	Female	42	66
	Male	22	34
Age	23	1	2
	22	12	19
	20	34	53
	21	4	6
	19	13	20
Total		64	100

Procedure

The instructor instructed the students to work in a group of four to five. They were instructed to construct a concept mapping from a given topic in a group. Besides, they were encouraged to discuss synchronously and record the discussion session. Through this process, it was expected to foster students' interaction and contribution to creating the concept mapping. Then, all the products of the collaborative concept mapping were collected and scored.

Data collection and instruments

In the pre-test survey, an open-ended section to collect participants' demographic information (gender and age), computer skills, and students' language learning experience was distributed prior to the start of the experiment. Its purpose was to ensure group comparability (Fink, 2003). The questionnaire that was utilized as the post measure after the treatment was adapted from Tseng et al.'s (2009) study, with some phrasing changed to make it more appropriate for the study's context. A total of nine questions in form of a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree), was distributed to quantify students' group work satisfaction. Web online survey was used to collect the data, and sixty-four students (96.9%) completed the survey. The data was then analyzed to provide a descriptive statistic of the questionnaire.

In the qualitative phase, an open-ended questionnaire was provided to support the further discussion of the main questionnaire. In addition, the first author also invited the students to reflect on their collaborative concept mapping experience in a synchronous focus group discussion. The purpose of this activity is to gather a deeper understanding of students' perceptions.

Data analysis

To assess the effect of students' satisfaction on group collaboration, the authors calculated the mean (M) and standard deviation (SD) for the descriptive analysis. Finally, the focus group discussion was recorded, and the responses were transcribed and imported into NVivo 12. In the final analysis, Braun and Clarke (2006) six-phase thematic analysis was used to finalize the

transcription of the collected material.

Result and Discussion

In elaborating on the result of the study, the mean (M) and standard deviation (SD) of the group work satisfaction questionnaire are reported in Table 2. Overall, item "Collaborative concept mapping promotes creativity" gained the highest mean (M = 4.10; SD = .77). On the other hand, item "I acquire collaboration skills during the teamwork process" collected the lowest mean (M = 2.93; SD = .97).

Table 2. The Mean and Standard Deviation of each scale

No	Items	M	SD
1	I enjoy working in a collaborative concept mapping group with my teammates	4	.68
2	I enjoy solving the concept map with my teammates in the collaborative group projects	3.96	.64
3	Collaborating and engaging with the other members encourage me to think deeply	3.98	.73
4	Interacting with my group contribute to my understanding on the topic to be discussed	4.01	.65
5	My teammates provide me with useful feedback	4.03	.71
6	Collaborative concept mapping promotes creativity	4.10	.77
7	Working with teammates has been resulting in a better-quality project than working individually	3.71	.70
8	My teammates provide advantageous knowledge sharing during the teamwork processes	4.07	.62
9	I acquire collaboration skills during the teamwork process	2.93	.97

In the qualitative phase, Item 10-11 was in the form of open-ended questions. To analyze the data, the responses were uploaded to NVivo 12 software. Following are the questions and the responds.

Question 10: What do you enjoy most about collaborative concept mapping?

From the result of coding the responses, the most mentioned theme was relating to the "input" that they received from the activity with 46 participants using terms implying to this aspect. The most mentioned terms linked to this theme such as "understand the topic better" (*n = 21*), "exchange ideas" (*n = 12*), and "encourage thinking differently" (*n=8*). Meanwhile, the second most common theme (*n = 14*) was "output". Variations on this theme included "better in visualizing the topic" (n = 9), and "better group communication" (*n = 5*).

Given the same question in focus group discussion, students elucidated their responses on the questionnaire. Many students mentioned that collaborative concept mapping facilitated a better understanding of the topic. One student expressed:

> Not only makes all students active in the discussions, but this activity also makes it easier for us to understand better because we discuss with peers to solve problems. Apart from that, this platform is a new experience for us.

> Clearly, this platform makes us more excited to join the discussion and makes it easier for us to learn. (Student A – Focus Group Discussion)

In addition of being able to understand better, Student A also mentioned that collaborative concept-mapping increased their motivation in collaborating with a group member. Further, another student also stated that,

> Even though the discussion was conducted online, the important points on the topic could still be conveyed properly. In making concept mapping, we also did not experience any difficulties, because all group members played an active role in conveying their ideas. Overall, we can freely share our opinion in the group. (Student B – Focus Group Discussion)

From Student B's point of view, students in a group engage actively and contribute to the process of developing the concept-mapping. The above statements highlighted that collaborative concept-mapping was perceived positively.

