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Development and evaluation of a scaffolding guide to help lower secondary science students use the Internet to search for, select and organise information for the construction of personal text

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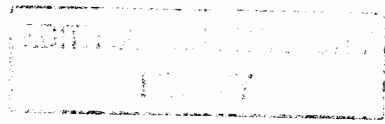
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**Development and evaluation of a scaffolding guide to help lower
secondary science students use the Internet to search for, select and
organise information for the construction of personal text**

Andrea Tunks B. Ed.

**A project submitted in partial fulfilment of the requirements of the award
of Master of Education**

School of Education

Edith Cowan University

October 1999

USE OF THESIS

The Use of Thesis statement is not included in this version of the thesis.

ABSTRACT

The purpose of this study was to develop and evaluate a scaffolding guide to help lower secondary science students use the Internet to search for, select and organise information for the construction of personal text.

An intact Year 10 science class participated in the study. Data were collected using the scaffolding guide completed by students, work samples, a questionnaire designed to elicit from students their perceptions about the research guide, observational notes made by the researcher and debriefing interviews conducted with the teacher and with a group of students.

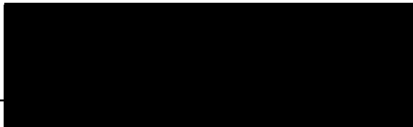
The study identified the skills needed by students to search for and select useful information from the Internet and construct a personal text from that information. The study found that scaffolding the skills of analysing the topic, searching and reading, selecting, summarising and writing, in the form of a research guide supported quality learning. Students were able to search in a logical way, select references that were relevant and credible, and present an outline of the text reflecting an ability to analyse and comprehend the content. Using the Internet research guide enabled students to take on as personal knowledge what they had read as reflected in the construction of a concise set of notes on which a coherent oral presentation was based. The research guide was perceived as useful by students and the class teacher. Data collected in the study have been used to revise the guide and make improvements to it.

DECLARATION

I certify that this project does not, to the best of my knowledge and belief:

- (i) incorporate without acknowledgment any material previously submitted for a degree or diploma in any institution of higher education;
- (ii) contain any material previously published or written by another person except where due reference is made in the text; or
- (iii) contain any defamatory material.

Signed _____



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CHAPTER 1: INTRODUCTION

Background

Since the mid 1980s there has been an increase in the use of computers in schools. The last 15 years has seen schools evolve from having one or two computers of limited function to the current situation where it is common for schools to have computer laboratories and, in some schools, students being required to have a personal lap top computer. With the proliferation of computer equipment and the advent of the Internet, the information resources available to students are more extensive than those available in the past. The Internet is a tool which will be used by students increasingly as the Science *Learning Area Statement* comes into effect with a move from transmissive to constructivist learning and teaching practices. The move toward students becoming more responsible for their learning and developing information technology skills is evident in the Overarching Learning Outcomes in the Western Australian curriculum framework for K-12 schooling:

3. Students recognise when and what information is needed, locate and obtain it from a range of sources and evaluate, use and share it with others.

4. Students select, use and adapt technologies. (Curriculum Council, 1998)

Problem

The problem for students confronted with this vast amount of information is how to locate and extract information that is accurate, credible and relevant to their needs in completing school work. Students now have access to information which has not been vetted in advance by a teacher or librarian. When a student takes a text book from the school library, s/he does not need to question it's credentials as a suitable source of information. Information on the Internet does not have to meet requirements of being a suitable source of student information. Internet documents do not have to meet the requirements of refereeing by peers or review by editorial

boards People and organisations creating Internet sites may be trying to sway public opinion. Their purpose may well not be to supply factually accurate and unbiased information.

There has been some debate about whether the information technology revolution improves student learning. Some schools feel compelled to install the hardware, but do not follow-up by teaching students how to learn using the equipment. Bigum (1998) notes that schools tend to assume that the appropriate response to the Internet is simply to get online. There are few useful precedents for teaching complementary skills needed to effectively use the technology; for example how to find, appraise and select information.

A student searching for information on the Internet could easily suffer ‘navigational problems’ and spend a lot of time inefficiently meandering and retracing their steps through various search engines to sites which may or may not be related to what they originally set out to investigate.

Having located a piece of information which may be of use, the student needs to make decisions about the relevance and credibility of the material. Does the material address the issue the student is investigating? If so, who has produced the information? Are they a reliable source of information and what might be their motivation in creating the site? Once the student has selected enough information to address the topic of investigation, s/he needs to analyse what is said, comprehend the content and be able to summarise it through note making in order to make use of the information.

