

# Factors for Effective Mobile Computer support Collaborative learning (MCSCCL)

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**Abstract** — Collaborative learning is widely used in both schools and colleges. However, when working without the support of technology, collaboration becomes less effective. Computer support collaborative learning (CSCL) foster new possibilities for achieving more effective and interesting learning activities. In CSCL, students typically used fixed location as a tool for collaborative learning. Therefore, the focus on tool and lack of collaboration actually happening perhaps led to some uncertainty in initial CSCL trials. A new and emergent area within CSCL is that of mobile computer support collaborative learning MCSCCL whereby the use of mobile devices had overcome the limitation posted by desktop computer and make working with collaborative activities more personal and more mobile. This paper explored collaborative learning activities that students perform with the use of mobile devices in Universiti Teknologi Malaysia (UTM), and identify the factors for effective mobile computer support collaborative learning MCSCCL's activities. The data has been collected from literature and through survey by questionnaires students from both level postgraduate and undergraduate, in the Faculty Computer Science and Information Systems (FCSIS), UTM Malaysia. Moreover, this study showed the tools that students used to get their tasks done and the best method used for establishing collaborative group as it is identified by the student perception.

**Keywords** – collaborative learning activities; MCSCCL; collaborative learning tools; factors for effective MCSCCL.

## 1. INTRODUCTION

Many researches on collaborative learning have been conducted and showed that collaborative has many advantages of learning such as it is more interesting and productive to work collaboratively with other team members for a common goal or a task than to work alone. And it also can produce better social interaction and learning advancements. With the improvement of technology, Computer Support Collaborative Learning (CSCL) fosters new possibilities for achieving more effective and attractive learning activities.

A new and emerging area within CSCL is the mobile computer supported collaborative learning, MCSCCL, e.g. [1]. Where the use Mobile Smart devices overcome the limitations posed by desktop computer with no mobility for doing the collaborative activities. By incorporating mobile smart devices, learning becomes personal and mobile, and students are able to socially interact and participate in collaborative learning activities anytime and anywhere. [2, 3]. Some research studies have shown that the use of mobile devices in classrooms could significantly impact student collaboration [4]. Students leverage on their own mobility and the mobility of the devices in order to coordinate collaboration and to exchange information simultaneously over the connected devices.

The student needs to collaborate with each other while they are doing their tasks so with the adoption of mobile technology collaboration becomes more interesting and effective because with mobile devices students are able to work with adaptive collaborative applications outside the classroom context, providing a flexible learning environment. However, collaborative mobile learning implementations are still at their early age, and are yet to be explored and expand as our mobile phones, become more collaborative and more affordable. A research was conducted to measure the effect of collaboration in mobile learning, and it was found that technology itself does not cause human to human interaction in collaborative learning tasks, and collaboration does not happen automatically by the technology available, but it depends heavily on the design of tasks and applications [5].

In the university context students involve in many collaborative activities in order to do their tasks and extend their knowledge and social skills, so this study aims to identify the effective factors for mCSCL, in addition to that, will explore the collaborative learning activities that students do using mobile computer devices in collaboration with their peers.

## 2. BACKGROUND

In the background, we are going to define collaborative learning and study general model for CL proposed by [6], which show learning environment and tools for collaborative learning. We are going to define the term Mobile Computer

Support Collaborative Learning (MCSCL), and explore the form of mobile technology that is suitable for collaborative activity performance. Lastly identifies factors which contribute for effective mobile computer support collaborative learning MCSCL.

### A. Collaborative Learning

Collaboration highlights the social interaction in any learning process; [7] defined collaborative learning as "a situation in which two or more people learn or attempt to learn something together". If we look deeper to this definition it is composed of three elements

- Scale of participation: This element measure the size of participation's group (i.e. A pair, a small group, a class, or a society), and the collaboration time span (i.e. Extended from hour to lifelong learning).
- Learning contexts: this consider as the second elements of collaborative learning in which it could be a formal context ( e.g. sharing course material) or through joint problem solving where learning is a side effect measured by the improved performance of problem solving or gained knowledge. Another form of learning is "lifelong learning" gained from experience encountered in the course through individual action or collaborative work within the professional community.
- Method of collaboration: this can range from asynchronous communication to synchronous or co-location.

