CHAPTER 4

FINDINGS OF PHASE 1: THE ANALYSIS

In the analysis phase, the situation of the students' in the context of the study on the use of technology was observed. Further to that, the implications of the findings on the design of the module were discussed. Next, the content for the module was analyzed from the syllabus, the curriculum specifications and other documents for recommendations on the design and content of the module.

The situation on the use of technology of the students in the context of the study was analyzed with respect to their skills, ownership of technology, the frequency of use of technology tools, and the perception of the use of computers and mobile phones for learning. The data was collected using a survey instrument, analyzed using descriptive statistics and the findings are reported in this chapter. Several recommendations were made based on the design of the module based on the findings

Next, the content for the topic of nutrition was analyzed, and the topic was mapped to determine the number of lessons in the module. Recommendations were also made based on the analysis of the documents.

Situation Regarding the Use of Technology

The findings regarding the situation on the use of technology of the group of students in the context of this study was organized and reported according to the research question: What is the situation regarding the use of technology of the group of students in the context of this study in the following areas:

a. the perception of their skills in computer and mobile phone usage?

b. forms of technology equipment the group of students has access to?

c. the frequency of use of technology in basic computer operations and concepts, and research and problem solving tools for learning?

d. the frequency of accessing the communications tools for learning ?

The report of the findings on the use of technology is organized according to the following areas: perception of skills in computer and mobile phone usage; technology equipment accessed; frequency of use of technology in basic computer operations and concepts, and research and problem solving tools for learning; and the frequency of accessing the communications tools for learning. The analysis of the findings from the data collected is shown in Tables 4.1, 4.2, 4.3, and 4.4.

Perception of Skills in Computer and Mobile Phone Usage

The perception of respondents' skills in the use of computers and mobile phones was surveyed and analyzed (see Table 4.1). The respondents perceived their skills in computer usage (Mean = 2.69, S.D. = .639) was lower than their skills for mobile phone usage (Mean = 2.06, S.D. = .883). Only 29.8% of the respondents rated themselves as skilled in computer usage, as compared to 67.7% of respondents who were skilled in the use of mobile phones.

Although only 2.5% of the respondents have attended courses on computers, almost a third of the respondents (29.8%) perceived themselves as skilled in the use of computers. This seemed to indicate that the respondents did not acquire their computer skills through formal courses, but through informal learning.

The results show that the respondents in the context of the study perceived themselves to be averagely skilled in the usage of computers, but skilled in the usage of mobile phones.

Table 4.1

Respondents' Perception of Their Skills in the Use of Computers and Mobile Phones

Equipment	Skill*, % (n)				Mean (S.D.)
	1	2	3	4	
Computer	5.1 (8)	24.7 (39)	64.6 (102)	4.4 (7)	2.69 (.639)
Mobile phone	29.1 (46)	38.6 (61)	24.1 (38)	5.7 (9)	2.06 (.883)

Note. *1 – Very skilled, n = number of respondents

2 – Skilled

3 – Average

4 - Low

Technology Equipment Accessed

The ownership and access of technology equipment from computers to audio players was surveyed and analyzed. From the list of equipment owned by the respondents in Table 4.2, the majority of the respondents had access to mobile phones (81.6%). In addition, more than half the respondents owned or had access to computers (63.9%), and video CD and DVD players (63.3%). However, a smaller percentage of respondents (44.3%) had access to the internet with computers. The ownership of other equipment, such as portable audio and video players, was lower, at 24.1% and 5.1% respectively.

To summarize, a large number of the group of students in the context of the study owned mobile phones, followed by computers and video players.

