CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

After processing the data collected from the survey the results were analyzed according to the needs of the research questions outlined earlier in Chapter 1.

Since the researcher knew the subjects in this survey as part time Masters in Education students majoring in Educational Technology, the demographic information from section one helped to determine their suitability as respondents for this survey.

From the demographic information obtained from section one of the questionnaire, it was found that all the teachers were teaching in government aided secondary schools around Kuala Lumpur, Selangor, Negeri Sembilan and Perak. All the teachers who responded had more than three years of teaching experience in schools. They taught subjects in their area of specialization such as Mathematics, Science, History, Geography, Moral, Commerce, Economics, English and Bahasa Melayu.

This implied that they were experienced teachers fulfilling the needs of similar educational policies and curriculum. At the same time they have been exposed to Information and Communications technologies (ICTs) and have been using it in the course of pursuing their Masters in Education program. Thus this made them computer literate as well as aware of the capabilities of ICTs in education. This study investigated the teaching methods using ICTs to promote higher order thinking skills from the perspective of these computer literate teachers.

The data obtained from the questionnaire were analyzed and discussed in sequence with the research questions(RQ).

4.2 (RQ.1):What teaching methods are teachers with computer literacy using to teach? How frequently are they using these methods?

To answer these research questions the results obtained on use of teaching methods, their frequency of use of the teaching methods, as well as their daily, weekly and monthly use of the teaching methods listed in the questionnaire were analyzed.

Use of the various teaching methods

The results of the survey revealed that the teachers used a variety of teaching methods at present. The percentage of teachers who used the various methods is presented in Table 4.1.

Table 4.1:Percentage of teachers who used the various methods

1. Lecture	100
2. Note giving	86
3. Written class exercises	92
4. Demonstration	76
5. Games	66
6. Simulation	70
7. Role-play	62
8. Inquiry learning	90
9. Practical work	78
10. Field trips	24
11. Problem solving	92
12. Projects	72

N = 50

According to Table 4.1, teachers have used all the teaching methods listed. It can be seen that all the methods have been used by more than 60% of the teachers in the survey except for Field trips which was used by only 24% of the teachers. All the teachers (100%) have used the Lecture method, making it the most popular method. The method that scored the second highest was Written class exercises (92%) and Problem solving (92%). The least popular method was found to be Field trips (24%).

Frequency of use of teaching methods

The results shown in Table 4.2 are the mean scores for every teaching method.

Table 4.2: Frequency of use of teaching methods

Methods	Mean	SD.
1. Lecture	3.48	1.43
2. Note giving	2.84	1.01
3. Written class exercises	3.24	0.76
4. Demonstration	2.40	1.06
5. Games	1.98	0.91
6. Simulation	2.2	1.06
7. Role-play	1.98	0.90
8. Inquiry learning	2.92	1.02
9. Practical work	2.64	1.07
10. Field trips	1.24	0.43
11. Problem solving	2.94	0.95
12. Projects	1.88	1.56

From table 4.2, the mean nearest to 4 shows the highest frequency of use. The Lecture method (M=3.48, SD=1.43) shows the highest frequency of use, followed by written class exercises (M=3.24, SD=0.76).

On the other hand, the mean scores further from 4 shows the least frequently used methods. Field trips shows the lowest score (M=1.24, SD=0.43), followed by Projects (M=1.88, SD=1.56), Role play (M=1.98, SD=0.90) and Games (M=1.98, SD=0.91).

This finding implies that the most frequent methods used by these teachers are teacher centered or teacher directed. The methods that require more student participation seem to be used less frequently.

The Lecture method, which is the most popular method used, does not provide many opportunities for student participation in the learning process. This feature makes it less conducive in developing higher order thinking among students compared with more interactive methods like in Projects, Role-play, Games, Inquiry learning, Collaborative learning and Simulations and Field trips.

Even the method that scored the second highest for frequency of use, that is, Written class exercises, only seems to support the use of the Lecture method. Often after a Lecture session Written class exercises are given to reinforce as well as assess how much the students have understood or can recall of the information delivered in the Lecture.

Teaching methods used daily

This analysis was done to find out what teaching methods the teachers favored in when teaching on a daily basis.

The scores for daily use of the various teaching methods was also calculated and presented in percentages in Table 4.3.

