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Research paper



The Characteristics of the Computer Supported Collaborative Learning (CSCL) through Moodle: a View on Students' knowledge Construction Process

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Abstract

Computer Supported Collaborative Learning (CSCL) is based on the pedagogical process of observation where students will learn progressively through active group interaction. CSCL is an emerging branch of the learning sciences concerned with studying on how people can learn together with the help of computers. Thus, this research was conducted to measure the characteristics of the CSCL learning environment through Moodle that assists the process of students' knowledge construction during the teaching and learning process. The CSCL learning environment is an educational learning system which develops to help the teachers and students in managing School Based Assessment (SBA) in selected secondary school in Malaysia. Samples involved two groups of students and two Technical and Vocational Education and Training (TVET) teachers from two different schools. A total of 61 students, who were taught using CSCL approach through Moodle, underwent the process of teaching and learning using their school computer laboratory. The finding shows that the characteristics of the CSCL learning approach that used in this learning environment for the first group are at a high level with overall mean of 4.17 and the second group at moderate level with overall mean of 3.62. The result proves that the characteristics of the CSCL learning environment help students to build their knowledge during teaching and learning process at the high level with an overall mean score of 3.87. The mean of these two groups may vary according to students' background, as well as learning environment facilities. Although, CSCL leads to students' self-development, improving learning quality, sharing knowledge and assisting students' in the process of building their knowledge, implementation of CSCL must first considering the technology relevant facilities, especially computer laboratory and internet accessibility in school. The implication is that designing a good CSCL must also taking into account the targeted users' cultural background and socioeconomic factors.

Keywords: *Computer Supported Collaborative Learning; Moodle; Knowledge Construction; Technical and Vocational Education*

1. Introduction

Collaborative Learning Model with Computer Supported Collaborative Learning (CSCL) is a part of the learning that based on student-centered learning models. This CSCL learning model is a combination of cooperative learning model through computer and internet usage as a medium in learning [1]. As increasingly of sophisticated technology, individuals in different places have an opportunity to collaborate online. If the use of this learning model can be effectively utilized by the teacher, the teaching and learning process at school will be more interesting and effective. CSCL arose in the 1990s in reaction to software that forced students to learn as isolated individuals. The exciting potential of the Internet to connect people in innovative ways provided a stimulus for CSCL research. As CSCL developed, unforeseen barriers to designing, disseminating and effectively taking advantage of innovative educational software became more and more apparent. A transformation of the whole concept of learning was required, including significant changes in schooling, teaching and being a student [24].

According to Tingoy [2] in his study of CSCL model, it has been divided into two parts. First, it includes the list of necessary tools and methods for promoting online learning and student collaboration. The focus is on how students can learn in the context of collaborative activities and how to design technology based activities for collaborative learning. Additionally, teachers need to identify all necessary collaborative learning activities at the right time. The second part discusses about collaborative learning model that include design model that helps to build knowledge and arguments which can help collaborative learning from various perspectives.

Based on the theory of social constructivism, working together thus achieving task that been set seen as a good learning environment besides facilitating the development of an active knowledge [3]. A study found that students who experiencing collaborative learning processes have additional constructive learning process [4]. CSCL can lead to self-development, improving learning quality, sharing knowledge and assisting them in the process of building student knowledge [5]. In this online learning environment, students can create,

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Share information, provide critical insights, talk about meaning, test synthesis and build a friendly environment. In addition, collaborative writing tasks, group discussions, debates and argument criticism also allow students to add their knowledge [6].
A study by Chan and Ismail [7] also found that computer assisted collaborative learning can promote active interaction between pairs. Their study also found that students have a positive perception towards the use of dynamic mathematical software and collaborative learning. This technic include technology used to design interaction by placing students in situations where they are bound to interact in order to build their understanding by choosing how to deliver assignments that are suitable to the language that they use [8].
Mukama [9] found that students had more opportunities to share information among group members during the CSCL learning process. Through this sharing session, students can reflect on their individual learning. In assisting the process of teaching and learning, Inaba et al. [10] has developed ontology to represent a CSCL session. This study introduces a support tool for teaching design using an example as source. It will be useful not only to interpret what kind of collaborative learning has taken place in the learning session, but also to identify why learning sessions are ineffective.
Lundin [11] studies in exploring the CSCL design that focused on learning at the workplace state that a collaborative learning among colleagues must be in a flexible and orderly manner. Mobile devices with visualization applications and some of interactive capabilities used in this method have proven useful for exploring and structuring design work. In addition, collaborative activities with support of new technologies have also been proposed and refined.
In a study to examine the relationship between questioning and the quality of knowledge constructed in the context of CSCL through three levels, it is found that at the level of constraints, students are able to understand advance knowledge through questions. Then, at individual level, it is found that students ask good questions and possible to express high level of explanations. Lastly, at the group level, a better-performing group is likely to have high level of knowledge [12].
In social collaborative argumentation, knowledge is constructed and shared among peers and the property of a single individual. The challenge is to ensure that argumentative knowledge construction process in social collaborative learning environment improves students' thinking skills [13]. Thus, further investigation and evidence is needed into the roles and dynamics of reflective assessment for knowledge construction process in different cultural contexts [14].
Thus, the purpose of this study is to measure the characteristics of the CSCL learning environment that assists the process of students' knowledge construction during the teaching and learning process. The CSCL learning environment is an educational learning system which develops to help the teachers and students in managing School Based Assessment (SBA) in selected secondary school in Malaysia [15].