Furthermore, Collaborative learning is a learning method in which small groups whose members have equal opportunity of collaboration to attain common goals, to solve a dedicated problem, to perform common tasks and to evaluate common outcomes. The ingredients of successful collaborative learning are the active interaction of group members, positive interdependency, and a strong sense of individual responsibility [8].

So & Lee has explored learning environment and tools for collaborative learning which composed of tasks (activities), communication tools, collaborative task workplace and learning resources as shown in Figure 1.



FIGURE 1: Learning environments and tools for collaborative learning [6]

### B. Mobile computer support collaborative learning

MCSCL can be considered as a specialization in the field of CSCL. It alleviates the constraint posed by fixed times and locations for doing the collaborative activities. By employing mobile devices, learning becomes personal and portable, and students are able to participate in collaborative learning activities when and where they want to [2]. Some research studies have shown that the use of mobile devices in classrooms could significantly impact student collaboration [4]. Students power on their own mobility and the mobility of the devices in order to coordinate collaboration and to exchange information simultaneously over the wirelessly connected devices.

The rapid improvement in the mobile technology has made collaborative learning more and more interesting, the student can use their mobile to do their learning activities anytime and anywhere. Mobile devices aren't the only item for the leverage of the collaborative learning process, rather there should be suitable tools in which it will work with mobile technology and help students in collaboration [9] list many tools for mobile collaborative learning, it is summarized below in Table 1.

TABLE 1: Forms of mobile collaborative learning

Collaborative resource	The way of using it
Weblog or Blog	It is an online diary that is simple to create and maintain, this diary can be set to allow updates from more than one person. Some contributors quoted “downloading blogs” as a collaborative activity
Wiki	Is a website for a group, this website is much more similar to a collective blog, with Wiki participants can create collaborative web pages which are updateable by more than one member and contribute to discussion threads.
Web forum	It is also websites which is related to a particular thread that are maintained by a team of administrators, but which have information threads that can be created and added to by members.
Beaming	This form of mobile collaborative learning is basically a way of sharing data between mobile devices by the use of infrared “beam” or Bluetooth. Adding information to a shared database, or one--to-one information sharing.

### C. Factors for Effective MCSCL

Grouping a number of learners together does not mean they can learn collaboratively, or they learn effectively through collaborative work, but there are some factors which contribute to design of effective mCSCL activities .Table 2 shows some of the factors for mCSCL according to some authors:

TABLE 2: Factors for designing effective MCSCL activities

Authors	Factors
[10, 11, 12]	They mark <b>individual accountability or individual responsibility</b> : as factor for the success of the group members, Each member has to take responsibility for the performance of himself or herself, of all group members, and of the group as a whole, When the group succeeds, all group members succeed; and vice versa. Based on motivational theories.
[8, 10, 11]	They highlight <b>equal opportunities</b> as another factor for mCSCL. Equal opportunity means that learners contribute to their team by improving their own performance. This factor ensures that all members are challenged to do as much as they can irresponsible for their level.
[11]	<b>Group goals</b> : can be considered as the third factor. The group's goal means that group members must match the same or the common goals when working as one unit in a collaborative way.
[13]	<b>Social skill</b> : is another important factor in collaborative learning. Exchanging ideas, reasoning and challenging group members are the most frequently occurred interaction patterns in a collaborative activity; thus, fluent and effective communication is critical. Learners with higher social skills can get to know each other more easily, communicate more accurately and less ambiguously, and resolve conflicts more constructively. .
[1, 14]	<b>Mutual support</b> : the member not only responsible for his learning but also he should have a sense of responsibility for helping to assist other members of the group through the frequent exercise of social skills during group interactions
[14, 15]	<b>Face-to-Face Interaction</b> : the people in charge for must involve a discussion among the members of the team to make group member efficiently exchange opinion and make compromises to build a consensus answer.
[8, 11]	<b>Formatting of Small Group</b> : Discussion, social interactions and consensus building can only be obtained in small groups of three to five members
[15]	<b>Interactivity</b> : this term refers to the quota of interactions between learners using the mobile devices, and the extent of using handheld force learners to share information in a learning activity.
[15]	<b>Coordination</b> : this term refers to the use of mobile or handheld devices to promote active participation by all learners and a need to coordinate activities. Using Handhelds allows for negotiation between learners within team activities, as a consensus needs to be reached before moving on to another activity.
[15]	<b>Communication</b> : is a way of opening a channel of communication between learners and their