Table 4.3:Percentage of teachers who used the various methods daily

1. Lecture	58
2. Note giving	30
3. Written class exercises	40
4. Demonstration	20
5. Games	8
6. Simulation	10
7. Role-play	8
8. Inquiry learning	38
9. Practical work	24
10. Field trips	-
11. Problem solving	34
12. Projects	4

N = 50

Table 4.3 shows that the Lecture method was used daily by 58% of the teachers surveyed. This was followed by Written class exercises (40%), and then Inquiry learning (38%).

The method that scored the least for daily use was Field trips. No teachers went on fieldtrips daily. Projects (4%) and then Games (8%) followed this.

Here it should be noted that the high scores for Lecture followed by Written class exercises is consistent with the finding for frequency of use of the teaching methods from Table 4.2.

This means the dominant methods used daily by the teachers was the Lecture method followed by written class exercises.

Teaching methods used weekly

The scores for weekly use of the various teaching methods were calculated and presented in Table 4.4

Table 4.4:Percentage of teachers who used the various methods weekly

1. Lecture	32
2. Note giving	38
3. Written class exercises	48
4. Demonstration	24
5. Games	16
6. Simulation	30
7. Role-play	20
8. Inquiry learning	26
9. Practical work	32
10. Field trips	-
11. Problem solving	34
12. Projects	8

N=50

From the results in Table 4.4 written class exercises is the most weekly used method (48%). It could be that after delivering a series of lessons using the Lecture method daily; Written class exercises are given at the end of the week for assessment or drilling purposes.

Note giving, which scored the second highest for weekly use, could also have been used to reinforce information delivered by the Lecture method.

Teaching methods used monthly

The percentage of teachers who used the various methods monthly was calculated and the results presented in Table 4.5.

Table 4.5:Percentage of teachers who used the various methods monthly

1. Lecture	10
2. Note giving	18
3. Written class exercises	8
4. Demonstration	32
5. Games	42
6. Simulation	30
7. Role-play	34
8. Inquiry learning	26
9. Practical work	16
10. Field trips	24
11. Problem solving	24
12. Projects	60

N=50

The analysis for monthly use revealed that more student centered teaching methods ıre used on a monthly basis. According to the results, Projects was used by 60% of the eachers. This was followed by Games (42%) and Role-play (34%). Field trips also ;howed a better response for monthly use. 24% of the teachers responded to having used it monthly.

Overall the results showed that the most popular method of teaching, in terms of frequency of use as well as used by the most number of teachers is the Lecture method followed by Written class exercises. The lecture method was also used daily by most teachers.

These teachers seem to favor methods that allow them to deliver as much information as possible to the students. The lecture method, which scored the highest for frequency of use, enables the delivery of large amounts of information to a large number of students at a time. Written class exercises which scored the second highest for frequency of use supports the use of the lecture method, whereby students are given written class exercises to assess how much the information delivered can be remembered by the students. The purpose of teaching by giving notes also tries to deliver as much information as possible to the students.

However methods that require students to seek and process information on their own were used less frequently. Projects, Role-play and Games require a great deal of student autonomy and high level cognitive abilities by students, were used on a monthly basis.

Field trips scored the lowest for frequency of use as well as used by the least number of teachers. However the results showed a more favorable use on a monthly basis.

4.3 (RQ 2). How often do they promote higher order thinking skills while teaching?

The frequency of promoting higher order thinking skills while teaching is shown in Table 4.6.

Table 4.6: Frequency of scores for promoting higher order thinking skills

Points scored for frequency	Percentage of teachers
41 - 45	8
36 - 40	22
31 - 35	34
26 - 30	18
21 - 25	8
16 - 20	6
11 - 15	4
6 - 10	0

N=50

The results in Table 4.6 shows that most of the teachers in the survey frequently promoted higher order thinking skills. Those who scored above 22.5 points can be considered as frequently promoting higher order thinking skills, therefore by adding up the percentage of teachers who scored above 22.5 points it was found that 90% of the teachers frequently promoted higher order thinking skills.

A further analysis of the activities used by the teachers who were considered to frequently promote higher order thinking skills was done. The results obtained are shown in Table 4.7.

Table 4.7:Percentage of teachers who scored higher based on type of activity

Teacher centered activities	Student centered activities
88.9	11.1

N= 45

By comparing the data in Table 4.7, it was found that more teachers (88.9%) scored higher for frequently promoting higher order thinking skills by using activities like asking questions and having dialogue sessions with students .