2. Methodology

This study reported a part of the large study of the mixed approach. In this paper, the focus is on the quantitative data. A descriptive survey study using questionnaire was deployed in order to investigate the characteristics of the CSCL learning approach under Moodle platform. An observation was also carried out in order to capture the selected schools' environment, in order to support the quantitative finding. In this case, the CSCL approach caters multidisciplinary areas which are ranging from a handling computer to the execution of the learning objectives during teaching and learning process. It mainly comprises of three main components, namely computers, collaboration, and learning. Figure 1 shows the multidisciplinary range of CSCL:

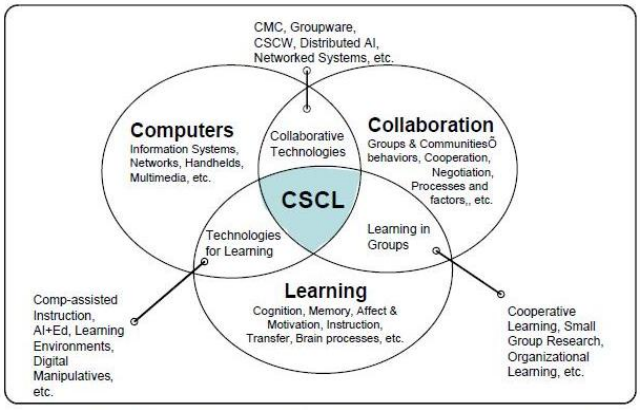


Figure 1: Multidisciplinary of CSCL

Samples involved two groups of students and two Technical and Vocational Education and Training (TVET) teachers from two different schools. A total of 61 students who were taught using CSCL approach through Moodle, underwent the process of teaching and learning using their school computer laboratory. The proportion of students in each school is shown in Table 1.

Table 1: Distribution of questionnaires

School	Number of samples
A	28
B	33
Total	61

A set of questionnaire was used to gauge CSCL characteristics. A total of 35 questions within five major constructs (for each element), namely positively interdependent, face-to-face interaction with the students, individual and group responsibilities, interpersonal skills and small groups and group process. These constructs are very important in order to see the characteristic of the application of CSCL. Table 2 presents the sample of the items.

Descriptive analysis was used in this research to determine the level of each element for each school. A comparison of means between these two schools will be discussed in this paper. The justification of the result will be supported by the finding from observation.

Table 2: Example of question distributions

Section	Construct and item example	Number of questions
A	Respondent's information.	3
B	Elements of positively interdependent Sample item: My friends can perform assignments that have been provided through learning information (item 7)	7
	Elements of face-to-face interaction with students Sample item: My friends will praise the group members' work each time after our group activity ends (item 12)	7
	Elements of individual and group responsibilities Sample item: My friends always trust each other by sharing learning information (item 20)	7
	Elements of interpersonal skills and small groups Sample item: Our group members always give new ideas until the assignment is resolved (item 26)	7
	Elements of group process. Sample item: My friends always provide new ideas for learning to achieve an excellent work (item 35)	7
	Total	35

3. Findings

The result indicates that the group process element of these two groups in the CSCL learning environment has the highest average mean of 3.92. This is followed by the positively interdependent element with an average mean of 3.91. Next, it is the interpersonal skills and small groups elements are with an average mean of 3.89 and followed by individual and group responsibility element with mean of 3.88. Lastly, the face-to-face interaction with students' element has resulted 3.77 of the mean score. Table 3 shows the details mean for both groups.

Table 3: Mean and results for both groups

No.	Construct	Group 1	Group 2	Average Mean
1.	Elements of positively interdependent	4.16	3.70	3.91
2.	Elements of face to face interaction with students	4.08	3.51	3.77
3.	Elements of individual and group responsibilities	4.20	3.60	3.88
4.	Elements of interpersonal skills and small groups	4.27	3.56	3.89
5.	Elements of group process.	4.12	3.75	3.92
	Total average mean	4.17	3.62	3.87

The finding also shows that the characteristics of the CSCL learning approach that been used in this CSCL learning environment can help build the students' knowledge during teaching and learning process, which is based on the high level of overall mean score (3.87). Based on this result, the interpretation is that the features of the CSCL learning approach used in CSCL learning environment has contributed to improve students' knowledge construction.

