CHAPTER 4: ANALYSIS AND RESULTS

4.1 Introduction

The purpose of this study was to investigate how the Internet was used in a secondary mathematics classroom and the students' and teacher's attitudes toward using the Internet. Year 12 students from a mathematical modelling class were observed and interviewed about how they used the Internet. This chapter discusses the results and analyses of the data gathered from the observations and interviews. Also included in this chapter are relevant documents that illustrate use of the Internet within the classroom.

4.2 Research Question 1

How does a teacher and students use the Internet is in a secondary mathematics classroom?

Observations, interviews and documents were used to determine how the Internet was used in a secondary mathematics classroom. The observations occurred over a nine-week period, where students completed three projects involving the use of the Internet. The interviews were conducted at the end of the observational period, and were used to clarify and describe situations that occurred throughout the nine
weeks, which involved the use of the Internet. An \( I \) will denote the interviewer and the interviewees will be denoted by an \( S \) for students and a \( T \) for the teacher.

The observations, interview data and documents were analyzed and coded into categories describing patterns of use that were determined throughout the research period. These were: Student Usage and Planning, Teacher Interactions, Student Activities, Time Spent on Internet, and Collaboration and Cooperation.

**Student Usage and Planning**

The first category that was identified during the research period was how the students used the Internet and which students used the Internet. This also included whether the students planned their Internet usage or whether they simply used the Internet randomly to find information.

Six students worked together in pairs and appeared to use the Internet in almost every mathematics lesson during the three projects over the nine-week observational period.

\[
\begin{align*}
I &: \text{How often do you actually use the Internet in maths?} \\
S &: \text{Probably every class}
\end{align*}
\]

(Interview Fri 5\textsuperscript{th} Sept 1997)

These students gathered a wide variety of information as they searched for everything that was required for the project. These students spent a lot of time reading through information they found on the Web before they appeared to find
what they were looking for. When specific information was found, it was either printed off, bookmarked or the URL address was written down to be used at a later date. For example, here are a couple of the addresses students used to find information for the holiday project:

http://www.lonelyplanet.com
http://www.virtualtraveler.com

(Observational Record Fri 1st Aug 1997)

The following two figures 4.2.1 and 4.2.2 represent some documents that students used in the first project. Appendices 8 and 9 represent some documents that were used by another student for the second project on Western Australian Rainfall.

FIGURE 4.2.1 Information that Students Obtained off the Web for the Holiday Project.
Five students, who didn't use the Internet all the time, only came into the computer laboratory for one to four periods throughout the project.

I: How often do you use the Internet in maths at school?
S: Probably just once or twice every assessment. I just mainly get the information and then I can write it up.

(Interview Mon 8th Sept 1997)

It appeared that the information these students were looking for was specific and did not require looking at a lot of sites. These students appeared to know exactly what they wanted and they went straight to the sites. These five students appeared to plan how they would use their time in the computer laboratory so that they did not 'explore' other sites.

The students needed to look up information from the Weather Bureau on the Rainfall of Australia and more specifically Perth for the second
project. One student came into the computer laboratory for 30 minutes and gathered all the data he required for the Rainfall project.

(Observational Record Wed 13th Aug 1997)

The other most dominant feature of student usage and planning was the delegation of responsibilities for the project. Most of the students worked in pairs but they each had a computer to work on. It appeared that instead of both students looking for the same information, one would look for one particular aspect of the project while the other would look for something else. The students in each group appeared to spend some time cooperatively planning what each one of the pair would do and find for the projects.

The students are finding information for their holiday projects. They are well into the projects now. One pair has decided to gather the information they need on exchange rates and passports and visas. One of the pair decides to search the banks for currency exchange rates, while the other decides to gather information on visas into America and passport information.

(Observational Record Mon 4th Aug 1997)

Teacher Interactions

The teacher did not appear to give too many instructions to the students during the observational period. He appeared to give enough instruction to give the students hints and tips on how to find information on the Internet. At times he discussed sites that the students might use to help them with their projects.

If the students place " " around the words in the search it narrows it down to those words only. Eg "Australian Banks"

(Observational Record Mon 28th July 1997)
Here is another example of when the teacher suggested that the inverted commas be used to make the search more specific to find the relevant information.

_Eg "Perth and Rainfall"_

(Observational Record Fri 15\textsuperscript{th} Aug 1997)

The teacher, when interviewed about whether he had given the students formal instruction about the Internet, commented that most of the students had received some previous exposure to the Internet in previous years and other classes. He explained that this was why he only gave them help if they required it or if they appeared to be having trouble using the Internet.

\textbf{I}: How much time have you spent using the Internet with them?

