

CHAPTER 6

FINDINGS OF PHASE 3: THE EVALUATION

The collaborative mLearning module for the topic of Nutrition was implemented on a group of Form 2 students. In Phase 2, the collaborative mLearning module was designed using computer-mediated communication (CMC) for instruction based on Merrill's First Principles. Formative evaluation was then conducted by a team of experts and the module was enhanced. The enhanced version of the collaborative mLearning module was used for this phase of the study.

The participants in the context of the study were Form 2 students. The responses of the participants while attempting the tasks assigned were observed and recorded. On completion of the module, the participants were surveyed and interviewed on the use of the module.

The research question in Phase 3 was to determine the usability of the module from the perceptions of user. The participants' perception on the activities and technology tools, the difficulties in the implementation of the activities, and the collaborative learning process was investigated.

In order to answer the research questions on the perceptions of the usability of the collaborative mLearning module, data collected from the survey, transcripts of participants' responses in attempting the tasks, and interviews, were coded and analysed into themes. This report of the findings was organized according to the research questions.

The Activities and CMC Tools

The activities and CMC tools used is reported according to the research question: What are the participants' perceptions on the activities and CMC tools in the collaborative mLearning module for Form 2 Nutrition in the context of the study? Three CMC tools were used in this module: wiki, online discussion forums, and text messaging. For the online discussion forums, initially *Yahoo groups* was utilized but because of the technical difficulties faced by the participants, an alternative forum was used, the *Freewebs* forum as described in the Implementation phase in Chapter 3. Both these forums were maintained during the implementation of the module.

Four areas were investigated: the preference of activities with the CMC tool, the frequency of participation and use of the tool, other CMC tools used, and difficulties faced during the implementation of the module. The analysis of the data in Tables 6.1, 6.2, 6.3, 6.4, 6.5 and 6.6; from the transcript of the interviews; and documentation in the online forums and wikis; contribute to the findings.

Preference of Activities and CMC Tool

The participants were surveyed on their perception of the activities using the CMC tools to determine their preference of the tool used. The opinions of the participants are displayed in Table 6.1 below.

The online tasks on the wiki and the SMS Quiz were the activities liked by most participants. The responses of 15 participants on their perception of the activities indicated that more participants (14) liked the SMS Quiz as compared to the wiki tasks (12) (see Table 6.1). The participants gave positive comments on both the wiki tasks and the SMS Quiz. On the wiki tasks comments given were “easy,” “interesting,” “best,” “get to work as a group and discuss online,” and “easy to find.”

The comments on the SMS Quiz were equally positive: “interesting,” “fun,” “can test my brain,” “easy to keep up with,” and “because I can release tension.” Although some participants did not commit themselves when they were surveyed, none indicated that they disliked the online tasks and the SMS Quiz.

Table 6.1

Participants’ Perception of the Activities on the Technology Tool Used.

	Perception of activities on CMC tool		
	Like	Dislike	Do not know
Online tasks on wiki	12	0	3
Online discussion questions on Yahoo	7	4	4
Online discussion questions on <i>Freewebs</i> forum	7	5	3
SMS Quiz (text messaging)	14	0	1

Note. Number of participants, n=15

On the other hand, the participants seemed to differ in opinion on the online discussion questions on the forum as some participants liked the forums, while others did not. The comments given on the *Yahoo* forum were mainly negative: “boring,” “hate to discuss,” and “dislike.” The reason could be because of the technical difficulties the participants faced when using the *Yahoo* forum (see Figure 6.1). Participants had to sign-up as a *Yahoo* mail user before applying for membership on the *Yahoo* forum. In addition, they had to wait for approval for membership on the *Yahoo* groups before they could post their comments online. The process seemed

confusing to the participants who later opted for alternative sites to post their comments.

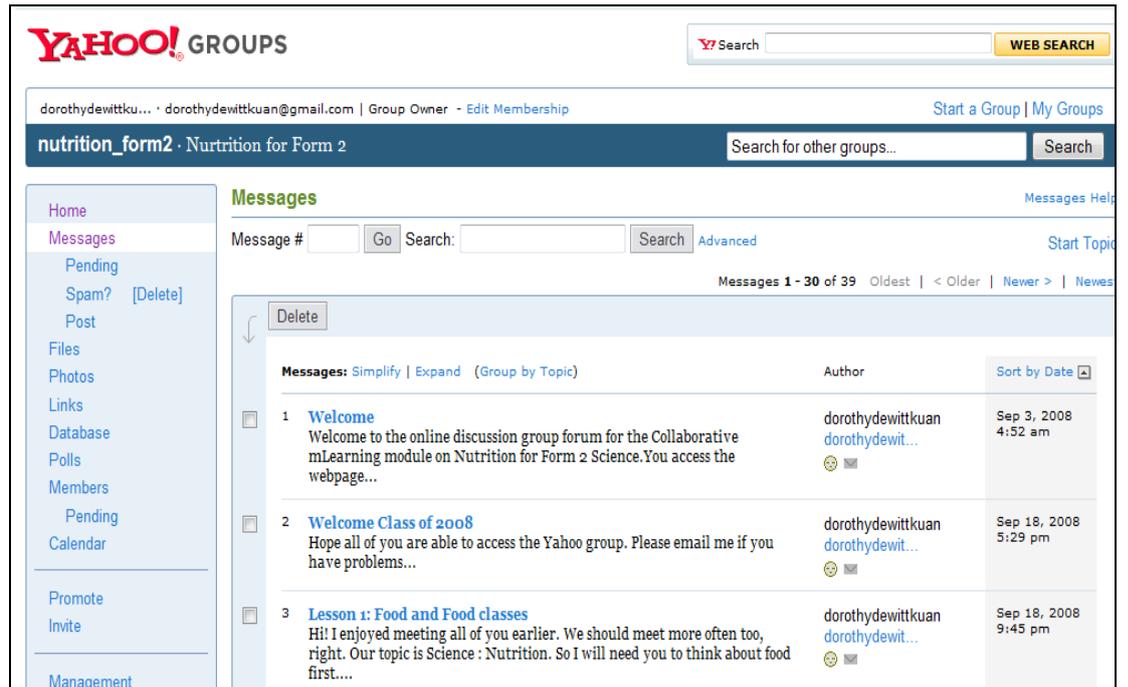


Figure 6.1. List of first few topics in the Yahoo group forum

The *Freewebs* forum however had positive responses from the participants: “fun” and “interesting.” This was also because of the ease of use of the forum as there was no need for membership application or approval.

The online discussion questions on the forum did appeal to some of the participants. One comment from a participant described his preference for online forums as he liked both the *Yahoo* and *Freewebs* forums “because I can release tension.” The online forums appealed to him as he could express himself freely.