Rationale

Much has been written on preparation for reading, thinking through reading, extracting and organising information and translating information from reading to writing. For example, the ERICA model (Morris & Stewart-Dore, 1985) and the

strategies outlined in *Stepping Out* (Education Department of Western Australia, 1996). However the ERICA model and the *Stepping Out* strategies assume the student has been provided with sound text by the teacher. Now that students have access to the Internet for their assignments and are going to have to meet the requirements set out in the Overarching Learning Outcomes, they need additional understanding and skills to help them to learn from text; how to search for information on the Internet and how to select relevant and credible information, before moving on to the stage of extracting information from the selected texts. When students are selecting information themselves, it is not possible for the teacher to provide specific scaffolds to overview and comprehend Internet tools as they vary so much in structure. Even recently published texts on study skills which address helping students to survey texts and evaluate material, do not discuss the unique problems associated with using the Internet.

To enable students to extract useful information efficiently they need to be provided with some form of scaffolding to guide them and keep them on track when encountering vast amounts of information. A set of questions / strategies which guide students' thinking and decision-making process as they use the Internet would help keep them focussed on what it is they are looking for, where they have searched and whether a piece of information is credible and relevant. Having made decisions on which information to keep and which to discard, strategies to help students extract and organise the information can be applied so that the students can finally translate the information into personal text and knowledge. The ultimate test of the usefulness of a scaffold is: Did it help the student learn?

Purpose and Research Questions

The purpose of this study was to develop and evaluate a guide for students to use when using the Internet to search for and select information for a lower secondary school science assignment. The Internet research guide consisted of five

sections: *Analysing the Topic*, *Searching and Reading*, *Selecting*, *Summarising and Writing*. *Analysing the Topic* helped students define their research topic, develop research questions, and identify existing knowledge and main ideas relating to the topic. The *Searching and Reading* section has information on how to use popular search engines. *Selecting* posed questions for students to ask about the relevance and credibility of articles. *Summarising* gave a format and instructions on how to produce a skeleton outline of selected texts. *Writing* guided students through the process of drafting, reviewing, editing and producing a final copy for presentation to an audience.

The purpose of the project was to develop and conduct a preliminary evaluation of a guide for searching and extracting information from the Internet. More specifically the study aimed to address the following research questions:

1. What skills are needed by students to search for and select useful information from the Internet and construct a personal text from that information?
2. Does using a guide to scaffold students' research support quality learning as evidenced by:
 - a. students search in a logical way avoiding navigational problems;
 - b. selected references are relevant and credible;
 - c. students produce a skeleton outline of the text reflecting an ability to analyse and comprehend the content;
 - d. students take on as personal knowledge what they have read as reflected in written work which does not include verbatim copying and is written as a constructed text; and
 - e. the final piece of written work addresses the original research question.

3. Do students perceive the guide to be useful and a resource they want to use?

The first research question was addressed by conducting a literature review to identify the skills needed by students to find, select and use information from the Internet. Research questions two and three were addressed using data collected during the implementation and evaluation of the guide.

CHAPTER 2: LITERATURE REVIEW

Theoretical Background

Cognitive apprenticeship

Modelling, coaching and scaffolding are key elements of the cognitive apprenticeship model of instruction proposed by Collins Brown and Newman (1989). Traditionally, novices learnt from expert practitioners through apprenticeship. Modelling involved the expert carrying out a task so the apprentice could observe and build a conceptual model of what was required to perform a task. Coaching involves the expert observing as the apprentice carried out a task offering hints, feedback and new tasks aimed at bringing the performance of the apprentice closer to that of the expert. The provision of scaffolding by the expert helps the novice complete a task that the novice could not yet manage on their own. As the novice develops competence the scaffolding can be gradually withdrawn or faded away.

Collins et al (1989) suggest that by relegating learning to schools, skills and knowledge have become abstracted from their uses in the world and that teachers should look to the apprenticeship model as a means of embedding the learning of skills and knowledge back into their social and functional context. The use of modelling, coaching and scaffolding for subjects such as reading, writing and mathematics in schools is referred to as ‘cognitive apprenticeship.’

Situated cognition

The notion of embedding the learning of skills and knowledge in their social and functional context is essential according to Brown, Collins and Duguid (1989). They view knowledge as a cognitive tool which needs to be used in authentic domain activities to enable students to acquire and shape or hone their cognitive skills. Only by engaging in authentic activity can students gain access to the standpoint that

enables experts to act meaningfully and purposefully. Like an apprentice, a student must participate in the culture of a domain. This is the basis of situated cognition.

Constructivist perspective of learning

The importance of learning occurring in a social setting is explained by Hennesy (1993). Cognitive development is not spontaneous, but occurs through sociocultural activity in which cognitive activity is socially defined, interpreted and supported.

The prior knowledge and experience of learners are crucial factors in the learning process. Previous knowledge and experiences are major factors that determine how new tasks are interpreted and whether new materials will make sense. This is the essential assumption of constructivism (Hennesy, 1993).