\textbf{T}: Initially not much, probably a zone (40 minutes). Most of the instruction was self-initiated. I just showed them how to start the search. I think most of them have had searching instructions from the library previously so a lot of them knew how to do it. I would just get them up and running and show them how to do general searches. When they ran into difficulty we showed them how to do a more precise search for information and how to neglect stuff that didn't seem to be relevant.

(Interview Mon 22\textsuperscript{nd} Sept 1997)

It was rare that the teacher gave them URL addresses to look up. The teacher would only do this if the students were struggling to find information. This allowed the students to explore the Internet on their own, which helped them to develop their searching skills.

\textbf{I}: Where did you get your information from?
S: I just search myself.
I: Search yourself?
S: Yeah, he may occasionally give us an address like the water authority or something like that, but it's nothing major.

(Interview Fri 29th Aug 1997)

The teacher also appeared to suggest to the students that they should make use of the Internet while they could. The information that the Internet could provide the students with was up to date and relevant.

There is information given in the textbook, (mathematical modelling), but this may be out of date as the textbook was written over two years ago. Therefore it would be worth finding the Web site to get the information, costings and ways to save energy and therefore money.

(Observational Record Wed 3rd Sept 1997)

The students appeared to receive the most help from the teacher, as they required it, while in the computer laboratory. The teacher's background is computing and computers, which helped the students enormously when they were having trouble with the computers. For example:

Quite a few times during the first week of the holiday project the printers were jamming. This meant that the students were sending documents to be printed, but they were not getting printed. The teacher was able to tell the students about the printer memory. The teacher told the students that they could have trouble printing pages from the Web, if those pages contained a lot of pictures or graphics on them. The printer does not have the memory to store all the pictures and the printer would
overload. The students would therefore be required to copy and paste the
document onto a word document to obtain the text information.

(Observational Record 1st Aug 1997)

The teacher also used the Internet during the research period. He would use it to
look up information for the following projects, therefore he did not use it in every
class. He would work on the Internet for 10 minutes at a time and then answer any
questions, if any, in the computer laboratory and then he would go and check on the
students in the classroom.

The students are to search the Alinta Gas, Western Power and Centre
for Saving Energy web sites. These web sites are supposed to be on the
Web. However, the teacher has been searching for them for three days
and has been unable to find them. He asks the students to continue to
look for them and if they cannot find the sites, then they are to call him
so he can try and find the actual address from another source.

(Observational Record, Wed 2nd Sept 1997)

The main interaction with the teacher and the students appeared to occur in the
computer laboratory. The teacher was able to provide assistance with the computers
when the students had problems. The interaction within the classroom appeared to
be greater during the first week of the projects when the students learned the skills
required to complete the projects. After this period though, the teacher did not
appear to interact with the students unless they asked for help. He allowed them to
work on their own to finish their projects.
**Student Activities**

The main activity that the Internet appeared to be used for during the observational period was research.

**I:** How have you used the Internet in maths?

**S:** Um, well, all our assignments are sort of practical so just everything from, um, finding out rainfall figures, finding out the cost of tiling a house and things like that. Just all of our assignments basically use it to get information.

(Interview Fri 29<sup>th</sup> Aug 1997)

**S:** Finding out information for our assignments

(Interview Fri 5<sup>th</sup> Sept 1997)

**S:** Just research.

(Interview Fri 19<sup>th</sup> Sept 1997)

The projects that the students accomplished required them to find up to date information that would allow them to answer the project questions. During the observational period the students appeared to gain a large selection of data that enabled them to complete their projects. Some of the topics that they collected data on were passports, visa, currency, exchange rates, water tank prices, rainfall in Western Australia, Western Power and the cost of electricity. The three projects required them to find different information for the different projects.

**I:** So can you give me some examples of how or what you've used it for?

**S:** Um, I guess we mostly used it for maths. So in the projects, we've done a few projects, one was on tiling a house and we went on the Internet and found actual places of tiles, like the
actual sizes of each tiles. ... Um, I think you were here when we did the weather one, on the rainfall and we found different Australian rainfalls for monthly, yearly times and we did building a house and there was heaps of stuff on the Net.

(Interview Wed 3rd Sept 1997)

The Internet was not used solely for the purpose of research. Often the students did not always stay on task but wandered off task and simply 'surfed' the Web. The students looked at a few things in particular when they surfed, and they were music, television, games and astrology. The students who 'surfed' the most were the students who were in the computer laboratory a lot of the time. Sites that appeared on their screens as a result of a general search could easily distract the students. Often the students would type in words in the search engine and topics would be found that were not related to the words that had been typed in. They were also easily distracted by advertisements that appeared on the top of the screen before and after they completed their searches. These, when clicked on, could be displayed showing a full-page advertisement.