Table 4.2

Ownership and Access to Technology Equipment

Equipment	Ownership, % (n)
Personal computer/ laptop	63.9 (101)
Computer with internet access	44.3 (70)
Mobile phone	81.6 (129)
Video CD and DVD players	63.3 (100)
Audio digital players/MP3/iPods	24.1 (38)
Portable DVD players / MP4	5.1 (8)

Note. n = number of respondents

Frequency of Use of Technology in Basic Computer Operations and Concepts, and Research And Problem Solving Tools for Learning

The analysis of the frequency of use of technology in two areas was analyzed: basic computer operations and concepts; and research and problem-solving tools (see Table 4.3).

Considering the basic computer operations and concepts, printers (Mean = 2.03, S.D. = .993) and digital equipment like scanners or digital cameras (Mean = 2.24, S.D. = 1.121) were used more often by the respondents compared to word

processors (Mean = 1.83, S.D. = .976). Spreadsheets were the least frequently used (Mean = 1.57, S.D. = .804).

Table 4.3

Analysis of Frequency of Use of Technology in Basic Computer Operations and Concepts, and Research And Problem-Solving Tools

Skill	Level of usage*, % (n)				Mean
	1	2	3	4	(S.D.)
Basic computer operations and concepts					
Word processing	47.5 (75)	31.6 (50)	11.4 (18)	9.5 (15)	1.83 (.976)
Spreadsheets	60.1 (95)	23.4 (37)	13.9 (22)	1.9 (3)	1.57 (.804)
Graphs from spreadsheets	62.7 (99)	27.2 (43)	5.7 (9)	4.4 (7)	1.52 (.638)
Printers	38.6 (61)	28.5 (45)	23.4 (37)	8.9 (14)	2.03 (.993)
Scanner or digital cameras	36.1 (57)	22.8 (36)	23.4 (37)	17.7 (28)	2.24 (1.121)
Research and problem solving tools					
References using CD-ROM	56.3 (89)	19.0 (30)	15.2 (24)	9.5 (15)	1.78 (1.026)
Search engines	13.3 (21)	13.9 (22)	17.1 (27)	55.7 (88)	3.15 (1.101)
Evaluating materials on internet	39.9 (63)	19.0 (30)	15.8 (25)	25.3 (40)	2.27 (1.228)
Graphical software	67.1 (106)	14.6 (23)	9.5 (15)	7.6 (12)	1.57 (.951)

Note. *1 - Never doing a particular item, n = number of respondents
2 – Once a month
3 – Once a week
4 - Frequently used, that is more than once a week.

Search engines (Mean = 3.15, S.D. = 1.101) were used most often as a tool for research and problem solving by the respondents, while references on CD-ROMs, which included courseware, were used infrequently (Mean = 1.78, S.D. = 1.026).

In general, the group of students in the context of the study used digital equipment more often for basic computer operations while the spreadsheet and graphical software were the least often used. In addition, the internet was most frequently used as the search engine was an important tool.

Assuming that the frequency of use of a particular tool is related to the skill in the use of the tool, it can be assumed then that the respondents were skilled in the use of digital equipment and in the use of search engines to search for information.

The Frequency of Use of Communications Tools for Learning.

The analysis of the frequency of use of communication tools for learning showed the tools that were widely used (see Table 4.4). E-mails seemed to be least frequently used: sending and receiving e-mails had low mean scores (Mean = 1.68, S.D. = 1.053 and Mean = 1.60, S.D. = 1.049 respectively). Accessing the internet on mobile phones (Mean = 1.64, S.D. = 1.080) was also not popular.

On the other hand, phone discussions were frequently used by the respondents for learning (Mean = 2.97, S.D. = 1.157). Even the mobile phone was used by the respondents, specifically for sending and receiving text messages for learning (Mean = 3.13, S.D. = 2.672 and Mean = 2.78, S.D. = 1.267 respectively), and for transferring files (Mean = 2.51, S.D. = 1.267). An interesting point noted was that respondents seemed to be more willing to send messages (Mean = 3.13) than receive messages (Mean = 2.78).