Life-world knowledge is resistant to change even when the learner is presented with new evidence which contradicts their existing beliefs. If teachers do not take into account existing knowledge and experience and situate knowledge to be learnt in an authentic context, the student may develop two domains of knowledge, the school domain which is not used in everyday life and the life-world domain in which existing knowledge remains intact and unaffected by school knowledge (Solomon, 1993).

Literacy and learning

There are seven principles which should be applied to literacy and learning according to Bickmore-Brand (1996). The way in which each of these principles can assist students in learning new skills, knowledge or values is outlined below:

- **Modelling** of thinking strategies by the teacher through what is written and what is said is important for students to see new skills in operation by a significant person.

- **Scaffolding** is needed by students to support them as they progress through stages in the development of new skills. The teacher can provide routines and materials which provide scaffolding.

- **Metacognition** is the ability to be aware of one's thinking processes. If students are to practice their reasoning abilities they need materials which foster the process of making sense of their learning processes and tasks.

- Learners need to assume increasingly more **responsibility** for their learning, but should not be left to sink or swim. Teachers should gradually reduce their control over student activities.

- A sense of **community** in the classroom should provide learners with an environment in which they feel able to take risks.

- Construction of new knowledge depends on **connections** being made by the learner between new information and existing knowledge, skills or values. When students construct knowledge for themselves it becomes part of their personal knowledge.

- Learning and practicing skills is easier when students can see the relevance of the learning. Therefore creating a **meaningful and relevant context** assists learning.

Cambourne (1996) outlines conditions of learning some of which approximate to those of Bickmore-Brand. These conditions, Cambourne asserts, promote successful development of literacy and the acquisition of wider understandings. As in Bickmore-Brand's principles, Cambourne recognises the need for creating a meaningful context to encourage **engagement** in learning by students. Cambourne also notes the importance of learners assuming **responsibility** for decision making about their own learning. Modelling or **demonstration** by the teacher of what is expected is essential if learning is to occur. It is important to create a supportive classroom environment in which students are encouraged to practice or **approximate**

new skills. The opportunity to **use** developing skills is needed if learners are to gain mastery over them.

In addition, Cambourne explains the importance of **immersion** of students in the medium they are to learn to help build background knowledge and experiences on which they can draw in the construction of new knowledge. In this way students learn new language and concepts simultaneously. It is also important to have positive **expectations** of learners and to communicate these through modelling what is expected, using positive reinforcement and verbalising expectations. Positive expectations should be followed up with positive feedback in **response** to students efforts (Education Department of Western Australia, 1996).

McGinley and Tierney (1988) explain the importance of reading and writing as ways of exploring and re-examining a knowledge domain such as those encountered in content area subjects, such as science, as a means to acquiring new knowledge. Reading and writing are active and productive in nature; learners are engaged in building or constructing a textual world as they make meaning through language. When writing **precedes** reading in the form of knowledge activation learners become more engaged in what they are reading. When students write **after** reading, they perform better at description, interpretation and generalisation which are three measures of literary understanding.

Studies examined by McGinley and Tierney (1988) present evidence that more extended forms of writing (ie analytical, personal and formal writing) performed in the context of reading result in better learning than other less cognitively engaging writing-related activities such as notetaking, outlining or study questions. Composing, by virtue of its potential to induce one to think more carefully and deliberately about what was read, makes the combination of writing with reading a powerful learning duo.

McGinley and Tierney (1988) perceive a need for further research into students' self-directed employment of reading and writing as ways of acquiring knowledge.

This will help educators understand students' strategic decisions to engage in different forms of reading and writing in the service of learning. The development of strategies for teaching literacy skills should be considered a major goal as students study difficult topics and attempt to solve complex problems.

Prior Studies

The computer and pedagogy

In recent times there has been an urgent and growing interest in the use of new information and communication technologies in schools. In particular the pedagogic implications of new ways of constructing and reconstructing knowledge using computer technology. Teaching practices must cope with a 'classroom without walls,' ie an environment in which students can have learning experiences outside the classroom through computers (Bigum & Green, 1993).

The Internet poses unique problems for teachers and students in learning how to find, select and appraise information (Bigum 1998). For example, Reinking (1997) likens the navigational problems associated with finding one's way around the Internet as 'getting lost in hyperspace.'

Bigum (1998) points out that there are no quality assurance methods connected to information on the Internet, and that there is a need to identify skills that complement the use of the Internet. As yet there are few useful precedents for working with the Internet. There is a need to make the work of students and teachers a priority and to recognise the cost of time for students and teachers to learn how to use the technology. After all, the key test for implementation of new technology is it's workability, ie does it improve the working conditions for the student or the teacher? Bigum (1998) warns that schools must not place blind faith in technology alone. They need to be informed, critical and creative in the use of new technologies.