I: Would you like to use the Internet more in maths?
S: Um, not really because its, um, more of a distraction than anything.
I: Why is that?
S: I find myself looking at, like, they've got little billboards at the top when you do a search and ah, the recent one is Web addresses and stuff like that and you just find yourself going "Oh Yeah", click on that, you're somewhere else and then you just say "Oh bugger it", I'm not doing any work.

(Interview Fri 29th Aug 1997)
The students were allowed to 'surf' the Web when they finished their projects. Only a few students did this at the end of their projects. Again it appeared it was the six students who used the Internet quite regularly that took advantage of this.

Today is the last day of their holiday project. Most of the students have finished their projects. They are simply tying up any loose ends. They are handing in their projects today. If the students have finished their project they are allowed to 'play' on the Internet. They have their own free time to explore the Web. Only a few students chose to explore the Web. Some things that the students looked up were games, horoscopes (astrology), bands and music.

(Observational Record 8th Aug 1997)

Time Spent on Internet

Some of the students appeared to use the Internet almost all of the time during the projects, while other students appeared to merely use the Internet when they needed to.

I: How often do you use the Internet in maths at school?
S: Whenever I have to.

(Interview Fri 19th Sept 1997)

When the students were interviewed about their use of the Internet they often commented that it took too long for information to come up on the Internet. The students stated that this was a disadvantage of using the Internet because it wasted time.

I: Do you have any problems with the computers?
S: Um, they suck. They are too slow.

(Interview Fri 29th Aug 1997)
S: It is too slow at school.

(Interview Fri 5th Sept 1997)

T: The computers at the moment are too slow.

(Interview Mon 22nd Sept 1997)

Collaboration and Cooperation

It became apparent that the students who used the Internet less frequently would be given information from the other six students who used the laboratory all the time. They would often be told what to type in at the search engine to get a particular site that would give them the information they required.

Type in America (search), then California (search), then Los Angeles (search), then hotels (search).

(Observational Record Mon 4th Aug 1997)

The other information they would be presented with by the six students was the URL address. It appeared that the six students who used the laboratory all the time enjoyed searching and finding information, while the other five students just wanted to find exactly what they were looking for and did not choose to wander or search generally.

I: Other than you just putting in words, was there at any other times you found other sites because someone gave you information or did you just search yourself?

S: You'd search yourself, but sometimes people would give you information, like the weather one (project). While I was inside doing exercises, the girl was getting stuff and then um, I just got the address off her and just typed that in, cos when you've got
the actual address, you can go to the top and type it in and you'll go straight to it and you don't have to do different search things.

(Interview Wed 3rd Sept 1997)

All of the groups spent a lot of time collaborating on their projects. Whilst each individual group planned and delegated responsibilities with each other, the groups also worked collaboratively to achieve the desired results for the projects.

Students were able to develop their selection and interpretation skills, as they were required to interpret the information on the sites to see if the information was relevant. The students would then include the information if they thought it relevant for their project.

Throughout the observation period, the author mainly observed students using the Internet for research purposes. These students do not have e-mail accounts, but they do use the Internet for surfing and entertainment when they have finished their projects. The students used the Internet to gather a wide variety of information for their project.

4.3 Research Question 2

What are the teacher's and students' attitudes to using the Internet in a secondary mathematics classroom?
Interviews were used to determine the students' and teacher's attitudes were towards using the Internet in a secondary mathematics classroom. The interview data were placed into categories describing attitudes to the use of the Internet in a secondary mathematics classroom that were identified throughout the research period, these were: Using the Internet, Future use of the Internet, Advantages and Disadvantages, and Recommendations of Internet Use.

Using the Internet

The interview questions asked the students whether they enjoyed using the Internet or not. Some of the responses that were received throughout the interviews of this nature:

I: Do you like using the Internet?
S: Yes
S: It's good, but at times it can be frustrating.
S: I do and I don't.
S: No, not really.

About half of the students enjoyed using the Internet and about half did not. Several different reasons were given for the dislike of using the Internet. Those students that did not like using the Internet described it as too slow. They also commented that it was frustrating at times to use because they did not know how to use the Internet properly. They found it difficult to search and find relevant information, particularly information that was to be found from Australia.

I: Do you find it difficult to find specific things that you are looking for, when you do a search?
S: Yes, because most of them are American. So if I want an Australian one (site) then I would have to put, like, Craft Decor, AUSTRALIA.

(Interview Fri 29th Aug 1997)

Future Use of the Internet

The students and teacher were asked questions to determine what they thought was the future for the use of the Internet in education and in particular mathematics education.

It appeared that the teacher and all the students believed that the Internet would be used more in the future.

I: What are your expectations of the future use of the Internet.

S: In maths, it will probably go through so all schools will have it and this and they'll use it for maths and other subjects.

(Interview Fri 29th Aug 1997)

S: Definitely strong, because it's just so easy to use. It's like all around the world, not just in Australia or Western Australia. So, I mean you can get so much info from it.