To summarize, the majority of participants preferred the SMS Quiz and the online tasks on the wiki while only half of them liked the online discussion questions on the forums. In addition, the *Freewebs* forum was preferred compared to the *Yahoo* forum.

Frequency of Participation in the Use of the CMC Tools

The frequency of participation in the activities was investigated from the use of the CMC tools. The frequency of use of the wiki and the *Freewebs* forum could be captured from the system embedded in the *Freewebs* webpage which enabled participant log-ins for the wiki and views of the forum to be monitored.

Online problem tasks were assigned to groups. The participants in the groups had to solve the tasks assigned collaboratively online on a wiki. The *Freewebs* system enabled the frequency of participants logging-in and uploading tasks on the group wiki to be captured (see Table 6.2).

Table 6.2

Frequency of Group Members' Use of Wiki for Working on Online Problem Task

Group	Number of members	Number of log-ins	Number of log-ins for uploading / editing data
1	4	7	4
2	3	3	2
3	3	0	1
4	4	2	2
5	3	5	3
6	3	0	0
Total	20	17	12

Note. Number of participants, n = 20

A majority of the participants had logged-in to the wiki but only a little more than half uploaded information on the wiki. A total of 17 participants from 6 groups

had logged-in to view the online tasks on the wiki but only 12 participants logged-in to upload or edit information on their group's wiki (see Table 6.2). However it was noted that in some groups, discussions were done off-line and one member was assigned to upload their group's task online: "We do in a group, we don't use computer. We talk and sit face-to-face, and one person will write what we discussed about it (SI.S6.146)."

Some groups did not manage to complete the tasks due to the difficulty in getting the members to participate. One participant described in his preference of activities in the survey: "Dislike because I need group members." There were different preferences regarding group work: some participants did not mind working in groups, others preferred to work alone.

The wiki was utilized as a space to publish the solution of the online problem task. The groups did not seem to collaborate much online, except to occasionally edit information uploaded, and discussions were mainly face-to-face.

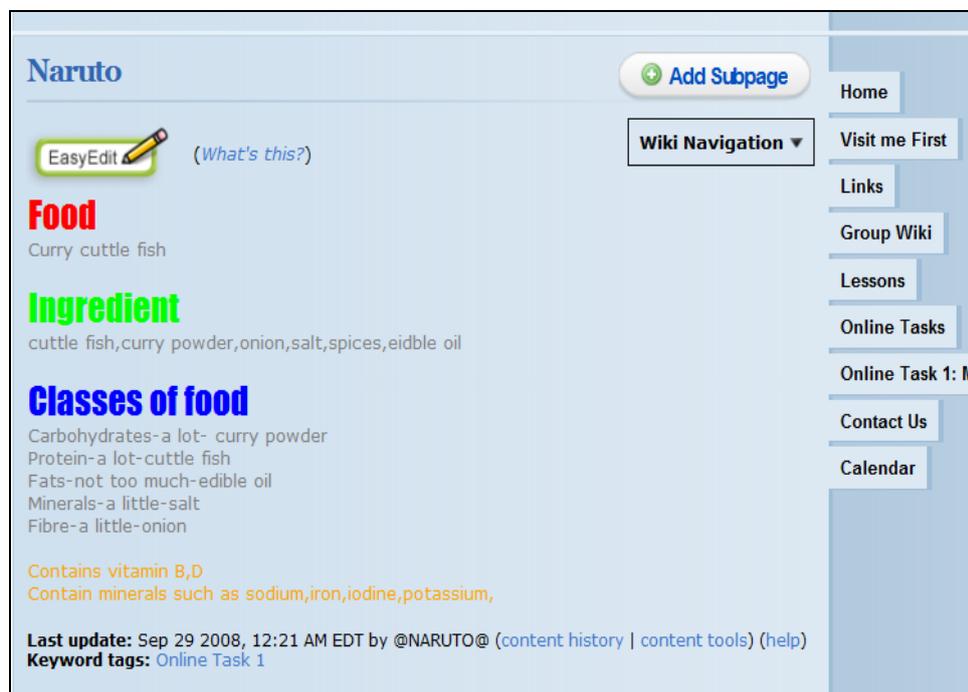


Figure 6.2. Answering questions of the discussion forum on the wiki.

The posting of replies and answers to the discussion questions was detected not only on the discussion forums but in the other CMC tools. The answers to the discussion questions were originally supposed to be answered on the *Yahoo* forum. Due to the technical difficulties faced, the *Freewebs* forum was initiated. However, in addition to the forums, some participants posted answers on their group wiki (see Figure 6.2), and others by e-mail to the tutor. Table 6.3 shows the number of participants' posts to the discussion questions in each lesson on the different CMC tools.

Table 6.3

Frequency of Participants' Posts in Discussion Questions on the CMC Tools for the Lessons in the Module

Lesson	1		2		3		4		5		6		7		8	Total
Discussion Question	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	
<i>Freewebs</i> Forum	2	-	5	5	1	6	5	2	3	3	6	3	3	4		
<i>Yahoo</i> Forum	1	-	7	2	2	-	-	-	-	-	-	-	-	-	-	
Wiki	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	
E-mail	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total posts	11	4	7	7	3	6	5	2	3	3	6	3	3	4	67	

Note. Number of participants, n = 20

Many CMC tools were used in the first lesson because the participants were not familiar with the discussion forum. In the first lesson, participants posted the

answers to the discussion questions on their group wiki (see Figure 6.1), and sent through e-mails. By the second lesson, the answers were posted on either the *Yahoo* or *Freewebs* discussion forums only. After the third lesson, posts were only detected on the *Freewebs* forum (see Table 6.3). The initial use of a variety of CMC tools might indicate that the participants had difficulty the instructions, or the technical aspect of using the *Yahoo* forums. The results also indicated the participants' preference for the *Freewebs* forum.

The screenshot shows a forum page titled "Collaborative mLearning Module on Nutrition". The forum is for "Lesson 6: Digestion". There are two discussion topics listed in a table:

topic	posts	views	last post by
Discussion Q1 by nutritionform2	4	16	nabil Oct 22, 2008
Discussion Q2 by nutritionform2	7	22	Nabil Oct 22, 2008

The interface also includes a "Create New Topic" button and a sidebar with navigation links: Home, Visit me First, Links, Group Wiki, Lessons, Online Tasks, Online Task 1: Meals, Contact Us, and Calendar.

Figure 6.3. Frequency of posts and views on *Freewebs* forum for discussion question on Lesson 6

Another interesting observation that was captured from the *Freewebs* forum was the number of times a post was viewed (see Table 6.4). From the number of views and the posts on the *Freewebs* forum during a four week period, more participants viewed the posts only, as compared to posting a the reply to the

discussion questions (see Figure 6.3). This indicated that there were inactive “silent observers” or “lurkers” in the environment.