Table 4.4

Analysis of Frequency of Use of Technology Communication Tools

Skill with technology communication tools	Level of usage*, % (n)				Mean (S.D.)
	1	2	3	4	
E-mails: Sending	64.6 (102)	13.9 (22)	10.1 (16)	11.4 (18)	1.68 (1.053)
E-mails: Receiving	70.9 (112)	8.9 (14)	8.2 (13)	11.4 (18)	1.60 (1.049)
Average score	67.75	11.4	9.15	11.4	1.64
Online Discussion tools – sending and receiving information	53.2 (84)	13.3 (21)	13.3 (21)	19.6 (31)	1.99 (1.212)
Online Discussion tools – sharing information	57.6 (91)	15.2 (24)	10.1 (16)	16.5 (26)	1.85 (1.154)
Online Discussion tools – discussing and exchanging information	62.0 (98)	12.7 (20)	11.4 (18)	12.7 (20)	1.74 (1.095)
Online Discussion tools – sharing media files	57.6 (91)	14.6 (23)	11.4 (18)	15.8 (25)	1.85 (1.148)
Average score	57.6	13.95	11.5	16.2	1.86
Presentations (newsletter, web pages)	74.1 (117)	11.4 (18)	3.8 (6)	10.1 (16)	1.50 (.972)
Phone discussions	15.8 (25)	20.3 (32)	14.6 (23)	48.7 (77)	2.97 (1.157)
Sending text messages	18.4 (29)	16.5 (26)	16.5 (26)	47.5 (75)	3.13 (2.672)
Receiving text messages	25.3 (40)	15.2 (24)	14.6 (23)	44.3 (70)	2.78 (1.257)

Table 4.4 (*continued*).

Analysis of Frequency of Use of Technology Communication Tools

Skill with technology communication tools	Level of usage*, n (%)				Mean (S.D.)
	1	2	3	4	
File transfer on mobile phones	33.5 (53)	14.6 (23)	17.7 (28)	32.9 (52)	2.51 (1.267)
Access internet on mobile phones	67.7 (107)	11.4 (18)	5.7 (9)	13.3 (21)	1.64 (1.080)

Note. * 1 - Never doing a particular item, n = number of respondents

2 – Once a month

3 – Once a week

4 - Frequently used, that is more than once a week.

Online discussion tools were used but less frequently as compared to text messaging. The online discussion tools were used occasionally for sending and receiving information (Mean = 1.99, S.D. = 1.212), sharing information (Mean = 1.85, S.D. = 1.154) and sharing files (Mean = 1.85, S.D. = 1.148). This tool was more popular when compared to e-mails as online discussion tools (Average score = 1.86) were more frequently used as compared to e-mails (Average score = 1.64). Further analysis of the frequency of use showed that more respondents (27.7%) used online discussion tools weekly or more often as compared to respondents (20.8%) who used e-mails. In addition, online discussion tools were used by more respondents (42.4%) as compared to e-mails (32.3%).

Generally, phones and mobile phones were used most frequently for communicating about schoolwork. These communications included phone discussions and text messaging. Online discussion tools were also used for learning,

especially for sharing information and files. Although less frequently used, online discussion tools were preferred by the respondents compared to e-mails.

Perception on the Use of Technology

The findings regarding the perception of the group of students in the context of this study on the use of technology is organized and reported according to the research question: What are the students' perceptions on the use of computers and mobile phones for teaching and learning? The analysis of the findings is summarized in Tables 4.5 and 4.6.

Table 4.5

Students' Beliefs on the Use of Computers

	Frequency* % (n)				Mean
Statement on beliefs	1	2	3	4	(S.D.)
I do not think that I can do work with a computer.	17.1 (27)	66.5 (105)	9.5 (15)	5.1 (8)	2.03 (.693)
I am confident that I can learn computer language	20.3 (32)	12.0 (19)	52.5 (83)	12.7 (20)	2.59 (.961)
All students should be given an opportunity to use computers for learning activities	3.2 (5)	5.7 (9)	43.0 (68)	46.8 (74)	3.35 (.734)
Knowledge of how to use computers is a useful skill	1.9 (3)	2.5 (4)	58.9 (93)	36.1 (57)	3.30 (.615)
Computers help me improve my writing skills	13.3 (21)	15.8 (25)	49.4 (78)	20.9 (33)	2.78 (.929)

Table 4.5 (*continued*).