(Interview 8th Sept 1997)

T: I can see that at the moment we have limitations because the speed is so slow, eventually when it becomes a lot faster. The ideas that the school is going to have are research zones, which we all have. Which will make the facility available to all students anytime that there is any research or such is necessary. The maths department has the intentions of using it as a means of allowing feedback and communication to students because
eventually the school will become Internet based in that they will have the ability for students to be able to actually access the Internet from home, in particular those students who are sick, those students who have been suspended and put on home duties.

(Interview Mon 22nd Sept 1997)

When the students discussed how the Internet could be used in the future of mathematics education it appeared that the students believed that the Internet could not benefit students who did TEE mathematics. The students appeared to think that those subjects were too complex and that the Internet could not be used to help them in those subjects.

I: Do you believe that the Internet will be used more in future mathematics lessons?

S: No, not necessarily with TEE maths or anything like that, but probably with Mathematics in Practice and Modelling with Mathematics in Year 11 and Year 12.

(Interview Fri 29th Aug 1997)

S: No, not in TEE, I don't reckon so, 'cause they don't do projects like we do.

(Interview Fri 19th Sept 1997)

S: No, not necessarily for maths, because maths it's just like, it's normally bookwork for TEE maths. But for other subjects I reckon it will because you'll always have assignments and everything that are on people and places.

(Interview Mon 8th Sept 1997)
The students appeared to believe that the Internet could only be used for research and finding information for projects. They appeared to have a limited view of the use of the Internet.

**Advantages and Disadvantages**

The students and teacher were asked to give some advantages of having and using the Internet in a secondary mathematics classroom. It appeared that the students thought one of the main advantages of the Internet was the time factor. They believed it to be easier and quicker than ringing up the companies to find information, as they were required to do previously. The students, it appeared, also believed that the information was mostly factual and up to date.

**I:** What are some of the advantages of using the Internet in the mathematics classroom.

**S:** When you are good at it, it makes things really quick and you can do things quickly.

(Interview Wed 3rd Sept 1997)

**S:** Mostly things are up to date

(Interview Wed 3rd Sept 1997)

**S:** It's just easier than looking things up in the phonebook or going out into places, like shops, and stuff and finding stuff. It's easier just to sit down and look it up on the computer.

(Interview Fri 5th Sept 1997)

**S:** It's easier to find information, than to go and ring up people. It saves time.

(Interview Fri 5th Sept 1997)
S: Quick, it's easy, factual, depends on the source, but most of the time it is factual. You have lots and lots of different sources, so like it's not just one. You can see what, just say you had an assignment on one thing but you can get it (information) from all different sources and get like a lot of information.

(Interview Mon 8th Sept 1997)

The students and teacher were asked to give some disadvantages of having and using the Internet in a secondary mathematics classroom. The students appeared to believe that the disadvantages were related to being unable to find specific information. They believed that using the Internet could take a long time to find specific information. As a result, a few students commented that at times using the Internet could be very frustrating.

I: What are some disadvantages of using the Internet in a secondary mathematics classroom?

S: I guess if you don't have it at home and if you don't do it properly then it gets really frustrating, cos everything you try and you find it takes you ten times as long.

(Interview Wed 3rd Sept 1997)

S: When you look for something you can't always find it.

(Interview Wed 3rd Sept 1997)

S: When the Internet doesn't work or you can't find certain things.

(Interview Fri 5th Sept 1997)

S: Sometimes you can't find things. It depends on which, like if you don't have the correct address sometimes you can't find what you are looking for.

(Interview Mon 8th Sept 1997)
The students did appear to believe that there weren't really too many disadvantages to using the Internet. They believed that the advantages were far greater than the disadvantages.

I: What are some disadvantages of using the Internet in a secondary mathematics classroom?

S: There's none really. Just here it takes a while 'cause there's so many (students) that go through. But I think that it is pretty good.

(Interview Fri 19th Sept 1997)

S: There are some like the cost of running it and sometimes it'll freeze and you can lose half your stuff, but it's mainly advantages.

(Interview Mon 8th Sept 1997)

When the teacher was interviewed he believed that the speed of the Internet at the school was the major disadvantage to using the Internet. He also commented on the nature of the information.

T: A lot of the information we find is irrelevant, a lot of it is outdated, surprising though it may seem. Someone sets up a page where it was set up say in America a year ago and they haven't updated and you tend to think that that is the only information. Major restrictions at the moment are time to use it. It's so slow at the school that it's not terribly good.

(Interview Mon 22nd Sept 1997)
Recommendations of Internet Use

One of the questions that the students and teacher were asked related to whether they thought the Internet was worthwhile and would they recommend the implementation of the Internet into mathematics classrooms.