Table 6.4

Frequency of Participants' Posts and Views of Posts on the Freewebs Forum for the Lessons in the Module

Lesson	1		2		3		4		5		6		7		8
Discussion Question	1	2	1		1	2	1	2	1	2	1	2	1	2	1
Posts on Freewebs Forum	2	-	5		5	1	6	5	2	3	3	6	3	3	4
Views of Freewebs Forum	37		36		22	11	24	22	11	12	16	22	21	16	14

Note. Number of participants, n = 20

As indicated by one participant, the reason for not participating in the discussion was because he did not know the answers. However, he did not think that the discussion questions were useless, as he would rather not attempt the questions.

DD: What about discussion questions? I didn't see your name. So, did you do at all?

B: No

DD: Why? What's the reason?

B: Er, some of it I don't know. Ya, most of it.

DD: Most of it you don't know.. the answer?

B: Ya

DD: Did you see the other's answers?

B: Ya (strongly)!

DD: So when you see the answers, did it help or not?

B: Not really much

DD: So no point having these discussion groups?

B: A little point, but for me I don't really do (SI.B2.23).

Participant B did not post any answer because he did not know the answer to most of the discussion questions. In his opinion, viewing the answers posted by others did not help him answer the discussion questions. However, he had strongly stressed that he did view the answers. Observational learning occurred when he viewed the answers and non-participation did not indicate that there was no learning.

The participants preferred forums which were easy to use. However, more participants only viewed the posts on the discussion forum compared posting answers. In addition, viewing the answers posted by others did not ensure that the participant could continue the discussion.

For the SMS Quiz, the data captured from the records of participants' replies to the text messages in the system was posted in an *MS Excel* file meant for tracking text messages in reply to the Quiz (see Figure 5.6). The number of active participants in each lesson was captured from the records of replies given (see Table 6.5).

Table 6.5

Frequency of Participants' Use of SMS Quiz via Text Messaging for the Lessons in the Module

Lessons	1	2	3	4	5	6	7	8
No. of Quiz questions	7	3	4	3	3	14	4	5
Number of active participants ^a	18	10	9	14	14	12	11	11
Number of participants ^b	19	19	16	16	16	16	16	16

Note. Number of participants, n = 20,

^aParticipants who answered all or most of the SMS Quiz questions, ^bParticipants who did not drop out due to non-functioning equipment, lack of credit and other reasons.

The number of active participants in the SMS Quiz conducted through text messaging seemed to be higher compared to the other activities. One reason was the accessibility of the device as the participants had their own personal mobile phones. Participants who did not respond to the Quiz cited reasons such as inaccessibility (the mobile phone belonged to another family member, or the mobile phone was not functioning, or there was insufficient credit). Another participant refused to participate as she had gone on holidays overseas, and did not access the phone (RJ11).

In summary, the frequency of participation indicated that the SMS Quiz was the most preferred activity followed by the online tasks on the wiki and the discussion questions on the forums. Lack of participation in uploading answers did not indicate that the participants were not doing the activities as work was done off-line. In addition, learning occurred when other posts were viewed.

Other Tools for Collaboration

The data also indicated that another tool other than the wiki, discussion forums and text messaging, was used for collaboration and communication. Synchronous text messaging tools were used for chat purposes. The interview data showed that some groups claimed that they had conducted chats on MSN.

DD: So, when you do together (the online tasks) as a group, you do together with them in school, or do you do at home, or how do you do it?

B: Er, sometimes I'm online at MSN, then I ask what I should do lah. Then they tell me (SI.B2.12).

Another tool that was used during the implementation was *Yahoo Instant Messenger* (Yahoo IM). The researcher had communicated with some participants on *Yahoo IM* (see Figure 6.4) and provided scaffolding in the form of procedural support to assist them in overcoming their technical difficulties (IM6.O.2; RJ4). When the participants indicated they were unsure about how to start an activity, the researcher also provided conceptual and strategic support (IM6.04, IM9.O1). Besides the use of the synchronous text messaging chat tool for support, it afforded a social role. One of the participants who did not complete the SMS Quiz through text messaging preferred to complete most of his SMS Quiz on *Yahoo IM* (IM9.O8.RJ14).

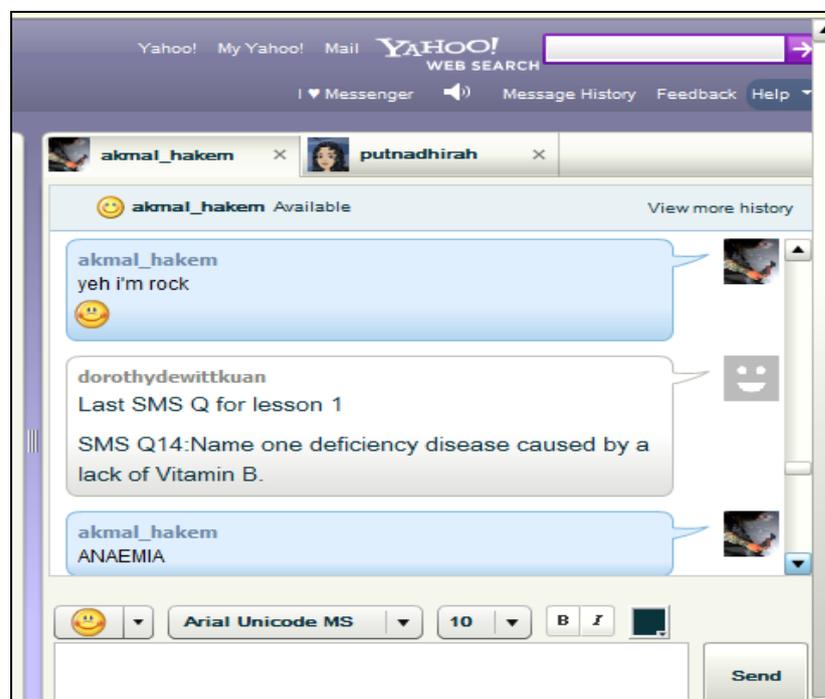


Figure 6.4. Screen capture of participant answering SMS Quiz on *Yahoo Instant Messenger (IM)*

The results showed that some participants used synchronous text messaging tools for collaboration in the implementation of the module. The response and

feedback using these tools was immediate and the cost of the use of the technology was minimal.

Ease of Access of the CMC Tools

The participants were questioned on the ease of using the technology tools when attempting the activities for the online group tasks, discussion forums and SMS Quiz. Their responses are tabulated in Table 6.6.

Table 6.6

Frequency and Ease of Use of Technology Tools.