Apart from the problems of finding, selecting and appraising information on the Internet, students may find difficulty using computers if they suffer from computer anxiety. King (1993) found that gender, prior experience and personality can affect the level of computer anxiety experienced by a student, ie the fear and apprehension experienced when using or anticipating using computers. Merely increasing the amount of time spent using a computer does not necessarily decrease levels of anxiety and may in fact increase it. It is therefore important that teachers are prepared to help students use computers successfully.

Strategies for helping students with reading and writing

Morris and Stewart-Dore (1985) outline a series of stages for helping students achieve effective reading in the content areas. Their model has become popularly known as the ERICA model. The stages of the ERICA model are *Preparation for Reading, Thinking Through Reading, Extracting and Organising Information* and *Translating Information from Reading to Writing*.

Preparation for reading

Before students encounter a piece of content area text, they can be given activities to prepare them for the concepts and terminology they will encounter. Smith and Smith (1995) point out the importance of establishing what is known about a topic before starting reading and identifying key terms. Morris and Stewart-Dore (1985) suggest using a structured overview to identify key words and point out the relationships between ideas. Graham and Robinson (1989) describe the structured overview as a 'readiness technique' which illustrates the hierarchy of concepts and the propositions connecting concepts. A Graphic Outline may also be used. This helps students deal with the structure of the text. Students complete the graphic outline to help them recognise the organisation of the text and predict the likely

content. Thirdly, a vocabulary identification chart helps students understand subject specific terms or terms within the context of the content area.

Pearce (1985) argues that students must analyse the question they are being asked to address through their reading. This can be done by reading through the question, identifying and underlining key words, then using the key words as subheadings at the state of extracting and organising information.

Selecting text

Strategies such as skimming and survey reading can help students gain an idea of whether material is appropriate for their purpose before reading the detail. Careful word by word reading is unnecessary and time wasting at this stage. A general idea of the main ideas of a text is gained from headings, topic sentences and diagrams. (Education Department of Western Australia, 1987).

Pearce (1985) describes a form of skimming she refers to as ‘survey reading’ to form an overview of an article. She outlines five steps:

1. Read the title. This explains what the article is about.
2. Read the first paragraph to find out what the authors approach is and what is included in the article.
3. Read the sub-headings which are the main topics in the article.
4. Look at the pictures as they help explain the text.
5. Read the conclusion as this provides comments on what has been included in the article or chapter.

When selecting text, students need to read critically. Devine (1981, p.195) lists a set of 10 questions students might keep on hand as they conduct research. The following will help students make judgements about the objectivity and credibility of the text:

- Does the author have the background to write about the topic?
- Does the author display any biases? Do you detect overly strong opinions, emotional language, or prejudice?
- Does the author stand to profit from persuading readers to believe his or her point of view?
- Is the work a contribution to scholarship or a popularisation?

Thinking through reading

Having selected text for reading, students can be helped to understand what is written at three levels: the literal level, what is said in the text; the interpretive level, what the author meant; and the applied level, statements the author would agree with. To do this a three level guide may be used which gives students a series of statements aimed at each of the three levels. Students need to think about what they have read in the text and decide if the author made the statement, meant what the statement says or would agree with the statement (Morris & Stewart-Dore, 1985). Whilst it is possible to provide a three level guide where all students work from a set text, it is not possible to provide such a guide where students are locating and using different texts on the Internet.

Extracting and organising information

Extracting and organising information is the process by which students internalise information. It is the link between understanding and translating the text into one's own words. Students must understand the text, then select and order information into notes. Before students can make notes from text independently, they must possess a number of skills; selecting key words, finding the main idea, seeing relationships between key words, outlining and diagramming. Practice will be

needed, the amount of which depends on the students' experience and ability (Education Department of Western Australia, 1987).

A skeleton outline helps students see the overall plan of the text; the main ideas are first identified then supporting details added. This process turns the text into a visual display and understanding develops in the process of producing it through the necessary re-reading to check facts and understanding (Morris & Stewart-Dore, 1985).

Pearce (1985) suggests a similar process for making notes, though she does not present the steps in as graphic a form as have Morris and Stewart-Dore. She does suggest a couple of additional steps for effective note making. Having made an outline, edit the notes to keep them simple and concise. Information not essential to understanding the topic should be removed. The student should define or replace any words which are not understood.

Translating information from reading to writing

Students come to 'own' the ideas they have encountered in their reading through the retelling of the information as personal text. Retelling through written work should be seen by the student to be a purposeful activity the results of which will be valued. The student should be given the opportunity to write for an audience other than the class teacher reading for evaluation purposes. This encourages the student to avoid verbatim copying (Morris & Stewart-Dore, 1985).