Almost all of the students recommended the use of the Internet in secondary mathematics classrooms. The believed that it was very worthwhile and that they would definitely recommend it to anyone who asked them.

I:  Do you believe the use of the Internet is worthwhile?
S:  It is really good and it can be a lot of fun.

(Interview Fri 29th Aug 1997)

S:  I reckon to make it more worthwhile they should have it in every single class, like make sure that every kid has the opportunity to use it.

(Interview Wed 3rd Sept 1997)

S:  Its heaps easier to do work and find information. ... Now you can just click it up and print off information yourself.

(Interview Fri 5th Sept 1997)

S:  Yeah it's worthwhile, especially if you're doing a big project and you need heaps of information, cos it contains so much.

(Interview Fri 5th Sept 1997)

S:  Yeah, it is worthwhile. I reckon in a couple of years it will I expand even more and it will be much better.

(Interview 19th Sept 1997)

S:  I think they should teach um, some people still don't know how to use it properly. I think they should teach them how to use it
properly otherwise they'll just be looking and they don't know where to go.

(Interview Mon 8th Sept 1997)

It appears that students believe that the Internet has helped them greatly in their mathematics class. It has helped them obtain information at a greater pace than they used to when they had to go out and visit companies to obtain information. It has allowed them to obtain a wide selection of information due to the vast amount of information that is presented to them on the Internet.

I: Do you believe that the Internet is worth using.

T: At the moment that is debatable. ... When the speed increases it will improve, the kids' ability to communicate with other schools and other kids and more research around the world I can see it having a benefit that way. The maths department has the intentions of using as a means of allowing feedback and communication to students.

(Interview Mon 22nd Sept 1997)

The teacher can see the potential the Internet has as an educational tool, particularly in mathematics, but believes that it still has a way to go.
CHAPTER 5: CONCLUSIONS

5.1 Introduction

In this chapter, conclusions are drawn about the research, the limitations of the study are discussed and the implications for teaching and further research are discussed.

The aim of the project was to determine how, in a secondary mathematics classroom, the Internet was used by the students and the teacher. The project consisted of two research questions.

Research question one was concerned with finding out how a teacher and students use the Internet in a secondary mathematics classroom. Research question two was concerned with the identification of what were the teacher's and students' attitudes to using the Internet in a secondary mathematics classroom.

5.2 Limitations of the Study

Modelling with Mathematics is a project-based subject. The subject required the students to research specific problems and present solutions to these problems. The subject therefore is heavily research-based. This limited the use of the Internet to information gathering only as the students were not required to use it for any other
purpose. The full capacity of the Internet and its uses, such as email, has not been fully explored by this study.

The research consisted of a small sample of eleven students. The research was restricted to one class and may not be generalisable to other classes that use the Internet in mathematics, only to classes which are similar to or the same as Modelling with Mathematics. Even though the sample was small the researcher believes that the sample was manageable and was therefore able to complete the research successfully. If the sample had of been larger, then interviews with all students may have been difficult to complete.

5.3 Discussion of Results

The results gained from the research will be discussed in terms of research question one and two.

5.3.1 Research Question 1

The research found that the students and teacher from the year 12 Modelling with Mathematics class mainly used the Internet for research purposes. At times the students would also use the Internet for entertainment or 'surfing' when their projects were completed.
The research allowed for categories to be determined from the observations of the use of the Internet in the classroom. These categories were: Student Usage and Planning, Teacher Interaction, Student Activities, Time Spent on Internet, and Collaboration and Cooperation. The documents collected supported the observations of the use of the Internet in a secondary mathematics classroom.

**Student Usage and Planning**

Usually the students used the Internet according to how much planning they had done for their projects. The more planning, the less the Internet was used. Some students had a direction and knew what they were looking for. Most of the students were able to systematically and quite rapidly sift through a lot of information. Dixon & Falba (1997) note that, as with any traditional search, extraneous information may be included with the results of a Net search. Finding ways to organise, use and share information is vital. These processes were observed as students completed their projects using the Internet.

**Teacher Interaction**

The teacher gave little direct instructions on how to use the Internet. The students seemed to believe this was good because it gave them the opportunity to explore the Internet on their own. It gave them the opportunity and experience to become more responsible for their own learning. The less the teacher interacted, through direct instruction, the more the students were required to think and work in their groups. This may be of benefit to particular students as Real (1995) noted that when students
worked on their Internet projects, the naturally more able became more responsible for their own learning.

However, some students believed that this was not always such a good thing. They commented that they wished they had received more help earlier on with Internet training. Ingvarson (1995d) suggests that knowing where to find everything are important skills required in Netsurfing and Netsearching. In this class quite a 'happy' medium was achieved a lot of the time. There were only a few minor problems, which required the involvement of the teacher. As Ingvarson (1995d) suggests, the teacher in this classroom is becoming a 'coach' rather than a fountain of knowledge.