Item on Technology Tool	Don't know	Agree	Disagree
Online Group Tasks on wiki			
I found the group wiki easy to access	2	11	2
It takes a lot of time to do work with the internet	1	9	5
I found the group wiki difficult to use and edit	2	1	12
Discussion Questions on Forums			
I found the Yahoo discussion group easy to access	2	9	4
I found the <i>Freewebs</i> discussion group easy to access	1	14	0
I prefer answering the questions on the <i>Freewebs</i> discussion group forum	2	12	1
It takes a lot of time to do work with the internet	0	7	8
I found the Yahoo group difficult to use and edit	1	6	8
SMS Quiz (Text messaging)			
I found the SMS function on the phone easy to access	1	13	1

Note. Number of participants, n = 15

Wiki

The wiki was considered easy to use. A majority (11) found that the wiki was easy to access and not difficult to use or edit (12) (See Table 6.6). However, there were two participants who had difficulties.

The participants who did not access the wiki at all had technical problems. Although all participants were given training in the use of the wiki, some were still not confident in the use of the wiki. On the other hand, participants who explored the wiki managed to add pages, graphics, and animations on the wiki (see Figure 6.5) were more confident users and had uploaded the solutions to the tasks on the wiki.

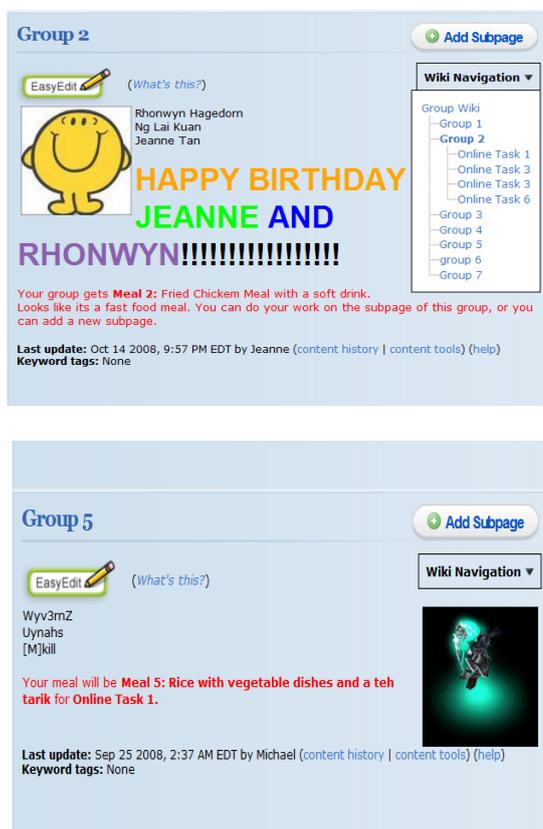


Figure 6.5. Screen captures of two groups which used graphic and animation on their group wiki

Discussion forum

Two online discussion forums were used in the study. The original forum was *Yahoo*, and later the *Freewebs* forum. However, the participants' perceptions on both the forums were mixed: some participants liked it; others did not.

The majority (14) found the *Freewebs* forums easy to access, as compared to the *Yahoo* forum (9) (see Table 6.6). Many (8) also found the *Yahoo* group forum difficult to use and edit, preferring the *Freewebs* forum (12). When asked about the *Yahoo* forum, participants had comments like "don't know how to use." This indicated the problems some participants had in using the forum.

There were several steps involved in signing-up for membership in a *Yahoo* group. Some participants gave comments that indicated their dissatisfaction with the steps involved: "Dislike because I don't have a *Yahoo* account," and "I am a little confused with Yahoo Tech groups."

There was no negative comment made when participants' opinions were asked about the *Freewebs* discussion forum. Participation in this forum was easier and one could post discussions directly.

Text messaging

The SMS Quiz was also easily accessed by the majority of the participants (13) (see Table 6.6). Although the text messaging function seemed to be easy, there was one participant who had difficulty in accessing the SMS Quiz questions. Further probing indicated that this participant was unfamiliar with the use of mobile phones, and did not know how to delete messages from the *Inbox* when it was full.

Summary of the Perceptions of the Activities and CMC Tools

The participants found most of the technology tools easy to access, with only the *Yahoo* group forum being difficult to use. The text messaging function for the SMS Quiz seemed to be the most accessible technology tool. In addition, collaboration was not limited to the tools in the module as other synchronous tools were used for communication in the collaborative mLearning environment.

Difficulties in the Implementation of the Activities

The difficulties during the implementation phase of the module were analyzed to answer the research question: What are the difficulties faced by the participants in the context of the study in the implementation of the activities in the collaborative mLearning module for Form 2 Nutrition?

The difficulties faced by the participants when attempting the activities were mainly in the following areas: the medium of instruction, technical aspects, and proficiency in science, the large number of questions in the activities, and the complexity of the tasks.

The frequency of difficulties faced in the areas of language, technical requirement and subject for the activities of the three technology tools used was surveyed and tabulated (see Table 6.7). Additional data was collected from the transcript of the interviews, documentation in the online forums and wikis, as well as documentation in the researcher's journal, and was analyzed.

The Medium of Instruction

Language did not seem to be a difficulty when attempting the activities. The majority disagreed that the activities was difficult to understand because of the language (see Table 6.7). However, there were a few who agreed that the language used for the online tasks on the wiki (3), and the discussion questions on the forum (4) was difficult. However, fewer participants said it was difficult for the SMS Quiz (2). This was verified during the interview with participant B.

Table 6.7

Perception of Areas of Difficulty According to Language, Technical Requirement and Subject

Item on Technology Tool	Don't know	Agree	Disagree
Online Group Tasks on wiki			
The question was difficult to understand because of the language	1	3	11
The question was difficult to understand because of the technical requirement	3	0	12
The question was difficult to understand because I did not know the subject	1	2	12
Discussion Questions on Forums			
The questions given were difficult to understand because of the language	0	4	11
The questions given were difficult to understand because of the technical requirement (<i>Yahoo</i> or <i>Freewebs</i>)	1	4	10
The question was difficult to understand because I did not know the subject	0	2	13
SMS Quiz (Text messaging)			
The questions given were difficult to understand because of the language	0	2	13
The questions given were difficult to understand because of the small screen display on the phone	0	2	13
The question was difficult to understand because I did not know the subject	1	1	13

Note. Number of participants, n = 15

DD: You mentioned you had problems with language

B: Yes, some language, em. Grammar I don't understand.

DD: So English was a bit difficult?

B: Ya.

DD: If I set the questions in Bahasa (Malaysia), easier or not?

B: Em I can understand some of Bahasa Malaysia (SI.B1.64).