Only 11.1% of the teachers used more student centered activities like mind mapping, using raw data and primary sources for analyzing, relating current issues, predicting outcomes, evaluating situations and making their own decisions, applying concepts they know to solve real life problems and find alternative ways to solve problems all on their own.

The results show a positive trend towards promoting higher order thinking skills. However the activities used by the teachers to promote higher order thinking skills were not encouraging enough to integrate ICTs in the classroom.

4.4 (RQ 3): Are teachers aware of the resources available through the Information and communications technologies that can be used for teaching?

The subjects chosen for this survey were all considered to be computer literate and expected to know and be able to identify the resources that were are available from the ICTs. The findings presented in Table 4.8 generally confirmed their knowledge of the

availability of the resources. However the percentage of teachers who could identify the different types of resources differed.

Table 4.8: Percentage of teachers who know of the availability of each of the resources listed.

Resources	Percentage of teachers
1. There are interactive lessons available on CDs on various subjects.	78
2. Teachers can find lesson plans on the internet.	56
3. Students and teachers can join international discussion groups on the Internet.	70
4. Educational web sites provide a rich source of information for students.	94
5. Students can use e-mail to communicate with other students from other parts of the world.	98
6. There are libraries on the Internet.	78
7. Students and teachers can use e-mail to consult with experts on various fields and issues.	90
8. CDs and the Internet can provide scenarios and simulations which use real world problems that can stimulate students' learning.	72

N = 50

From table 4.8 the most known resource by the teachers surveyed was the use of E-mail to communicate with other students from other parts of the world (98%). The second most known resource was Educational web sites that provide rich source of information for students (94%) followed by Libraries on the Internet (90%).

The resource that was least known among the teachers was the availability of Lesson plans on the internet.

It can be seen that some teachers know more of the resources than others do. An analysis of the amount of resources known by the teachers is presented in Table 4.9.

Table 4.9: Percentage of teachers who know of resources available by amount listed

Amount of resources listed	Teachers who know
100	36
81 - 90	18
71 - 80	18
61 - 70	8
51 - 60	-
41 - 50	18
31 - 40	-
21 - 30	-
11 - 20	2

N = 50

Table 4.9 shows that 36% of the teachers surveyed had knowledge of availability of all the resources (100%) listed in the questionnaire and 98% of the teachers knew more than 50% of the resources listed in the questionnaire. This means that most of the teachers had a high awareness of the availability of resources from the ICTs.

This finding is hardly surprising considering the fact that the teachers are also part-time Masters in Education students of University of Malaya who have been exposed to Multimedia presentations and the Internet. These teachers, being students, have been surfing the Internet databases and web sites for resources to complete their assignments.

Since electronic mail is arguably the easiest Internet feature to use, these teachers could be using it to communicate with their lecturers and colleagues for consultation and are thus very familiar with its capabilities as an educational resource.

It was however surprising to note that only 56% of the teachers could find lesson plans on the Internet. The lesson plans on the Internet include those that integrate ICTs in the classroom and most of its activities that have been used by teachers in technologically rich as well as less technologically rich educational environments. Teachers can use this rich resource of tried and tested ideas by modifying them for use in their own classrooms to promote higher order thinking skills.

4.5 (RQ4). Do teachers know how to use teaching methods that can use Information and Communications technologies to promote higher order thinking skills?

This research question was answered by analyzing the percentage of teachers who claimed to know how to use teaching methods that can use ICTs to promote higher order thinking skills. A further analysis on the usage was also done by looking at the percentage of teachers who have used it for teaching.

The scores obtained for knowledge of use as well as usage of the teaching methods is shown in Table 4.10.

In contrast with their knowledge of availability of resources, the results in Table 4.10 shows that their knowledge of teaching methods using ICTs was much lower.

For all the methods listed in the survey, less than 50% of the teachers responded to knowing them. The important implication here is that even though the teachers were equipped with the knowledge of resources from the ICTs, they lacked the pedagogical skills to use it for teaching higher order thinking skills. It is therefore not surprising to

note further that the usage of these methods for teaching was found to be much lower for every method listed in the questionnaire. In fact two of the methods like electronic field trips and student writing for an authentic audience have never been used by any of the teachers in the survey.