**Student Activities**

The students used the Internet, the majority of the time, for research purposes. Dixon & Falba (1997) discuss the various types of real data that can be provided on the Web for the mathematics students. They suggest that online data, such as statistics, can provide students with the opportunity to deal with 'real data'. The activities that Dixon & Falba (1997) discussed did not take place in this classroom, but the students in this study also used real data. In this case the data was for a particular topic because the subject is task specific. As the subject is task specific the students are required to find information related directly to their projects. There are a large variety of different tools that the Internet can be used for, but in this case it was only used for research.
The Internet was also used for the purposes of entertainment. The students would either become distracted by advertisements on the Internet or they would become bored with what they were doing and simply look at things that were of interest to them. It is apparent that the task the Internet should be used for is stimulating and interesting enough that the students do not need to go off and 'surf'. Nevertheless, as with this class, it was a nice reward to allow personal use when they had finished their projects.

*Time Spent on Internet*

The time spent on the Internet could be broken down into two areas: useful and not useful. Many hours were spent on the Internet by students trying to find the information that they required for their projects. It is hard to classify the time spent on the Internet for searching because some students could search more efficiently than others. The better the students were at using the Internet the quicker they were able to find information, but that meant that they were able to find a lot more information also. The students who were good at the Internet would use several different search engines to find information rather than one. There needs to be a limit to the amount of time spent on the Internet. Students can spend hours and hours trying to find information and these students need to be helped as the time they spend may be wasted, whereas a students who is competent in the use of the Internet may spend the same amount of time accessing two or three times the amount of information.
**Collaboration and Cooperation**

Students participated and worked well together in class and on their projects. Real (1995) found, when working with year sixes online, that all students were eager to participate. The students in the year 12 modelling with mathematics class were able to develop skills that enabled them to work cooperatively together on their Internet projects. The use of the Internet enhanced their abilities to delegate responsibilities to one another and to ensure that the most amount of information could be found in a relatively short period of time.

5.3.2 Research Question 2

In general the students and teacher appeared to have a positive attitude toward using the Internet in a secondary mathematics classroom. They believed the use of the Internet to be worthwhile and they thought that the use of the Internet would increase in mathematics lessons in the future and in education generally.

The interviews allowed categories to be identified that determined the types of attitudes the teacher and students have to using the Internet in a secondary mathematics classroom. The categories identified were: *Using the Internet, Future use of the Internet, Advantages and Disadvantages, and Recommendations of Internet Use.*
Using the Internet

The students used the Internet for research purposes and most had a positive attitude to using it in the secondary mathematics classroom. They believed that using the Internet allowed them access to a greater range of information. They also thought that it was good to use the Internet because they did not need to go and visit companies for information.

The students enjoyed being able to find information on all the topics and hobbies that interested them when they ‘surfed’. The ability to be able to find lyrics to songs or look up their daily horoscopes allowed them a break from the research tasks. The students were excited by the prospects that the whole world was available at the click of a few buttons.

Future use of the Internet

The teacher and students believe that the Internet will be used more in mathematics education. They did, however, have different perspectives on how it could be used in the future. The students indicated that the Internet would be used a lot more to find information for the projects that they completed. Their limited exposure meant that they had a very narrow perspective on how the Internet could be used in the future of mathematics education. They were unable to see other uses for the Internet besides the ones they themselves had experienced. The students therefore thought that the Internet would be used a lot more in the future, particularly in Mathematics in Practice and Modelling with Mathematics.
The teacher also had his ideas on the future use of the Internet. He believed that the Internet would be used for research, e-mail (between staff and students as well as other countries and schools), and for interactive sites where the students could receive immediate feedback on work they submitted. According to the Open Learning Technology Corporation Limited (1995) online services will enable students to communicate readily with other students locally, nationally and internationally. The teacher in this study believed that the future use of the Internet will also head in this direction.

Advantages and Disadvantages

The Internet provides many advantages to the everyday classroom. The main advantage that was documented by the students was the fact that it was easier and quicker than going to the companies themselves and asking for information. They believed that the information provided on the Internet was mainly factual, especially for the sites that they usually were required to visit, e.g. Alinta Gas and Western Power.

The other most noticeable advantage that the students commented upon was the large selection of web sites from which to choose relevant information. They were provided with a large choice that allowed them to pick and choose information that they wanted and needed to use. According to Burgstohler (1997), new options will emerge through the use of the Internet. She expects that the use of the Internet will provide access to an unlimited amount of information.
The use of the Internet also provides some disadvantages as well. The students and teacher believed that at this point in time the Internet and computers were too slow. The time it took to download information and find or connect to sites could be very frustrating. Owston (1997) believed that there are many new barriers that are encountered when students connect to the Internet. Some of these include computer hardware malfunctions, difficulty in accessing the service provider and gaining access to popular Web sites.