Students' Beliefs on the Use of Computers

Statement on beliefs	Frequency* % (n) 1	2	3	4	Mean (S.D.)
Computers assist me in learning with others	15.2 (24)	11.4 (18)	53.8 (85)	18.4 (29)	2.76 (.931)
Computers can improve my thinking power	15.2 (21)	11.4 (18)	53.8 (85)	18.4 (29)	2.92 (.933)
Computers assist in improving learning	11.4 (18)	6.3 (10)	59.5 (94)	19.6 (31)	2.90 (.857)
I can learn many things when using the computer	4.4 (7)	6.3 (10)	48.7 (77)	38.6 (61)	3.24 (.765)
I feel important when someone asks me about the computer	24.7 (39)	27.2 (43)	37.3 (59)	10.1 (16)	2.33 (.963)
I feel happy doing many things on the computer	3.8 (6)	2.5 (4)	57.6 (91)	34.8 (55)	3.25 (.687)
I can do my work better when I learn using the computer	9.5 (15)	8.9 (14)	53.8 (85)	26.6 (42)	2.99 (.865)
I believe using the computer more often makes the work fun	5.7 (9)	11.4 (18)	52.5 (83)	29.7 (47)	3.07 (.802)
Learning to use the computer is like learning any other skill, the more one practices, the better one will be	4.4 (7)	7.6 (12)	53.8 (85)	33.5 (53)	3.17 (.753)
I am waiting for the time I can use computers in my school work	10.8 (17)	19.6 (31)	33.5 (53)	35.4 (56)	2.94 (.995)

Note. * 1 – Do not know, n = number of respondents

2 – Not true

3 – True

4 - Very true

From the analysis of the beliefs of the group of students in the context of this study on the use of computers for communication and learning (see Table 4.5), most respondents believed that computers were important. The respondents felt strongly that all students should be given the opportunity to use computers for learning activities (Mean = 3.35, S.D. = .734) and that knowing how to use the computer is a useful skill (Mean = 3.30, S.D. = .615). The reasons might be because the respondents perceived computers to be important in improving thinking skills (Mean = 2.92, S.D. = .933) and assist learning (Mean = 2.90, S.D. = .857).

The respondents seemed to have a positive attitude towards learning with computers. The respondents believed they could learn many things (Mean = 3.24, S.D. = .765), were happy attempting activities on the computer (Mean = 3.25, S.D. = .687), had fun with the computer (Mean = 3.07, S.D. = .802), and could do work better (Mean = 2.99, S.D. = .865).

The respondents also perceived that learning with computers was easy and were motivated to use computers in learning. The respondents believed that learning with computers was easy with practice (Mean = 3.17, S.D. = .753), and were eager to use computers in their school work (Mean = 2.94, S.D. = .995).

On the whole, the respondents believed that computers were important for learning and were motivated to learn with computers.

There was a difference in perception towards the use of mobile phones for learning (see Table 4.6). The respondents believed that the knowledge of using mobile phones was useful (Mean = 3.12, S.D. = .738), and that learning to use mobile phones was easy (Mean = 2.97, S.D. = .892). However, the respondents believed that mobile phones could not assist in learning (Mean = 1.98, S.D. = .718).

Furthermore, the respondents were not expecting to use mobile phone in their school work (Mean = 2.57, S.D. = 1.075).