Observation during the face-to-face meetings during the implementation indicated that some participants had difficulties in understanding using the medium of instruction, English. Two of the participants laboriously read the discussion questions, which were in English, as they attempted the questions (RJ16). However, it was noticed that the participants were reluctant to read the instructions and preferred to answer the questions immediately (RJ18).

Although most of the participants did not face difficulties with the medium of instruction, English, there were some who were not proficient in the language.

Technical Difficulties

The technical aspect of the collaborative mLearning module was not a barrier for most of the participants. This was because in the survey, the majority did not find the questions difficult to understand because of the technical requirement. A few participants noted the questions were difficult to attempt because of the technical difficulty of the discussion forums (4), but none of the participants noted technical difficulty on the wiki (see Table 6.7).

For the text messaging, the suitability of the screen size was inquired on during the interviews. However, this did not seem to be a problem for the

participants in the context of the study. In addition, the majority (13) disagreed that the questions given were difficult to understand because of the small screen display on the phone used for the SMS Quiz, but two participants found it difficult (see Table 6.7). The small screen display might be a problem to some students.

In short, there were not many technical difficulties faced during the implementation of the module. Most problems were because of the difficulty in using the *Yahoo groups*, which was addressed later.

Proficiency in Science

Some participants found the activities difficult because they were not proficient in science. A few indicated that the questions were difficult because they did not know the subject matter for the online tasks (2), discussion questions (2), and SMS Quiz (1) (see Table 6.7).

One of the participants explained when asked the reason for her non-participation in the discussion questions.

DD: The group discussions. Iina answered a lot of the questions but you didn't. Why didn't you?

S: Because ... I don't really know the answer.

DD: But do you read the others' answers?

S: No.

DD: So if you don't know maybe you should read ...

S: Because if I read their (answers), maybe they'll think I'm copying them (SI.S7.193, 215).

There seemed to be reluctance for the participants to read the answers of other members of the group. Reading other's answers was considered to be copying,

and was avoided. This might have been because of situational cues from prior experience influenced the learner not to read, or write another answer or discussion when the answer was given. In addition, the participants might not see the value in posting an answer when someone else had done so.

DD: Did you read the other people's answers?

I: Sometimes. Alright if I don't know the answers la but if I know the answers then I just write and don't read the others (SLS7.209).

One interpretation would be to suggest that Ilina lacked confidence and was afraid of cheating. Learning was a social activity where elements in the environment, including answers of the participants should be artefacts which "mediate" learning. Participants who did not know the answers to the questions felt that the question was difficult, and were not motivated to question and enquire on how to attempt the questions. There was no expectation of success when the question had already been answered.

The Quantity of Tasks in the Activities

There were Online Tasks, Discussion Questions and SMS Quiz to be completed in the module. Most participants considered there was a lot of work to be done. A comment on the large amount of problem tasks in the wiki was: "At first enjoyed, then mountainous." This was also reflected by another participant in the *Freewebs* forum, who disliked the amount of discussion questions that had to be done: "too many discussions."

The issue of the large number of questions was initially brought up by the experts in the development phase, but was reconsidered as it was assumed the

number of questions would be beneficial. An interesting point to note was that there were no complaints on the number of questions for the SMS Quiz.

The participants seem to consider the large quantity of questions from the online tasks and discussion questions, which may have caused discomfort and concern. The expectancy of success is attributed to causes such as high ability and lower task difficulty. Hence, the easier tasks would increase the expectations of success. However, the number of SMS Quiz did not seem to be a cause of complaints for the participants.

Complexity of Tasks

Misunderstanding of instructions when attempting the activities was not only due to the lack of proficiency in the language of the medium of instruction. In this case, some participants were confused with the complexity of the activities and did not know how to start (see Figure 6.6).

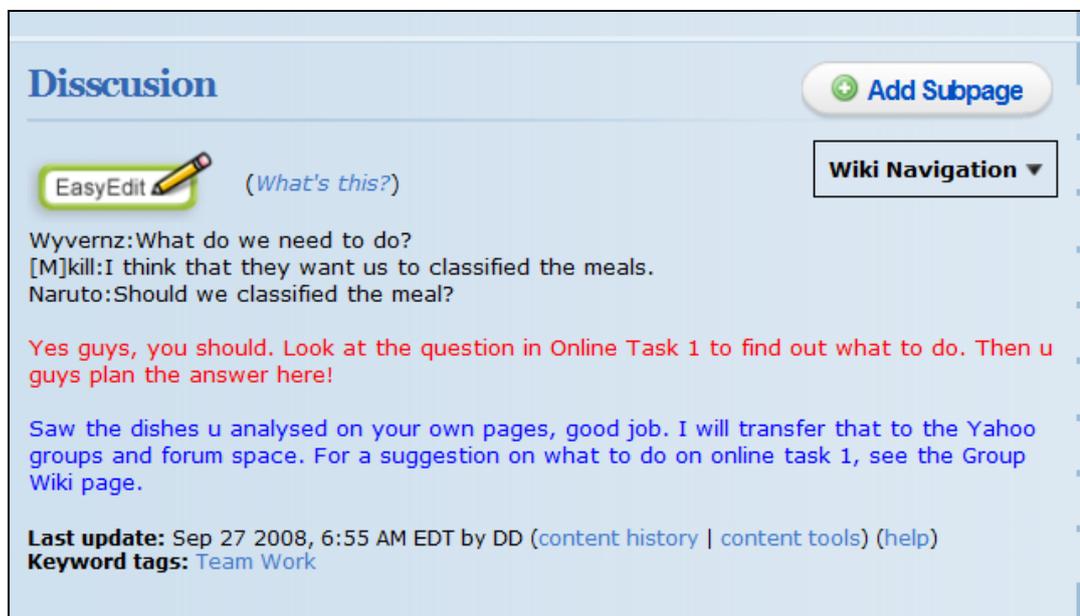


Figure 6.6. Screen capture of a discussion on the wiki on how to attempt the task.

There was some navigation for the online task which caused confusion. “Maybe online (tasks) because you have to go to some places, (online links) here and there, and there are a lot of questions to be finished, so it’s a bit confusing (SI.R4.94).”

The *Freewebs* forum could not be accessed directly. The user had to navigate to the appropriate lesson, and then click on the particular question (RJ8). One participant also asked details on the deadline for the discussion questions, and requested for the deadline to be postponed as she found the questions confusing (RJ13) (see Figure 6.7).



Figure 6.7. Screen capture of the exchange on the discussion forum on negotiation for a delay in the deadline.

Summary of the Difficulties in the Implementation of the Activities

Most participants in the context of the study did not have difficulties when using the module. However, a few had difficulty with the medium of instruction, technical

aspects, and the subject matter. In addition, the quantity and complexity of the tasks affected some of the participants who were not motivated to continue as they found the tasks daunting. The difficulties faced could be used for improvement of the design of the collaborative mLearning module. Forums which were easy to use and did not require prior registration, as well as activities which were direct with simple language were recommended.