The teacher believed that the Internet often provided information that was not necessarily correct. He thought that it was important that teachers are aware of what was on the Net.

**Recommendations of Internet Use**

The teacher and students believed that the Internet is worthwhile using in mathematics education. Owston (1997) believes that the Internet merits serious consideration as we search for ways to revitalize and enhance what we do in our schools. The researcher believes that the Internet will be and should be used more in mathematics education. The way the Internet has been successfully used in this classroom study warrants a reason for the continual use and development of the Internet in mathematics education. However, there is still much research that needs to be completed to gain the maximum benefit from this technology as its future impact is only vaguely known.
5.4 Implications

The research highlighted many issues that teachers can use to implement the Internet into the secondary mathematics classroom. It also illustrates several points that could be researched further.

The students did not receive detailed instruction about the Internet in the mathematics classroom. The teacher assumed that the students had been exposed to the Internet in previous years. He believed that the students had seen and explored the Internet in other classes and therefore they simply reviewed basic searching techniques. This could perhaps explain why some of the students did not like to use the Internet. The students said that it could be very frustrating to use the Internet when they did not know how to use it properly or know what they were doing.

Instruction could be carried out with the students at the beginning of the year to enable them to be confident with using the Internet. If some students have had sufficient instruction on the use of the Internet then they could help the teacher with less confident students. The author believes it to be an important step to take time out of the curriculum at the beginning of the year so that as time progresses they will use the Internet with minimal problems. One of the hardest techniques is learning how to search effectively and time should be taken to demonstrate and give the students the opportunity to develop these necessary skills.
Classroom teachers could begin to implement the Internet into their mathematics lessons as it has been shown that the Internet is an effective research tool. This would enable teachers to give research-based projects to students of all ages and ability levels. The students do not necessarily need to have access to the Internet in every lesson, but time could be allocated once a week or once a fortnight to allow the students to use the Internet. This study illustrates a successful example where the department has a computer laboratory that can be booked in advance. Classes in the laboratory may not necessarily follow the course content that is happening in the class each week but it could be separate content that is covered during the Internet access time.

This type of environment enables the students to become more responsible for their learning as they are required to manage their time effectively. It also allows for collaboration and cooperation to improve as the students can work together to solve their problems and to find relevant information that will allow them to answer specific questions or assignments. The students would be required to be able to interpret the presented material. Students would be able to give oral presentations on information that they find from the Internet. This will allow for the development of public speaking skills as well interpretation skills.

There needs to be care taken by the teachers with the type of information that is provided on the Internet to the students. Not all information presented on the Internet is current and correct. Teachers must provide students with sites, which they have
checked, to begin with and let them, explore from there. The teachers must be actively involved in the searching process by helping the students to find sites with relevant information. They need to be available to the students to help them determine whether sites they find can be relied on for accurate information. It must be pointed out to the students that information provided may not necessarily be correct. The students should take care and try to cross-reference where possible and appropriate.

There are a number of implications for further research resulting from this study.

Research could be conducted to determine whether there is a difference in attitudes to using the Internet between students who have had more Internet instruction to those who have not.

Interactive web sites can be explored and researched in the classroom. There are many valuable sites, which could be used to enhance mathematical learning. These sites can provide the students with opportunities to interact with the computer screen and gain immediate feedback. This is a valuable resource, which promotes the Internet as an exciting innovative tool.

Another aspect is email. The impact of email and the effective use of it in the mathematics classroom needs to be researched. It can provide the students with the
opportunities to communicate with people from all around the world, including other schools.

Students appeared to enjoying using the Internet. The Internet appeared to have a positive effect on the students' attitudes to learning mathematics. They interacted with each other, developing cooperation and collaboration skills. The use of the Internet can enable students to become more responsible for their own learning. Further research could be taken in the direction of using technology to make instruction more student-centred, to encourage cooperative learning, and to stimulate increased student/teacher interaction.

5.5 Conclusion

The research completed has provided an example of how the Internet can be used successfully in a secondary mathematics classroom. The Internet has been used mainly for research purposes for students to find information for projects. The teacher and students believe that the Internet will be used much more in the future of mathematics education as it provides a positive learning environment in which the students can learn. The attitudes of the teacher and students to using the Internet in a secondary mathematics classroom are generally positive. The Internet is a new and innovative tool that can be used to complement mathematics education. This research has demonstrated that it has a very positive influence on the students in the
classroom. More research is needed to determine other effective ways the Internet can be used in secondary mathematics classrooms.
REFERENCES


APPENDIX 1

Letter to Principal

July 15th 1997

Mr J Feutrill  
Woodvale Senior High School  
Woodvale Dr  
Woodvale, 6026.