Based on the observations carried out, these two groups are varying based on student background factors such as family income, as well as learning environment facilities. Finding indicated that respondents with home based computers in the first group were 92.9% compared with respondents in the two groups of 78.8%. Also, those who used computers at school computer laboratories to complete their school assignment in the first group were 89.3% compared with respondents in groups two of 78.8%. therefore, the mean score varies between these two school can be justified based on the students' background and learning environment facilities.

4. Discussion

Research in CSCL has both critical and design components. In order to revise its goals, a systematic way of analysis in making CSCL a prefect strategy in teaching and learning is therefore necessary. It is important to take into account students' perception and reflection during the interaction for a particular CSCL design besides considering the symbiosis of the relationship between analysis and design. One design must be commenced by analysis, but analysis also depends on the design of the analytic object [27].

The learning environment for positively interdependent elements emphasizes that each group member needs to have a perception that they are interdependent in achieving the goals of the given group. They need to know that the success of a group member means success for the whole group or on the other hand, the failure of a group member to mean failure of the whole group. To create this positive rela-

tionship, teachers can plan common goals for each group using this learning system and reward all members of the group as each member reaches the specified criteria and each member of the group can be assigned certain roles such as an active leader or member [16].

The findings showed that the overall mean of positively interdependent based on CSCL learning strategy was high for the first group with mean of 4.16 while the overall mean of positive interdependent elements for the second group was moderate with mean of 3.70. Overall, the mean of the learning environment for positively interdependent elements in this study was 3.91. This finding is in line with Neo et al. [17] study, which obtained a mean between 3.70 and 4.00 for positive interdependent elements in the learning environment using Multimedia Integrated Cooperative-learning Environment (MICE) 2.0.

In this positively interdependence element, each member of the group relies on each other as effort to achieve the same goal as their success depends on the success of the group [18]. They need to know that their group performance is more importance than their own learning performance. When their group has succeeded, then each group members achieves their goals [19]. Although a student is independent, a higher level of excellence can only be achieved through the group efforts and they need to help each other. This interdependence process exists when students consider that they need the efforts of others to complete a task. Students should change their view from self-reliance to interdependence.

Then, in face to face interaction elements with students require them to improve the performance of group members and group members need to interact with each other including discussions, sharing information and providing support to group members' efforts. Group members can be arranged to be able to face one another. This CSCL learning environment encourages face to face interaction when students work together through material sharing, mutual help and encouragement with each other in the course of activities. This group interaction includes student action to explain, discuss and teach what is known to others. Students can develop other students' learning by helping, sharing and encouraging learning efforts.

In this study, the overall mean of face to face interaction elements with students based on CSCL learning strategies is high for the first groups, which are 4.08 while the overall mean for the second group is moderate with 3.51 mean. Overall, the mean of the learning environment of face to face interaction elements with students in this study was 3.77. Neo et al., [17] also obtained a mean score of 3.87 to 4.02 for face to face interaction elements with students in their study, which is a higher mean value than this study.

Members in the group need to help encouraging the efforts of other group members while completing the assignment is the main feature in this face to face interaction element. The interaction between these students helps in the pursuit of successful learning goals versus their own efforts [20]. Each member of the group needs to solve the problem through communication within the group through feedback, sharing learning knowledge and making the best possible solutions even if individual problems have been solved. The assignment should be shared by the students in order to ensure success as well as each member of the group should share resources and help each other, encourage, support and appreciate the efforts of each member [19].

This is followed by the elements of individual and group responsibilities. Each member of the group is responsible to show their achievement of individual learning. This can be accomplished using this CSCL learning environment when the assessment is continuing on student achievement either by testing all students or random selecting of students from each group to answer questions and the scores obtained to the group. Although every student is required to work together in an activity, they are still responsible for their own achievements. Assessments can be made individually. To assess the individual accountability of each group member, the assignment can be given to the students individually upon completion of group activities. Each student will receive individual scores according to their performance.

The finding shows that the overall mean of individual and group responsibility elements based on the CSCL learning strategy is high for the first group, which is 4.20 while the overall mean for the second group is moderate, which is 3.60. The mean of the learning environment element of individual and group responsibility in this study is 3.88. Neo et al., [17] gained mean between 3.81 and 4.00 for individual and group responsibility elements in their study.

This individual accountability means for each student needs to actively engage in helping their group achieve goals, in which each student should stick to the principle of individually responsible in giving whatever contribution and mastering all the things learned. Each student needs to learn individually because the achievement of the group also depends on the achievement of individual members of the other group. This group activity was intended to make every individual more capable [21]. After completing a group activity, each student needs to be able to do and complete assignments assigned alone.