Table 4.10: Knowledge and use of teaching methods using ICTs to promote higher order thinking skills.

Teaching methods	% of teachers who know how to use	% of teachers who have used it in teaching
1. Problem solving using databases/discussion groups/ e-mail	36	10
2. Project work using databases/digital libraries/discussion groups/ e-mail	28	6
3. Collaborative learning using e-mail/discussion groups.	32	10
4. Role - playing in a simulated environment.	42	24
5. Games using interactive multimedia.	38	10
6. Inquiry learning using databases/ discussion groups/ e-mail.	34	6
7. Electronic Fieldtrips using databases/ web sites / e-mail.	14	0
8. Student writing for an authentic audience using e-mail	16	0

N = 50

According to Table 4.10, the highest response for knowledge of methods was for role-play in a simulated environment (42%) and also the most used method (24%) by the teachers. In this method an on going representation of a real situation is given to students

either from a web site or CD using rich multimedia elements that are interactive. Students may be given roles in which they have to make decisions or solve problems. Teachers have used it because it is easily available in CDs and over the Internet and can be used for individual as well as group work.

The second highest score, which was for Games using interactive multimedia (38%), have similar features except that there is an added element of competitiveness. Usually student involvement and motivation is high because it is often enjoyable.

Only a small number of teachers knew how to use Electronic Field trips using databases/web sites/e-mail (14%) and Student writing for an authentic audience using e-mail (16%). None of the teachers have used these two methods to teach.

This implies that very few teachers know how to use of Electronic Field trips as a method of teaching. This method, if organized and planned well by the teacher can take the students to any part of the world without physically moving out of the classroom. Students will find learning meaningful when they actually apply their knowledge when visiting sites which are interactive and communicate with people related to the site.

Even though the knowledge of E-mail use was high (98%) among the teachers (from Table 4.9) but their use of it to encourage their students to write to authentic audiences scored zero response (shown in Table 4.10). This could be due to the lack of knowledge on how to use it. Only 16% knew how to use it.

By correlating the scores for "I know how to use" with " I have used in teaching" using Pearsons r , it was found that $r = 0.85$. This figure shows a high positive relationship between knowledge of use of the methods listed and their usage by the

teachers who responded. This means the higher the teachers' knowledge of use of the methods listed, the higher its usage by the teachers.

At the same time the finding that their usage scores were all lower than their knowledge of use scores implies that there could be problems or obstacles to their usage in teaching.

Overall, the results showed that all the teachers in the survey responded to at least some of the knowledge of use of the methods listed. None of the methods scored zero for knowledge of use. As for usage of the methods listed all the scores were not only lower than for knowledge of use but two of the methods listed that is Electronic Field trips and Student writing for an authentic audience were never used.

4.6 (RQ 5). What are the problems the teachers think limits their use of Information and Communications technologies (ICTs) in promoting higher order thinking skills?

The fact that the teachers responded highly to promoting higher order thinking skills and also knowing the availability of resources through the ICTs but scored low on knowing and using the methods to use it to teach for higher order thinking skills, reflects that there could be problems or obstacles to its use.

Table 4.11 shows the percentage response of teachers to the problems listed in section six of the questionnaire. Some space was also provided for the teachers to jot down other problems that were not listed.

From the analysis of data in Table 4.11, it was found that most of the teachers (72%) considered that the lack of ICTs in schools as the major limitation to its use. The schools in which the respondents for this survey were teaching were all government funded

schools. This implies that the availability of these resources for teaching depends on government policy towards ICT use as well as the financial allocations for these schools.

Table 4.11: Percentage of teachers who responded to the problems.

Problems	Teachers
1. ICTs are not available in my school.	72
2. ICTs are too expensive as a resource for my school.	70
3. There is not enough time for their effective use in the present curriculum.	68
4. Too much time is wasted in devising appropriate ways to incorporate teaching of higher order thinking skills using ICTs.	50
5. There is limited availability of software that suits the school curriculum.	70
6. Sitting for public exams do not require higher order thinking skills.	26
7. The class becomes "out of control" if I were to use ICTs in the classroom.	16
8. The English language used in the ICTs is a barrier For our Malaysian students.	54
9. Classes are too large to teach higher order thinking skills using ICTs.	66

N = 50

The other problem that a high number of teachers claimed is that ICTs are too expensive as a resource for their schools (70%). The expensive nature of ICTs in terms of hardware, software and maintenance costs makes schools invest their limited funds on non-electronic resources for teaching. This implies that schools are deprived of a very

valuable learning resource like the Internet , thus making information and skills acquired in schools outdated and incompatible with the requirements of the new workplace.