Collaborative mLearning

The collaborative mLearning environment was analyzed to answer the research question: What is collaborative mLearning to the participants in the context of the study?

Several aspects collaborative mLearning were investigated and analyzed: the participants' preferences for collaboration with group members; the role of the tutor; the use of the module for learning; and motivation in using the module. The analysis of data in Tables 6.8, 6.9, 6.10, 6.11, 6.12, 6.13, and 6.14; from the transcript of the interviews; documentation in the online forums and wikis; and documentation in the researcher's journal; was utilized for the findings.

Collaboration with Group Members

The situation on group work for the online tasks on the wiki and the discussion questions on the forums was surveyed. There was collaboration when attempting the online tasks and the discussion questions on the forums. Most participants liked working in groups for the online tasks (12) as their group members were willing to contribute ideas (13) (see Table 6.8).

The discussion questions were also answered by groups of students. Most participants (13) preferred answering the discussion questions with a friend, indicating the preference for group work. The discussion questions on the forums were supposed to be completed individually, but many participants posted answers as a group (see Table 6.9).

Table 6.8

Frequency of Participants' Perception of Group Work

Item in technology tool	Don't know	Agree	Disagree
Wiki			
My group members are willing to contribute ideas	1	13	1
It is difficult to work together as a group	1	4	10
I like working in groups	2	12	1
Discussion Questions			
I prefer answering the discussion questions with a friend	2	13	0
I read the answers given by my friends	1	8	6
I correct the answers given by my friends	4	5	6

Note. Number of participants, n = 15

On reading others' answers and correcting the answers posted, this drew mixed reactions from the participants. As in the previous section on proficiency in science, reading others' answers was considered as copying and so was avoided.

Text messaging was also used for collaboration to get the opinions of the other members. The interview below referred to the SMS Quiz question, and the participant indicated that he "brainstormed" using the text messaging feature.

DD: So, when you contact the others (by texting), you brainstorm?

MD: Ya, We ask questions, we get opinions about each other's questions (PI.MD2).

Table 6.9

Frequency of Posts on the Discussion Questions According to Individual or Group Replies for each Lesson

Lesson	Individual Posts	Group Posts	Total Posts
1	12	3	15
2	7	0	7
3	4	6	10
4	11	0	11
5	3	2	5
6	8	1	9
7	6	0	6
8	3	1	4

Note. Number of participants, n = 20

Although most participants liked doing group work, it would depend on the members to the group. The tutor had assigned the participants to groups for the online problem tasks but had later entertained requests for change of members in the groups.

Groups which had members who collaborated well seem to be able to produce solutions for the online tasks which were well documented (see Figure 6.8), while groups with members who did not share the same values and purpose, seemed to have less participation in the online tasks. Some participants may not like working

in groups. One participant had stated that the dependency on the other group members in contributing to the online task made it difficult.

The screenshot shows a web page for a group wiki titled "Meal 5". At the top right, there is a button labeled "Add Subpage". Below the title, there is an "EasyEdit" icon and a link "(What's this?)". A "Wiki Navigation" dropdown menu is visible. The main content area includes:

- Meal 5:** [Rice with Vegetarian Dishes and Teh Tarik](#)
- Ingredients:**
 - White Rice: rice and water
 - Mixed Vegetables: 50g cucumber, 50g broccoli, 30g capsicum, 30g carrot, 1 onion, 1 garlic, oil, 1/4 teaspoon cornstarch.
 - Fried Bayam: 200g bayam, 1 garlic, oil for frying.
- Classes of Food:**
 - Carbohydrates: rice, cornstarch and all the vegetables.
 - Protein: cucumber, rice, broccoli, onion, bayam.
 - Fat: Oil, onion, broccoli, cucumber.
 - Fibre: All the vegetables.
- Nutritional Summary:** The food also contains Vitamin A from carrots, broccoli, cucumber and spinach, to prevent night-blindness. Vitamin C from spinach, broccoli and cucumber, to prevent scurvy. Vitamin E from broccoli, to help prevent sterility. Vitamin K from broccoli, cucumber and onion, to help the clotting of blood. The food also contains Iron from broccoli and cucumber. Calcium from broccoli and cucumber. Magnesium from broccoli, cucumber and onion. Phosphorus from broccoli, cucumber and onion. Potassium from broccoli, cucumber and onion. Sodium from broccoli, cucumber and onion. Zinc from broccol cucumber and onion. Copper from broccoli, cucumber and onion. Manganese from broccoli, cucumber and onion. Selenium from broccoli, cucumber and onion. Fluoride from broccoli and cucumber.
- Health Benefits:** All the classes of food help to keep us healthy. Carbohydrates provides us with energy, while Fat can be converted to carbohydrates for more energy. Protein is used to make enzymes and hormones in our body. Vitamins and Minerals are very important in preventina diseases such as night-blindness. beri-beri. rickets and

On the right side, there is a vertical navigation menu with buttons for: Home, Visit me First, Links, Group Wiki, Lessons, Online Tasks, Online Task 1: Meals, Contact Us, and Calendar.

Figure 6.8. Screen capture of online task of a group which collaborated well

Generally, participants seemed to prefer to collaborate while attempting the activities. The collaboration continued in the offline mode as well. However, in some groups, the tasks were not completed because there was lack of collaboration. Groups with members who had the same interests and similar background seemed to perform better and were more active as they shared the same goal. Even though there was an orientation meeting for participants to familiarize themselves with the technology and form the online groups, more ice-breakers should be done both offline and online to align the participants to the purpose of the module and to encourage collaboration among group members.

The quality of work on the tasks may be attributed to factors such as ability and effort contributed by the group members. Affective factors, such as the climate for interaction and mood, also contribute to the dynamics and success of the group in completing the tasks.

In future implementation, consideration should be given for participants to choose groups members, as having the same purpose and interest seems to promote collaborative learning.

The Role of a Tutor

In the implementation of the module, the tutor was present online and viewed the input for the activities at least twice a day. However, the tutor allowed the participants the freedom in attempting the tasks and only provided scaffolding when it was considered necessary. In the online tasks, scaffolding was given: exemplars were provided, and comments in the form of hints and suggestions of metacognitive strategies were given to assist in constructing the solution for the tasks. In the discussion questions, the tutor would inquire further on aspects which the group might not have considered when the answers were given.

After the implementation, the participants were surveyed to find out their feelings on the role of the tutor in the online tasks and discussion questions. The findings are tabulated in Table 6.10.