Table 4.6

Students' Beliefs on the Use of Mobile Phones

Statement on beliefs	Frequency* % (n) 1	2	3	4	Mean (S.D.)
I do not think that the mobile phone can assist me in doing work that is given.	13.9 (22)	47.5 (75)	26.6 (42)	10.1 (16)	2.34 (.847)
All students should be given an opportunity to use mobile phones for learning activities	8.2 (13)	45.6 (72)	23.4 (37)	21.5 (34)	2.59 (.922)
Knowledge of how to use mobile phones is a useful skill	4.4 (7)	8.2 (13)	57.0 (90)	28.5 (45)	3.12 (.738)
Receiving learning information through the mobile phones helps me remember facts	19.6 (31)	28.5 (45)	36.7 (58)	12.7 (20)	2.44 (.956)
Mobile phones assists me greatly in learning with others	13.3 (21)	30.4 (48)	44.9 (71)	8.9 (14)	2.51 (.842)
Mobile phones can improve my thinking power	21.5 (34)	39.9 (63)	31.0 (49)	5.1 (8)	2.20 (.843)
Mobile phones assist in improving learning	22.8 (36)	57.0 (90)	14.6 (23)	3.2 (5)	1.98 (.718)
I can learn many things when using the mobile phone	11.4 (18)	37.3 (59)	39.9 (63)	9.5 (15)	2.48 (.825)
I feel happy doing many things with the mobile phone	8.2 (13)	14.6 (23)	55.7 (88)	19.6 (31)	2.88 (.821)
I can do my work better when I learn using the mobile phone	20.9 (33)	45.6 (72)	24.7 (39)	7.0 (11)	2.18 (.849)

Table 4.6 (*continued*).

Students' Beliefs on the Use of Mobile Phones

Statement on beliefs	Frequency* % (n) 1	2	3	4	Mean (S.D.)
I believe using the mobile phone more often makes the work fun	17.7 (28)	32.9 (52)	36.1 (57)	11.4 (18)	2.42 (.918)
Learning to use the mobile phone is very easy	8.2 (13)	15.2 (24)	44.9 (71)	28.5 (45)	2.97 (.892)
I am waiting for the time I can use mobile phones in my school work	17.7 (28)	32.9 (52)	20.9 (33)	26.6 (42)	2.57 (1.075)

Note.* 1 – Do not know, n = number of respondents

2 – Not true

3 – True

4 - Very true

The perception towards the use of computers and mobile phones for learning differed. Computers have been used for teaching and learning, and the respondents have had some experience in using computers for learning. On the other hand, even though phones were already used for learning by the respondents, learners were not confident in it.

Implications of the Findings on the Design of the Module

The implications for the design of the module arose from two areas; firstly, the findings from the students' perception regarding the use of technology, and secondly from the documents analyzed. The summary of the recommendations are listed in Tables 4.7 and 4.8.

The Use of Technology of the Students in the Context of the Study

The use of technology of the students in the context of the study was analyzed from the first two research questions.

The findings from the research questions are as follows: (1) the group of students in the context of the study perceived that they were averagely skilled in the usage of computers but skilled in the usage of mobile phones; (2) a large number of the group of students in the context of the study owned mobile phones, followed by computers and video players; (3) the group of students in the context of the study used digital equipment more often for basic computer operations, while the spreadsheet and graphical software were the least used; (4) the group of students in the context of the study used the internet most frequently as search engines was an important tool; (5) the group of students in the context of the study were skilled in the use of digital equipment and in the use of search engines to search for information; (6) the group of students in the context of the study used phones and mobile phones for discussions and text messaging most frequently for communication on schoolwork; (7) the group of students in the context of the study also preferred to use online discussion tools for learning, as compared to e-mails; (8) the group of students in the context of the study believed that computers were important for learning and were motivated to learn with computers; (9) the group of

students in the context of the study were less confident in the use of mobile phones for learning as compared to computers.