Dear Mr Feutrill,

I am currently completing my Bachelor of Education with Honours in Mathematics Education at Edith Cowan University.

To complete my thesis on ‘How the Internet is used in the Mathematics classroom’, I require approval to observe and interview a group of students and their teacher who are using the Internet.

Students’ names will not be recorded and the school details will remain confidential. A letter requesting permission to interview the students involved in the study will be sent home to the parents before any details/answers are recorded.

If you have any questions or would like a copy of my proposal please feel free to contact me.

I hope this request meets with your approval and I look forward to hearing from you in the near future.

Yours Sincerely,

Megen West
APPENDIX 2

Letter to Parents and Students

Edith Cowan University
Mount Lawley Campus

Dear Parent/Guardian and Year 12 student,

I am currently undertaking research into How the Internet is used by a teacher and students in a secondary mathematics classroom, and how they feel about using the Internet in mathematics, as part of my Bachelor of Education with Honours degree.

I wish to ask one class of year 12 students to participate in some interviews. I will be observing the students and I then propose to interview each student about how they make use of the Internet in mathematics. I anticipate that these interviews will take no longer than 20 minutes. The students and teacher will be interviewed throughout the study as well as interviewed at the end to discuss with each student his or her feelings toward using the Internet in mathematics.

General information about how the students use the Internet will be passed onto the classroom teacher, so that any useful methods can be used during the course of the classes mathematics lessons. The benefits of the research will also be felt beyond the school, as recommendations will be passed to secondary mathematics teachers who use the Internet in their classrooms.

I wish to emphasize that all responses will remain confidential, as well as the identity of the school.

Any questions concerning the project entitled ‘How the Internet is used in the Secondary Mathematics Classroom’ can be directed to Megan West of the Education Faculty on 9246 3014.

If you give consent for your child to be involved in the study, please complete the permission form attached and return it to the school as soon as possible.

Yours faithfully,

Megan West
I have read the information attached and any questions I have asked have been answered to my satisfaction. I agree to allow my child to participate in this activity, realising that I may withdraw that permission at any time.

I agree that the research data gathered for this study may be published provided that neither the school nor my child will be identified.

-----------------

Parent or Guardian Date

-----------------

Year 12 Student Date
APPENDIX 3

Student Interview Questions

Interview Guide - Students

* Do you like using the Internet?
* Do you have access to the Internet at home?
* How often do you use the Internet at home and how do you use it? Do you use it to do mathematics?
* How have you used the Internet in mathematics at school?
* How often do you use the Internet in mathematics at school?
* Would you like to use the Internet more in mathematics? What would you use it for?
* Has the Internet ever helped you learn something new (in general)? To do with mathematics? Describe some examples.
* Do you believe the Internet will be used more in future mathematics lessons? What are your expectations of the future of the Internet?
APPENDIX 4

Student Interview Questions

During After Observation

* How did you find that site?

* Where are you going? What are you searching for? What is your aim? Where do you intend to end up?
APPENDIX 5

Teacher Interview Questions

* Have you used the Internet to help the students learn in the past? If yes, How much time have you spent using the Internet with them? What are the ways in which you use the Internet?

* What plans do you have for its future use?

* Do you believe it is worth using? Why?

* What benefits have you encountered by using the Internet in the mathematics classroom?

* Have you had any problems in using the Internet in the mathematics classroom?

* What limitations do you believe exist in using the Internet as a teaching tool in mathematics?

* Do you think that all schools and grades should have access to the Internet? Why/ Why not?

* Is the Internet useful for all year levels in mathematics?

* Is the Internet useful for all ability levels in mathematics?

* Give an example of an activity you would use for each of the year levels?

* Would you attempt to use the Internet for TEE classes? How would you use it in these classes?

* What do you see the future of the Internet is in education? In Mathematics education?

* How can teachers be assisted to learn about the Internet and its uses in the mathematics classroom?

* Do you believe increase use of the Internet in mathematics education will effect mathematics assessment procedures? Is so, how do you believe that they will be effected?
APPENDIX 6

Teacher Interview Questions

During After Observation

* How will this activity help the students learn?
* Why did you choose the Internet for this activity?

Other questions will be asked which are directly related to the activities observed.
## Observation Record

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**Teacher's Instructions**

**Types of Activities**

- Classroom Organisation
  - Computer setup
  - Student Interaction

**Students' Reactions**

**Other Comments**
APPENDIX 8

Australian Rainfall Information
APPENDIX 9

Western Australian Rainfall Information

Perth, Western Australia: Climate Data

http://www.jnet.net.au/-jacobth/clim.html

CLIMATE DATA

Perth, Western Australia

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