Stepping Out suggests that the writing process be implemented by making it clear to students what writing processes are required of them, and by modelling how to plan, draft and edit work. Discussions of what they are doing with other students will promote metacognition (Education Department of Western Australia, 1996).

Before writing begins, students should discuss among themselves the possible direction their writing might take, the questions to explore and how information

might be located and recorded. Students should then produce a rough draft (Morris & Stewart-Dore, 1985). Conferencing between the teacher and student during this stage provides an opportunity to reflect on ways of writing to meet a purpose and to provide feedback to the student on how they might improve their technique (Education Department of Western Australia, 1996).

The students should review each others' rough drafts which are then redrafted and edited before producing a final copy. Publishing the students' work for an audience and providing the opportunity for students to get a response to their work helps them see writing as a purposeful activity (Morris & Stewart-Dore, 1985). Feedback from the teacher should address the student's process skills as well as the end product (Education Department of Western Australia, 1996).

As discussed in the theoretical background, McGinley and Tierney (1988) emphasise that effective reading and writing are essential for exploring content areas. The stages of the ERICA model (Morris & Stewart-Dore, 1985) and the activities in *Stepping Out* (Education Department of Western Australia, 1996) demonstrate ways in which effective reading and writing strategies can be developed in the content areas. McGinley and Tierney (1988) also found that when student knowledge is activated through writing activities prior to reading, learners become more engaged in what they are reading. *Stepping Out* (Education Department of Western Australia, 1996) and the ERICA model (Morris & Stewart-Dore, 1985) both include activities which are aimed at establishing learners' existing knowledge. Finally, McGinley and Tierney (1988) emphasise the importance of composing as learners must think carefully and deliberately about what was read. The ERICA model (Morris & Stewart-Dore, 1985) and *Stepping Out* (Education Department of Western Australia, 1996) outline the steps learners can take in composing a piece of text from information they have read.

CHAPTER 3: METHODOLOGY

Research Design

A qualitative approach was taken in this study. A case study was conducted in which a single class was introduced to using the Internet research guide. The students were required by the school to prepare an assignment on genetic technology which involved preparing a three minute oral presentation. The original design assumed students would produce a written assignment. The design was subsequently adapted to accommodate an oral presentation.

Observational notes were made and informal interviews conducted with students as they used the Internet research guide to analyse the research topic, search for and select textual information from the Internet which was then used to compose notes from which a three minute oral presentation was given. Having completed the assignment and given the oral presentation students completed a questionnaire. Debriefing interviews were conducted with a group of four students to gather more detailed data regarding students' perceptions of the usefulness of the guide than could be gathered using the questionnaire. A debriefing interview was also conducted with the class teacher.

Participants

The participants were a class of Year 10 science students from a high fee, independent girls' school in an affluent suburb. The school had ample resources available to provide students with access to the Internet.

Instruments

Two instruments were developed for this study; the scaffolded Internet research guide, and a questionnaire designed to elicit from students their perceptions about the research guide.

Internet research guide

The scaffolded research guide was developed based on the principles and techniques examined in the literature review. Where the techniques outlined in the literature review were not appropriate for using the Internet or did not address specific needs of learners using the Internet new techniques were developed which adhered to the theoretical perspective on which the study was based. The guide took the form of five sections aimed at directing students' thinking as they analysed a research topic, searched for and selected information from the Internet, made notes from the selected texts and synthesised the information into a personal piece of writing in the form of notes to be used in an oral presentation. The guide included space for students to note answers to questions where relevant and tables to complete where appropriate. The guide was couched in terms that students could use for any research topic – not just the one used for the study. It was developed through drafting, appraisal and feedback from expert science educators (see Appendix 1).

Questionnaire

The questionnaire consisted of four questions to which students were asked to select one of three responses and then give a reason for their answer. The questions were designed to elicit from students their feelings about using the guide, how the guide compared to research methods they had used in the past, how the assignment prepared using the Internet research guide compared to past assignments and if the students would want to use the guide again. Students were asked to select one of three responses as this assisted in collating and organising data. Asking students to give a reason for their choice provided supporting detail to the response, for example why students did or did not like using the guide or why they felt their assignment was or was not better than other assignments (see Appendix 2).

Procedure

At the commencement of the study the purpose of the study was explained to the students, ie that the researcher was trying to make it easier for students to learn using the Internet and that by helping with the study the students would be making a contribution to that process, that their experiences and opinions would help improve the guide they were to use.

The students were given *Analysing the Topic* and used it to define a research topic, write two or three research questions, establish existing knowledge and define key terms to use when searching the Internet. In the next session students used the computer room in the library to search for and select information from the Internet. The *Reading and Searching* and *Selecting* sections of the guide were given by the teacher. Students were allocated one class session in the computer room with further searching done in their own time. During the class session the researcher was present to observe, answer questions and make notes.