Question 11: What obstacles did you face during working with your group in developing concept maps?

In responding the questions, the most mentioned theme was "nothing" with 24 participants using this term alluding to the theme. Meanwhile, the second most common was "different perspective" (*n = 14*). Followed by "internet and connection" (*n = 12*) and "technological equipment" (*n = 7*) as the third and fourth most common themes respectively.

In the focus group discussion, Student C felt that his group argued a lot and had different ideas on how to develop the concept mapping.

> During the discussion, each of us has own ideas. We also had slightly different opinions, so we argue a lot. To be honest, it's tiring.
> (Student C – Focus Group Discussion)

In contrast, Student D perceived the differences were not the barrier. In Student D's mind, having different opinions was a key to having an interactive group discussion, for it provoked students to think differently as well as a provided new insight, which can enhance their deeper thinking.

> For me, the activity was fun. I don't see anything that makes me dislike it. I think because we have different views, we have a very lively discussion. It's glad to have a different perspective, so that we can tie key ideas together by thinking more deeply. (Student D – Focus Group Discussion)

Since the activity was conducted synchronously, many students mentioned the internet as a barrier to group work. Student E claimed that the problem with the network might prevent the discussion's effectiveness.

> Mostly our group discussion was hampered by internet problems. During the discussion, we had to pause several times when members had network or signal problems. (Student E – Focus Group Discussion)

In addition to this, technological equipment also contributes as a barrier to collaboration concept-mapping activity. One student stated that his group encountered a problem with the concept maps tools.

> Creating an understandable concept map is not as easy as it looks. the use of tools, in fact, was confusing. For me, this is because I have never used a computer application in making map concepts.
> (Student F – Focus Group Discussion)

The findings from the survey indicate that the average perception of group work satisfaction is positive. The mean of each indicator showed that students were satisfied with their group work through the collaborative concept-mapping activity. From a closer look at students' perception from the questionnaire, most students agree that the activity provided students with valuable knowledge sharing. In addition to this, the result from the qualitative phase also highlighted that most students claimed to enjoy exchanging ideas with their peers. This is in line with Komis et al. (2002) study, who noted that collaborative concept-mapping could be used to support the social-cognitive process of knowledge sharing.

Besides, students believed that the strategy promoted their creativity and encouraged group interaction. A plethora study mentioned a concept-mapping as a useful tool to raise student interaction (for example, see Van Boxtel et al. (2002), Chiu et al., 2000). Further, the use of the strategy is also beneficial in developing students' critical thinking. In their study, Chang et al. (2017) revealed that computer-supported concept-mapping developed students' higher-order thinking. The critical factor is that the strategy facilitates interactive discussion among participants, thus promoting students' critical thinking (Chang et al., 2016).

Surprisingly, several participants considered different opinions as barriers to the activity. Besides, some students pointed out that they had difficulties in terms of the use of computer-supported concept-mapping tools. Regarding this, Ojima (2006) suggested that the instructor should provide appropriate support for the student's familiarity with the strategy. Other than that, the problem with the internet connection and the unfamiliarity with concept-mapping software was also considered a barrier that might hinder the satisfaction of the group work. However, the most significant portion of students agrees that they did not face any obstacles during the group work collaboration.

Conclusion

To conclude, this research aims to investigate students' group work satisfaction by implementing computer-supported collaborative concept mapping. The study's result revealed that the participants perceived collaborative concept-mapping positively. Most participants showed a positive attitude to the statements that this strategy promotes critical thinking, facilitates group

discussion effectively, and develops their creativity. In deeper analysis through focus group discussion, participants mentioned that the use of the strategy led them to understand the topic better, encourage thinking out of the box, have better communication with the group, and create an innovative concept-mapping product. Meanwhile, the participants mentioned that different perspectives from other group members are barriers to implementing the strategy. Besides, the issue on the network and the unfamiliarity with the concept-mapping tools also hinder the implementation's effectiveness. However, most participants agreed they did not face any obstacles.

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