The participants wanted more help and more feedback on the wiki and the discussion forum (see Table 6.10). It would seem that the participants wanted to be dependent on the tutor for the answer. The concept of the teacher as the “provider of knowledge” seemed to be ingrained in the learners. This goes against the principle of

social constructivism where learners should construct their own understandings from the interaction among their peers.

However, not all participants needed the tutor to be present all the time.

DD: So you don't want a teacher to be there?

S: My teacher, once in a while, yes, but when the teacher's not there, I have to go solo and have to think to supply myself and everything like that (SLR4.111).

As this participant S puts it, when the teacher is not present, the learner has to think while doing the task. Cultivating the thinking skills should be the aim of learning.

Table 6.10

Perception of Assistance from Tutor by Participants

	Don't know	Agree	Disagree
Wiki			
I prefer more help from the tutor	3	11	1
I prefer the tutor to give more feedback on whether I am right or wrong	1	12	2
Discussion Questions			
I would like it if the tutor told me if my answer was correct immediately	4	11	0
I prefer the tutor to give more help on how to answer the questions	2	12	1

Note. Number of participants, n = 15

Generally, there is still a need for more scaffolding by a tutor during the learning process for learners to build their confidence. This is again attributed to

causes like the social norms, beliefs, emotions and behaviour. The norm in Malaysian schools is to depend on the teacher for knowledge, as it is believed that the teacher is the source of knowledge. The online tutor can encourage the participant to contribute to discussions in order to construct knowledge from these discussions in a positive and encouraging learning environment. Hence, a support system should be put in place for learners to request for personal assistance. However, as the learner progresses and gains confidence, these support systems are withdrawn.

Participants' Learning using the Collaborative mLearning Module

The participants' learning was determined from the perception of the improvement of understanding when the collaborative mLearning module was implemented. The effectiveness of the module on learning was analysed from pre tests and post tests results. From another aspect, the participants' interest in continued participation for learning another topic using this module was considered.

The participants were surveyed on their opinions of the learning aspect of the activities in the module after the implementation of the module. The findings on their preference for more activities and their perception of improvement in understanding in science are tabulated in Table 6.11.

Understanding of Science

Firstly, the participants believed that their understanding of science improved after completing the activities. Most of the participants agreed that the activities improved their understanding: online tasks (12), discussion questions (13),

and SMS Quiz (13) and none of the participants disagreed although two or three respondents had marked “don’t know” (see Table 6.11)

When interviewed on whether the module encouraged learning, participants agreed that their marks had improved, and that they learnt from the discussions. The participants felt that the module helped in improving their knowledge: “I think there’s nothing that I disliked. Cause if I do this, it’s good for my knowledge (SI.S9.232).” In addition, the module helped in the revision of the topic.

I: A lot la I get ... Ah. Can learn about science... Ya, buat revision (Yes do revision).

DD: You really learn or not?

I: Ah, really (SLAI3.73).

Table 6.11

Participants’ Learning Using the Collaborative mLearning Module.

	Don’t know	Agree	Disagree
Online Group Tasks on wiki			
The Online group Tasks help me improve my understanding of science	3	12	0
Discussion Questions on Forums			
The Online Discussion Questions help me improve my understanding of science	2	13	0
SMS Quiz (Text messaging)			
The SMS Quiz Questions help me improve my understanding of science	2	13	0

Note. Number of participants, n = 15

The participants referred to their science text books and other reference books during the implementation of the module. Otherwise, they normally would not have done so.

I: It makes me open my book, which I won't open if I don't have exams (SI.S9.271).

Some participants felt that they learnt from the discussion forums.

A: I get to see the discussions in the Freewebs.

DD: Do you think you learn or not from the discussions?

A: Yes (SI.AI2.35).

Practice helps in memory work, but discussions can also be useful for learning: "Honestly, I think SMS this thing is like ... make me memorize things ... because we like to talk to our friends, chit chat, and then 'masuk kepala juga la' (gets in the head) (SI.S9.232, 236)."

Well, one thing for sure, with the questions, you can always ask people or you can go refer to your Science text book. At least it helps you to brainstorm a bit (PI.MD1).

Most importantly for some participants was whether it helped them in answering the examination questions. Participant B explained how the module had helped him in answering some questions.

DD: Does it help you in the exams?

B: There's this one question in the objective part about the walls of the organ. I picked C. And in subjective also, they asked about the name of the movement for food in the organs, so I recalled it, peristalsis.

DD: I asked you that question, right?

B: Ya. So I think that really helped me. We'll one point counts.

DD: So by participating in this module, at least it helps you to score a few points in for your exam?

B: Ya, if I didn't know the movement, I surely didn't get the point, I just leave it blank (SI.B4.21).

Participant B had recalled the answer to a question which was asked during the implementation of the module, and was happy that he managed to get a similar question correct during the examination.

Participant S also supports that the questions helps them recall for the exams: "You can do more topics so that we can ... memorize ... because we seriously, we remember all this revision topics (SI.S11.294)."

Effectiveness of the Module

Before the implementation of the module, a pre test was given to the participants to test their knowledge and understanding of the concepts in Nutrition for Form 2 science. Upon completion of the module, a post test which tested on similar concepts was given. The mean scores of participants for the pre test and post test and the difference in the means scores are in Table 6.12.

Table 6.12

Mean of Pre Test and Post Test Scores of Participants.

Mean scores		Increase in mean scores
Pre test	Post test	
61.97	83.07	21.09

Note. Number of participants, n= 16

As only 16 participants took the tests, the statistical analysis of t-test was not computed. Only the difference of the mean scores was observed. The mean scores of pre and post tests showed that there was an increase in the mean score. This seem to indicate that the module was effective for learning but further studies could be conducted to determine its effectiveness.

To summarize, participants agreed that the collaborative mLearning module assisted learning as discussion, and references to books in science was conducted. During the implementation of the module, participants had more revision, and hence, were able to answer tests and exam questions better.

Motivation

The aspect of motivation in using the collaborative mLearning module was indicated by the measure of the participants' interest, interest in continued participation in the module, and recommendation of the module to others.

Interest

Most participants were motivated in using the collaborative mLearning module. They were generally active in responding when using most of the technologies (see Tables 6.2; 6.3; 6.4; 6.5) as most participants liked the activities conducted (see Table 6.1).

Participants' comments on the activities and the learning process during the interview verified that most participants liked the activities. MD considered the questions and tasks as "interesting" and that it engaged him to continue as "I have something to keep me occupied (PI.MD1)." He explained specifically that the SMS

Quiz was considered an alternative means of learning which could be done while the learner had free time:

DD: I want to find your opinion on the SMS questions. How do you find the questions?

MD: The questions are actually not bad. Actually, they're okay.