Having selected information, students were given the *Summarising* section of the guide which provided scaffolding for students as they analysed and summarised the information. This was given to students in class time and it's purpose explained then students completed the summaries in their own time. No class time was devoted to this. Students were given the *Writing* section during class time. They then had to synthesise their summaries into a piece of personal writing addressing the research topic in the form of notes to be used in an oral presentation. Again, this was done in students' own time. In most cases a family member reviewed the students' work.

After a week, student groups gave their oral presentations. Observational notes recorded by the researcher, the completed Internet research guide and students' notes, palm cards and overhead transparencies used in the presentations were collected for analysis. All students completed a questionnaire and a debriefing interview was conducted with a group of four students. A debriefing interview was also conducted

with the class teacher. Thanks were extended to students and staff for their participation.

Throughout the implementation of the strategy the researcher assumed the role of participant observer. A constructivist and interpretive perspective was brought to the study and eight years of classroom experience was used in interpreting data and discussing practical aspects of implementing the Internet research guide with the teacher.

Data Analysis

The completed research guide, notes, palm cards, overhead transparencies, observational notes made by the researcher as well as debriefing interviews with students and the teacher were collected and analysed to address research questions two and three.

Notes made by students on the research guide provided data on how well they analysed the topic and whether they could draw on existing knowledge to analyse the topic. The summaries produced by students provided data on their ability to select information relevant to the topic and to analyse and comprehend the selected information.

The final pieces of written work produced by students were analysed to determine if students had addressed the original research question and had been able to take on as personal knowledge the textual information. The questionnaire was used to determine students' attitudes to using the Internet research guide and how the Internet research guide compared to what they had used in the past to prepare assignments, how this assignment compared to assignments prepared in the past and if they would like to use the guide again. Debriefing interviews with students gave a more detailed insight into students' perceptions of the guide. An interview with the

teacher after the strategy had been implemented revealed the perceived strengths and weaknesses of the guide and suggestions for improvement.

CHAPTER 4: RESULTS

Observational Notes

Observations were carried out over a week long period while students prepared their assignments. The researcher assumed the role of participant observer and interacted with students on a one to one basis to clarify what was being done. The class teacher gave all instructions. Students were given an assignment on the topic of Genetics. Their task was to prepare a three minute oral presentation on one application of genetic technology. Students were given an assignment sheet which listed possible topics including genetic fingerprinting, genetic screening for inherited diseases and gene manipulation. Students could choose a different topic after first checking with the teacher that it was relevant. Ethical implications had to be discussed. Marks were allocated for thorough information, confidence of presentation, use of audiovisual materials, discussion of ethical implications and keeping to time.

Preparation

Students formed groups of three for working on their assignments. Students chose their own groups based on friendship relationships and any allocation of tasks occurred informally within the groups. The teacher handed-out the assignment sheet and read through it with the class explaining the task. She then went on to explain that the class would be using the Internet research guide to help them prepare their assignment as part of a trial and that the researcher would be in class to see how it was working. Students were given the section of the research guide *Analysing the topic* then given 15 minutes in which to work through it. At the end of this time half

of the students had clarified their questions, two groups had got to the main ideas and two groups were still trying to decide on a topic. During this time the teacher entered into discussions with individual groups answering students' questions and helping establish topics for study. The students that had got as far as listing other ideas connected to main ideas were not necessarily getting more specific. For example:

Topic: Forensics

Main idea: Murder

Idea connected to this: People.

Searching the Internet

Students were booked into the computer room in the library for a full lesson to give them time to search the Internet for articles. There were enough computers for students to work alone or in pairs. The lesson began with the teacher handing out the sections of the research guide *Searching and Reading* and *Selecting*. She explained their purpose and read through them, then gave students the go ahead to begin searching.

Very little use of the newly introduced sections of the Internet research guide was observed during this session. Students went straight to search engines they were familiar with and entered search terms from the *Analysing the Topic* section completed in the previous lesson and at home.

During this time the librarian introduced herself to the researcher and discussed the experience students had in using the computers. Students spent six one-hour sessions in the computer room with the librarian at the start of the year practising using the search engines. Comments made by students during informal discussions

held as they worked revealed that they were confident in their use of the search engines and did not consider the help provided in *Searching and Reading* and *Selecting* necessary.

By the end of the session most students had printed-off one or two articles. Those that the researcher was able to examine were relevant to the chosen topics and gave broad background information on which the assignment could be based.

This was the last occasion on which students were given class time to work on their assignments. Further searching of the Internet or other sources of information was carried out in the students' own time. It was therefore not possible to observe the entire searching process. The students were given the summarising and writing sections of the guide during the following lesson, but these were completed in their own time so it was not possible to observe their use. Information on the usefulness of these sections was obtained by reading the completed summary sheets, through the student questionnaire and student interview.