Table 4.7

Recommendations Based on the Findings of the Analysis Phase

Item	Findings on Respondents	Recommendations
1.	Averagely skilled in the usage of computers, and skilled in the usage of mobile phones	Computers and mobile phones could be used in the module
2	Most owned mobile phones, followed by computers and video players	
3	Digital equipment were used more often for basic computer operations, while the spreadsheet and graphical software were the least often used	Avoid/ reduce the use of spreadsheet and graphical software
4	The internet and search engines were most frequently used	The internet could be used as a research and problem-solving tool
5	Skilled in the use of digital equipment and in the use of search engines to search for information	
6	Phones and mobile phones for discussions and text messaging were used most frequently	Incorporate the use of phone for discussions and text messaging
7	Online discussion tools were less frequently used for learning but more compared to e-mails	Include the use of online discussion tools but reduce the use of e-mails
8	Computers were important for learning and were motivated to learn with computers	Computers could be used in the module
9	Less confident in the use of mobile phones for learning as compared to computers.	Students have to be motivated to use mobile phones in the module

Based on the findings, several recommendations were made to the design of the collaborative mLearning module (see Table 4.7).

Firstly, the hardware for the delivery of the module will consist of computers and mobile phones, as most of the students in the context of the study owned and could access this equipment. However, participants who did not have access to this equipment will be allowed to use the computers in school and be provided with mobile phones.

The students in the context of the study also seemed to have some skills in the basic operations and concepts of the computer, and the use of search engines for research and problem-solving. In addition, some of the students in the context of the study had used online discussion tools, and were familiar with text messaging. Hence, because of the experience the learners had, online discussion tools and text messaging are used in the module.

The students in the context of the study perceived that mobile phones could not be used for learning. However, the study investigates whether this perception was valid and whether mobile phones can be used for learning.

Document Analysis

The syllabus, curriculum specifications, the approaches in the implementation of the teaching and learning of secondary school science in English, and past years' examinations questions were analyzed. Several recommendations were made based on the analysis (see Table 4.8). However, the rationale for the choice of the topic was reported in Chapter 3 (See Choice of Content Topic).

For the document analysis and the mapping, the Curriculum Specifications of the Ministry of Education (MOE, 2002) was used to set the standards for the

optimal or desired performance for science process skills, while suggested approaches, such as constructivism, project based learning, and future studies, were reviewed. As a result of the analysis of the documents, the learning objectives, learning outcomes, and approaches in the design of the collaborative mLearning module was determined. In the following section a description of the mapping of the contents of the topic to the resources required, and the design of the problem tasks is reported.

Table 4.8

Recommendations and Outcomes based on Document Analysis.

No.	Documents	Recommendations
1	Integrated curriculum for secondary school science syllabus (MOE, 2003)	The themes in secondary school science Theme: Maintenance and continuity of life
2	Curriculum specifications, Integrated curriculum for secondary school science (MOE, 2002)	Learning area: Nutrition Learning objectives: Total of six (6) Learning outcomes: Total of 24 Approaches: Project based learning, social constructivism
3	*Kupasan Mutu Jawapan PMR* (Analysis of Quality of Answers in the Lower Secondary Assessment) (MOE, 2004)	Recommendations from MOE Including common misconceptions and errors in topic of nutrition

The content in the learning area, nutrition was analyzed and the objectives and learning outcomes were mapped to the resources required. The content of the topic was mapped according to the objectives and learning outcomes of the topic of Nutrition in the Form 2 Science Malaysian Integrated Curriculum Specifications (2002). The number of lessons was determined from the mapping (see Appendix B).

From the mapping of the learning objectives and learning outcomes to the resources, it was determined that a total of eight lessons be designed for a four-week period of implementation.

Summary of the Analysis Phase

In the first phase of analysis, the analysis of the survey of the perception of the group of students in the context of the study on technology usage, and document analysis on content of the topic of Nutrition, was done. The findings and recommendations in this phase were used for the second phase of design and development. In the second phase, a social constructivist learning environment using Merrill's First Principles was designed for the collaborative mLearning module on the topic of Nutrition.