DD: You enjoy answering the questions that way?

MD: Well once in a while when I don't have anything else better to do, or if I have questions asking, emm, about the online question, then I can at least have the (SMS) questions to keep me company (P1.MD1).

During the interviews, most participants responded that the module was fun and that it was a different form of learning. When asked if they would like to continue using the module in another topic in science, most of the participants interviewed did not mind. The interview with J and R showed some aspects which interested them.

DD: Which part of the programme did you like?

J: You get to learn differently, and not just from the book. So, you get to use the internet, and then ya, something different.

DD: What about you R?

R: Ah, same as J. And I can do a lot of research online (SI.R2.49).

Additional comments from the participants that showed their interest were: "want to be implemented in school" "like to continue next year," "can do it again," "fun learning," "different way of learning – internet," and "expected fun, enjoyed internet."

The accessibility of the technology was liked by many: “easy and I can SMS anywhere,” “because I can answer it at anytime and anywhere,” and “because I always hold my phone.”

The frequency of participation in the SMS Quiz was the highest among the activities (see Table 6.4). The reason was because of the accessibility of the mobile phone.

S: I like the SMS.

DD: You like the SMS the most? Why?

I: I don't know, maybe because its...

S: easier

I: Its beside ...Our phone is just inside our (pockets) so we can just reply immediately...

I: Cause computer we need to access the internet.

S: Ya, you have to open it. Takes time (SI.S3.56, 94).

A number of respondents confirmed that accessing the internet was not that easy. Among the reasons given are: “My mother doesn't let me use so much internet (PI.CH1)” and “The online stuff kind of hard as I can only access the internet sometimes. Depends on the connection (SI.B1.3).”

Although accessing the internet was a problem for some participants because of parental control and connectivity problems, many indicated that they were able to use the tools for research: “I get to do research and learn more on nutrition (SI.I.11).”

One of the participants liked the interactive nature of forums which valued their opinions: “Like it because can give our opinions and comments (SI.N.21).”

On the other hand, there were several negative opinions. Firstly, the preference for school work, which was considered more important, was indicated: “was preoccupied with homework.” Secondly, the problems faced in using the technology discouraged the respondents: “don’t know how to use.”

In general, most participants were interested in using the collaborative mLearning tools for collaboration. This was because it was a new and interesting way of learning for them. Most of the participants found the text messaging function easy and convenient to use, as the device was easily accessed. Some like the interactive nature of the discussion forums, and the fact that the participants’ opinions were valued. On the other hand using the online tools required a little extra effort, and they were sometimes limited because of parental restrictions, and bad internet connectivity.

The usability of the device encouraged participation. As the device and the tools were easy to use, the expectancy of success is higher. In addition, the positive belief of the usefulness of the module also contributed to the success of the tasks. In addition, the contribution of the participant was valued, and the participant could control the situation.

Continued Participation

An indicator of the learners’ interest related to motivation was the willingness to continue participation in similar activities. The learners were surveyed on whether they would like to continue to answer more of the tasks and whether they would like to continue with another module.

An interesting note was that all respondents (15) preferred more discussion questions but a smaller number (10) preferred the SMS Quiz (see Table 6.13). In

addition, most of the participants surveyed indicated that they would like to answer more online tasks (12) and discussion questions (15) in another topic, but fewer for the SMS Quiz (12). Although the frequency of participation was the highest in the SMS Quiz (see table 6.4), it was not necessarily the most popular. In addition, participants would like to have more discussion questions on the forums.

Table 6.13

Participants' Interest in using the Collaborative mLearning Module.

	Don't know	Agree	Disagree
Online Group Tasks on wiki			
I would like to do more online tasks in another topic in science	3	12	0
I would like it if I was given a chance to learn this way again at a different time	2	12	1
Discussion Questions on Forums			
I would like to answer more discussion questions in another topic in science	0	15	0
I would like it if I was given a chance to learn this way again at a different time	1	14	0
SMS Quiz (Text messaging)			
I would like to answer more SMS Quiz questions in another topic in science	3	10	2
I would like it if I was given a chance to learn this way again at a different time	0	12	2

Note. Number of participants, n = 15

The comments related to the collaborative mLearning module in the survey were mainly positive. On learning, comments were positive: “I like it because it makes me open my science book more often.” However, there was one negative comment, related to the SMS Quiz: “because sometimes I’m not in the mood to (answer SMS Quiz questions).”

To summarize, the participants in the context of the study were interested in the activities and tasks using the different tools in the collaborative mLearning module. However, there were slight differences in the preference of the tools.

Recommendation of the Tool to Others

Another indicator of the interest and appeal of the tool to the learner is related to the learners’ perception of the usefulness of a tool. The learners were surveyed on whether they would recommend the tool to others (see Table 6.14).

Most would recommend the use of SMS Quiz to their friends (12), followed by the wiki (10), and the *Freewebs* discussion forum (8). The most non-committal answer was for the Yahoo group forum as less than half the participants (6) would recommend it to their friends and most of the others could not decide (7).

In general, most of the participants in the context of the study were willing to recommend the SMS Quiz, followed by the wiki in the collaborative mLearning module.

Table 6.14

Participants' Willingness to Recommend the Tool to Friends

	Recommendation of tool to a friend		
	Yes	No	Don't know
Wiki for collaborative tasks	10	2	3
<i>Yahoo group</i> forum	6	2	7
<i>Freewebs</i> discussion forum	8	3	4
SMS Quiz (text messaging)	12	2	0

Note. Number of participants, n = 15

Summary of Learning using the Collaborative mLearning Module

Most participants in the context of the study perceived that the collaborative mLearning module was useful for learning. Collaboration among the participants was observed during the implementation of the module, although not in all the groups. Most of the participants indicated the need for more scaffolding by the tutor. However, participants perceived that their understanding had improved, which was supported by the difference in the pre test and post test scores. In addition, most of the participants were motivated in using the module as they were engaged in the module. Further, the participants indicated their interest in continuing to do more tasks in the collaborative mLearning module, and would recommend the module to their friends.

Summary of the Evaluation Phase

The participants found most of the tools easy to access but the easiest seem to be the text messaging Quiz. However, some participants had used synchronous chat tools for collaboration on their tasks. The participants also found little difficulty during the implementation of the activities. Some participants may have had difficulty with the medium of instruction, technical aspects, the subject matter, and the quantity and complexity of the tasks. The collaborative learning process investigated indicated that the collaborative mLearning module was useful as it improved understanding, and motivated participants in using the module. The implementation and evaluation of the collaborative mLearning module indicated that the module could be used for learning science. There was also the possibility that this module could be used to teach other subjects as well. A discussion of the findings of the study, its implications, and suggestions for further research is discussed in the next chapter.