instructor. Mobility refers to the portability of the devices and the.
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### 3. METHODOLOGY

To make the research clearer is by providing methodology along with it in which it simplifies and guides the result to best practice. The collection of data in this mythology depends on two options. First, secondary data: which is collecting the data from the source that has been already published such as journals, papers, books, electronic sources. Second, primary data: which is the way of collecting data from first- hand- experience; there are many sources for collecting primary data such as experiment, survey, observation and interview. In this study, the primary data mainly collect from questionnaires.

A random sample has been selected by students from both postgraduate and undergraduate, in the Faculty Computer Science & Information Systems (FCSIS), UTM Malaysia. Questionnaires ultimately to know which activities student they do to get their task done in collaboration with their peers, and the type of tool they actually use it for performing collaborative activities, furthermore to the level of agreement for the effective factors for MCSCL's activities.

### 4. RESULT AND DISCUSSION

For this study the researcher used a sample size to distribute our questionnaire, 270 respondents from both level postgraduate and undergraduate with 48% undergraduate and 52% postgraduate. The population that was studied in our questionnaire included students in the Faculty of Computer Science and Information System (FCSIS) UTM Skudai, Johor Bahru. Demographic data including the students' academic level and gender were obtained. The statistical analysis reveals that 268 which is almost all participants with percentage of 99% own mobile devices and only 1% of participants who don't owe mobile devices and when the students asked about the usage of mobile devices for learning their answer presented in Figure 2.

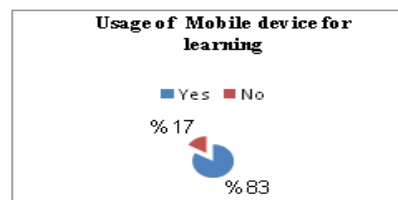


FIGURE 2: Student percentage of using mobile devices for leaning

Respondents asked about how is their feeling of using mobile devices for collaborative learning. Figure 3 shows that 150 with percentage of 55% feel excited, while 83 with percentage of 31% feel curious when using mobile devices for collaborative learning activities and only three-percent 3% feel annoyed.

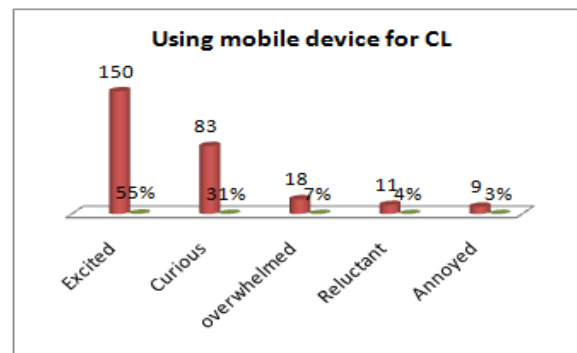


FIGURE 3: Students feeling about using Mobile device for CL

#### A. Collaborative learning Questions

In this part we have questioned student to know activities they are performing in collaboration with their classmate either inside or outside the class. Table 3 shows the types of activities that they usually do in groups.