The learning environment for the elements of interpersonal skills and small group involves teachers who need to teach the skills in a well-organized and detailed manner that include communication skills, leadership, decision making, listening, conflict management, encouragement and take turn [16]. This social skill is also very important to create effective interactions between different ethnic groups and cultures. To use this learning system effectively, teachers firstly need to teach these social skills to students. These skills include leadership, decision making, build trust, communication and conflict management.

Likewise, the findings show that the overall mean of the elements of interpersonal skills and small groups based on CSCL learning strategies is high for the first group, which is 4.27 while the overall mean of for the second group is moderate, with 3.56 mean. Overall, the mean of interpersonal and small group learning environment element in this study is 3.89. This finding is consistent with the study of Neo et al., [17] which obtained a mean between 3.83 to 4.11 for the elements of interpersonal skills and small groups.

Hussein and Abd [21] state that students need to have knowledge in social skills and should practice them as academic lessons. These skills can promote communication, create trust, improve decision making and smoothen conflict management within the group. Students need to be assisted and trained to build trust, making decision, leadership, communication and how to manage conflict in an effort to meet the needs of skills in individual relationships and teamwork. Teacher has limited access to student in developing their skills [25]. Therefore, the assistance of CSCL is seen as one of the mechanism to achieve this objective. Good social skills between members of the group are important so that each member of the group does not feel embarrassed or afraid to issue their ideas, opinions and opinions even if what they say may be rejected by other members of the group [19].

Finally, the group's learning process requires students to reassess their efforts as well as the progression of the group in terms of goal achievement. This allows each student to focus on mutual goals, work on improving social skills, ensuring that group members receive feedback on their contributions and reminds group members to continue to work together [16]. Through activities in this CPA learning system, students can discuss and analyze the extent to which their group achieves the desired goals and identifies actions and behaviors that need to be improved or stopped.

The findings show the overall mean of group process elements based on CSCL learning strategies is high for the first group with 4.12 mean while the overall mean of group process elements for the second group is moderate, with 3.75 mean. Overall, the mean of the group process element in this study is 3.92. Neo et al., [17] also obtained mean between 3.77 and 4.06 in their study.

Group processing exists when students discuss how far they have achieved their goals and maintain organized work effectively. Each student needs to clarify about the useful behaviors and decide on each action that will be done next or need to change it to help other group members achieve the goal. Each student should always assess how far they act as a group while identifying the necessary changes to function more effectively in the future. According to Johnson and Johnson [18], these groups of learners needs to make self-reflection to explain and discuss the actions of the group members who can help them achieve the goals of the group. During group processing, members can make individual reflections on how their group movements or during the end of a unit task [18]. Computer-mediated communication in current education world turns the communication into substance. As the teaching and learning process keep progressing, there are records of activity as well as product that can be kept, replayed, and even modified [28]. In this process, the students should explore the potential of the usage of these records for their reference and the collaboration that have been made through the session as a resource for inter-subjective learning.

The mean findings of these two groups were justified by the students' background factors as well as learning environment facilities. Specifically, students who possess a home-based computer (i.e. personal laptops) perform better than those who not. This has been explained by previous researchers from Funda and Erkan [22], who found that computer ownership and internet service connections had a positive impact on student academic success. Moreover, teacher backgrounds may also contribute slightly to the mean findings of these two groups as one of these sample teachers teaches non-option subjects due to lack of History subject teachers in the school. Through observation during the classroom learning and teaching process, it is found that these students are very passive during the learning and teaching process and this may occur as they are still in the early stages of a form school session and they have not yet recognized their friends closely.

However, communication and interaction among friends as well as with teachers are seen to improve every week after they use this learning system for the purpose of teaching and learning. The teacher should encourage students to complete tasks in the form problem solving methods especially through Problem Based Learning [26], analyze, prediction and encourage students to explore further to justify their answers and also encourage discovery learning by encouraging students to collaborate with other students [23]. The inclusion of collaboration and computer mediation in teaching and learning has prevailed that the adaptation of these strategies could promote the good environment and consequently improve student's achievement.

5. Conclusion

In conclusion, the first group result indicates that the characteristics of the CSCL learning approach used in CSCL learning environment has contributed to improve student knowledge construction during the teaching and learning process. Similarly, in the second group, the characteristics of the CSCL learning approach used in this CSCL learning environment has also improved students' knowledge construction while they experiencing the teaching and learning process. Although, CSCL leads to students' self-development, improving learning quality, sharing knowledge and assisting students' in the process of building their knowledge, implementation of CSCL must first considering the technology relevant facilities, especially computer laboratory and internet accessibility in school. Designing a good CSCL must also taking into account the targeted users' cultural background and socioeconomic factors.

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