Presentations

A full lesson was set aside for students to give their presentations. The teacher and the researcher observed from the back of the room whilst students gave their presentations from the front enabling them to make use of audio visual equipment such as the overhead projector, television and video.

The first group presented the topic of genetic cancers, specifically bowel cancer. The students had produced palm cards and a short written summary on which their talk was based. The content was relevant and accurate and the students demonstrated a clear understanding of the topic through their ability to speak without

having to read word for word from their notes and adopting a conversational tone. Examination of their completed Internet research guides revealed that the students had made full use of *Analysing the Topic*, the summary sheets were completed in accordance with the directions and students had received feedback from parents on the review form after practicing their presentation.

The second presentation was on cloning. This group was able to take the scientific information they had collected and present it through the example of the movie *Jurassic Park*. They were using their peers' life-world knowledge as a conceptual framework on which to base new learning. They adopted an informal style of speech and had summarised their articles into a set of palm cards and notes in point form from which they gave a coherent presentation. As with the first group, examination of the students' Internet research guide revealed that they had made full and intended use of the guide.

Two groups gave presentations on genetic fingerprinting. In both these groups the notes that they used during the presentation were mostly written in paragraph form rather than point form. The notes were in the students own words and the students relied on them more than those in the first two groups. Examination of the Internet research guides revealed that the students had not thoroughly analysed the topic and had made very brief notes in the *Summarising* section which were insufficient to base a whole presentation on.

One group gave a presentation on disease resistant crops. This group had produced palm cards in the students' own words, but they lacked continuity and fluency of ideas in their presentation. The group used a very detailed table of disease resistance in peanuts, but did not give a clear explanation of what it showed. They

were unable to explain how the genetics of the plants were affected by the spraying of chemicals to confer resistance to disease. This group did not submit an analysis of the topic or the summary sheets. They only submitted the review form from the writing section.

Student Questionnaire Data

When the students had completed and presented their assignments a questionnaire was administered (see Appendix 1). Students selected a positive, neutral or negative response to each of four questions and gave a reason for the response. The reasons were categorised and the number of responses in each category recorded. The data are summarised in Tables 1-4.

Table 1
Student responses to Question 1: How did you feel about using the Internet research guide? (n=21)

| Response | Frequency | Reason | Frequency |
|-----------------|------------------|-------------------------------|------------------|
| Like | 10 | Know what to look for | 6 |
| | | Easier to write up | 1 |
| | | Helped get started | 1 |
| | | Helped do assignment | 1 |
| | | Something new | 1 |
| No feelings | 6 | Same amount of work | 2 |
| | | Too troublesome | 1 |
| | | Didn't think about it | 1 |
| | | Prefer to use book & Internet | 1 |
| | | Writing section useful | 1 |

| | | | |
|---------|---|---------------------------|---|
| Dislike | 5 | Too may sheets to fill in | 3 |
| | | Didn't see the point | 2 |

Table 2

Student responses to Question 2: How did the Internet research guide compare to what you have used before to prepare assignments? (n=21)

| Response | Frequency | Reason | Frequency |
|-----------------|------------------|--------------------------|------------------|
| Better | 13 | Better organised | 6 |
| | | Easier to do assignment | 2 |
| | | Making notes helped | 2 |
| | | Better but more work | 2 |
| | | Helps get to the point | 1 |
| No different | 4 | Used same resources | 3 |
| | | Nothing changed | 1 |
| Worse | 4 | Took too much time | 2 |
| | | Couldn't just get a book | 1 |
| | | Too much writing | 1 |

Table 3

Student responses to Question 3: How do you feel the assignment you have prepared using the Internet research guide compares to other assignments you have done? (n=21)

| Response | Frequency | Reason | Frequency |
|-----------------|------------------|---|------------------|
| Better | 8 | Better organised, so easier to write | 5 |
| | | Better but more work & time | 1 |
| | | Understood subject | 1 |
| | | Family helped | 1 |
| No different | 11 | Normal standard | 4 |
| | | Can't compare – different | 3 |
| | | No different in outcome but better researched | 1 |
| | | Because left to last minute | 1 |
| | | Presentation too broad | 1 |
| | | Always use Internet | 1 |
| Worse | 2 | Spent time on guide, not assign. | 1 |
| | | Didn't have enough time | 1 |

Table 4

Student responses to Question 4: Would you want to use the Internet research guide again? (n=21)

| Response | Frequency | Reason | Frequency |
|-------------|-----------|---|-----------|
| Yes | 13 | Helped organise information | 8 |
| | | Helped a lot | 2 |
| | | Helped find information | 1 |
| | | Would help with hard assigns | 1 |
| | | Worked well but took a while to prepare | 1 |
| | | | |
| Indifferent | 1 | No reason given | 1 |
| No | 7 | Wouldn't use it | 2 |
| | | It's extra work | 1 |
| | | Too troublesome | 1 |
| | | Don't know how to use it | 1 |
| | | Didn't help | 1 |
| | | Just another thing on my mind | 1 |

The data in Tables 1-4 reveal that overall 52% of the students found using the guide a positive experience as it helped them know what to look for and organise their work. Twenty-seven percent of responses were neutral. These students felt the research guide had not affected the amount of work they did or the result they achieved. Twenty-one percent of responses were negative and referred to the amount of work involved.