**TABLE 3: Collaborative learning Activities**

	<b>CL Activities</b>	<b>Frequency</b>	<b>Percentage</b>
<b>1</b>	Group assignment	190	70%
<b>2</b>	Single project team	162	60%
<b>3</b>	Email Chat Groups	137	51%
<b>4</b>	Online Chat/ Groups Discussion	152	56%
<b>5</b>	Online Quizzes	93	34%
<b>6</b>	Writing papers	132	49%
<b>7</b>	Writing Journals	78	29%
<b>8</b>	Games	121	45%

Table 3 shows the result of student answers for what collaborative learning task they perform, from the result. The highest percentage has been divided between group assignment and single project team with percentage of 70% and 60%. Knowing these collaborative learning activities are going to help when designing mobile support collaborative learning MCSCL's activities.

### **B. Devices and tools used for doing CL's activities**

After asking students what collaborative learning activities they also have been inquiring about the type of devices and the suitable tools which they usually use to perform such activities. Figure 4 shows the type of mobile device; from the figure the students with a percentage of 86% do collaborative learning activities with laptop/notebook/tablet, and 55% percent perform CL activities using a Smartphone. The Suitable collaborative tools showed in Figure 5.

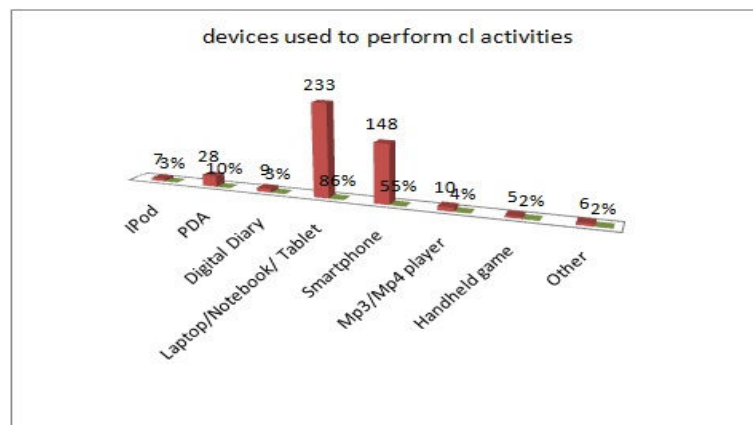
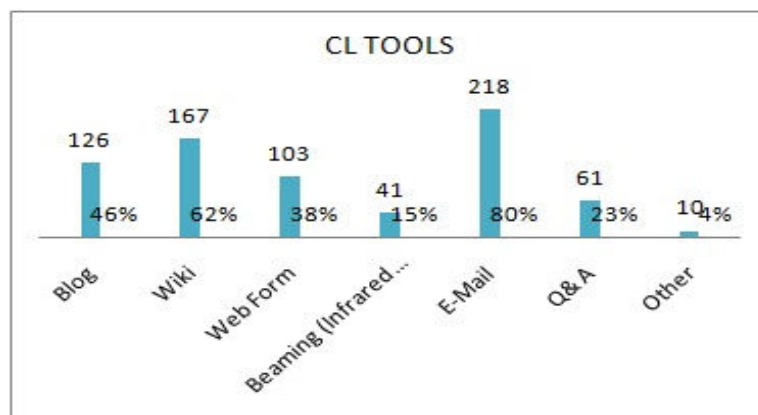

**FIGURE 4: type of devices students used to perform CL's activities**


FIGURE 5: Collaborative learning tools

### C. Students' Perceptions about factors for effective MCSCL

Table 4 confirms it summarize the analysis of respondents' answers for the effective factor for mCSCL and show the level of agreement. The scale used in this question is determined as below:

1= Strongly Disagree                      2= Disagree                                      3= Neutral  
 4= Agree                                      5= Strongly Agree                              4+5=Agree + Strongly Agree