A considerable number of the teachers (70%) seem to consider the limited availability of software that suits the school curriculum as a factor that limits the use of ICTs to teach higher order thinking skills. This suggests that teachers insist on delivering information using software in a structured manner following the syllabus. If this is so then the purpose of teaching higher order thinking skills which requires students to look, build and process information to suit the needs of the task is not achieved. This again reflects the lack of pedagogical skills in using resources from ICTs to promote higher order thinking skills.

Another problem that 66% of the teachers claimed was that classes were too large to promote higher order thinking skills using ICTs. This problem is likely to limit use of ICTs because the methods recommended require mostly group work and a class of forty to fifty students is not conducive. This is a problem that needs to be attended to by school administrators and policy makers.

The English language, the dominant language of the Internet is a barrier to Malaysian students was claimed as a problem by 54% of the teachers. This could be true because students in National schools learn English as a second language and are not so adept to its use. English is a barrier not only in terms of language but also deemed culturally irrelevant to Malaysian students in many ways.

Another problem that 50% of the teachers responded to was that too much time was wasted in devising appropriate ways to incorporate teaching of higher order thinking skills using ICTs. This is could be so in the case of most educational CD-ROMs sold

commercially which are often not curriculum based. They are more entertainment based on games format than serious educational material.

Fortunately only 26% of the teachers in the survey think that sitting for public examinations do not require higher order thinking skills. This reflects the negative attitude of some teachers based on the opinion that public examinations only tests low level thinking skills and so promoting higher order thinking in the classroom is a waste of time. The surfacing of this problem also highlights the weakness in the assessment system that mainly tests low level thinking skills like memory recall and comprehension.

Only 16% of the teachers think that the class becomes "out of control" when using ICTs in the classroom. This suggests that using ICTs will affect class discipline negatively. Studies have actually shown otherwise. The Vero Beach experiment reported by Bennett (1996) describes how an on going program where school authorities put at-risk students into a separate section where teaching was done, not by teachers, but by computers. These students who often misbehaved in the regular classes began attending school regularly and stopped being disruptive and started concentrating on learning and achieving more in school.

Students actually become more interested in learning when teachers use methods that promote higher order thinking skills using ICTs because the activities are student centered and can be highly motivating and enjoyable if carefully planned by the teacher

Individual respondents noted down that rural students were not interested in ICTs. This could probably be due to lack of exposure to this new media among rural students when compared to urban students who are more exposed and familiar with its usage.

Teachers also noted down problems like phobia towards ICTs, lack of exposure and lack of training in teaching to promote higher order thinking skills. All these can be classified as problems related to the shortcomings of teacher training programmes.

One teacher mentioned that the school administration is not supportive in the use of ICTs in teaching. This problem would eventually be overcome when the government policy towards use of ICTs in education is implemented fully in the Smart School Project.

4.7. Summary

From the analysis of data it was found that the teachers in the survey favored the use of teaching methods that can deliver large amounts of information at a time. The most popular method of teaching used was the Lecture method followed by Written class exercises. However, it was encouraging to note that teaching methods that require a high level of cognitive abilities by students, like Projects, Role-play and Games were used at least monthly.

Teachers scored high on frequency of promoting higher order thinking skills while teaching but often by using questioning techniques and dialogue sessions rather than in activities that required a high degree of student participation and student autonomy.

It was found that the teachers had a high knowledge of availability of resources for teaching. A considerable percentage of teachers were aware of the availability of all the resources listed.

In contrast, their knowledge of teaching methods using ICTs to promote higher order thinking skills was low. The methods that most teachers claimed to know was Role-playing in a simulated environment and Games using interactive multimedia .

Their usage of ICTs in teaching was even lower. Methods like Electronic Field trips and Student writing for an authentic audience were never used.

The teachers also claimed of problems of limited access to ICTs, its high costs, limited software, large classes, the English language, time wastage in using ICTs, higher order thinking skills as being unimportant for examinations and difficulty in disciplining the class as the main problems that limits their use of ICTs in promoting higher order thinking skills while teaching.