TABLE 4: Student agreement level of the factors for effective MCSCL

N	QUESTIONS	1	2	3	4	5	4+5	Mean	SD
1	Each member has to take responsibility for the performance of himself and of the group as a whole	7 3%	6 2%	26 10%	138 50%	95 35%	233 85%	4.13	0.866
2	All members are challenged to do as much as they can regardless of their capability	5 2%	7 3%	48 18%	141 52%	71 26%	212 78%	3.98	0.841
3	Group members must match the same or the common goals when working as one unit in collaborative way	5 2%	7 3%	37 14%	138 51%	85 31%	223 82%	4.07	0.845
4	Learners with higher social skills can get to know each other more easily, communicate more accurately and less ambiguously, and resolve conflicts more constructively.	4 1%	3 1%	41 15%	143 53%	81 30%	224 83%	4.08	0.788
5	During group interactions each member is responsible for helping each other	5 2%	4 1%	30 11%	143 53%	90 33%	233 86%	4.14	0.806
6	Effective interaction can only be achieved in small group 3 to 5 members	7 3%	21 8%	59 22%	117 43%	68 25%	185 68%	3.8	0.985
7	The use of mobile devices encourage active participation by all learners	2 1%	7 3%	59 22%	121 44%	83 31%	204 75%	4.01	0.832
8	The mobile learning environment need to open channels between the learners themselves and with instructors	3 1%	8 3%	53 19%	138 51%	70 26%	208 77%	3.97	0.819
9	Working in group projects/assignment give us the chance to work with students from different countries that makes learning more interesting	5 2%	5 2%	34 13%	128 47%	100 37%	228 84%	4.15	0.844

Table 4 presents a count of responses to the statements concerning the effective factors for MCSCL. By looking for the level of agreement in the subtotal column which include agree and strongly agree, for all the factors the level of agreement is more than 75% hence from this result it is necessary when designing collaborative learning tasks to put those critical factors into consideration.

### D. Group establishment method

In order to make the collaborative work more effective the instructor have to use a method for group establishment in figure 6 students has been asked about the best method to form a group. 170 of the respondents they prefer to "choose their



own members”, 93 “by capability identified by the instructors” 77 randomly assigned by the instructors. The result indicates that student prefer to choose their own members, however stacking to this method isn't going to foster the integration (gender, racial, ethnic, etc.) among students in which they are going to experience it during their work.

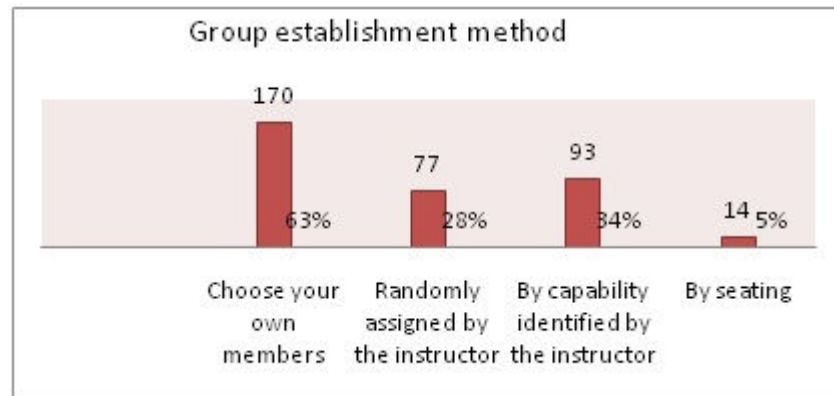


FIGURE 6: Best method for group establishment

## 5. CONCLUSION

This paper discussed the factors and requirements which are seen as important in designing and developing effective MCSCL's Activities. The factors and requirements mentioned are based on literature on good practices, and the general framework for collaborative learning has shown that for any collaborative task there should be a communication tool which acts as a pillar for performing these tasks. This paper explores the collaborative learning activities that's student used to do during their academic study with the support of mobile technology such as a Tablet PC or laptop, PDA, Web Pad and Smartphone. Know the best method for establishing the group and the student's perception of the use of mobile technology for CL's activity is another contribution of this paper. The use of mobile devices in the collaborative learning activities open a new era of possibilities, whereby the design of activities is an essential element, the MCSCL's activities support collaborative work and strengthen the social interaction among students and encourage the member mobility thus this is what makes the significant differences between MCSCL's activity and CSCL's activity.

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