Question 1. How did you feel about using the Internet research guide?

Of 21 students, 10 liked using the guide, the primary reason being that it helped them work out what information to look for. Six were indifferent to its use and five didn't like it as it contained too many sheets to fill in and they didn't see the point of it.

Question 2. How did the Internet research guide compare to what you have used before to prepare assignments?

Thirteen of the 21 students felt the Internet research guide was an improvement on what they had previously used to prepare assignments. They felt they were better organised and completed the assignment more easily than past assignments. Four students felt they had done nothing differently and four felt the Internet research guide was worse than their previous assignment preparation methods as it was too time consuming or too much work.

Question 3. How do you feel the assignment you have prepared using the Internet research guide compares to other assignments you have done?

Of the 21 students, eight felt their assignments prepared using the guide were better than previous assignments, the main reason being that they were better organised which made it easier to write the assignment. Eleven students felt the assignment they produced was of a similar standard to previous assignments. Of these, four simply said it was their normal standard. Three could not make a comparison as this assignment involved an oral presentation not the usual essay-style report. One felt the assignment was better organised, but the outcome was no

different. Two students felt their assignments were worse. One felt not enough time was given to complete it and one felt spending time filling-in the guide took away from the time spent writing the assignment.

Question 4. Would you want to use the Internet research guide again?

Thirteen of the 21 students indicated that they would like to use the Internet research guide again. The main reason given was that it helped them organise their information. Seven students did not want to use the guide again. Reasons given included that it was too troublesome, it was extra work and it didn't help. One student was indifferent to its use and gave no reason.

Student Interview

When students had completed the questionnaire, an interview was conducted with a group of four students. The discussion was recorded and was based on the questions below:

1. Did you find using the guide made doing your assignment easier or harder?
2. Did you find you worked more effectively or was it more difficult to get organised?
3. What was your teacher doing with people as you worked with the Internet research guide?
4. What do you think the purpose of *Analysing the topic* was? Did this affect how you searched for articles?
5. What did you think of the section on *Selecting*? Did you check through all the points for each article or did you use it in a different way?

6. How did you find making the summaries?
7. How did you use the *Writing* section?
8. What did you think of reviewing someone's work and having them review yours?
9. What changes would you make to improve the guide?

The discussion with the group of students became very interactive with five main themes emerging.

Theme 1: Analysing the topic before going to the Internet helped students organise their ideas.

Students were given a degree of freedom in selecting the topic of their assignment. Discussion with the students revealed that they found the *Analysing the Topic* section of the research guide very useful in establishing which aspect of genetic technology they were going to study. It also helped them organise their ideas and establish key words and ideas which could be used as search terms when they went to search the Internet for information. Student comments which illustrate this view included:

“Because you kind of could go into the Internet and that. If I don't find anything under that I can look here.”

“It was easier for like, separating things.”

“I'd say the first part really helped you get organised.”

Theme 2: Students felt they did not need a lot of notes on relevance, but found the section on credibility useful.

Students felt that they could assess the relevance of an article without the aid of the Internet research guide.

“I think that’s kind of self...I mean, we already know that.”

Credibility was more of an issue and students felt the questions designed to assess author credibility were a worthwhile inclusion.

“I think it made you aware that you should be looking at who the author is so if it’s like um some guy who’s doing a school project you kind of like think...”

Theme 3: Putting information into their own words was helpful, but being given lots of blank sheets was daunting.

Having printed-off articles, the students found working through the *Summarising* section useful as it helped them process the information before composing the assignment. They felt, however, that being presented with four blank summary sheets was off-putting.

“The first few pages were OK, but I felt that the summary pages because you had just lots of spaces with fill this in...”

“I found the ‘In your own words’ bit really good because then we could just do the bit that you actually used.”

“I liked the bit where you had to put it in your own words.”

Theme 4: The writing section was useful – particularly the review.

The students were in agreement that the guidelines for writing their assignment were useful. Specifically they felt that having someone fill in the review form was an

improvement on what they had done in the past. If they had asked someone to check their work they would just skim it and say it was OK. Using the review form gave them more specific feedback.

“I liked the review. That was good ‘cos then someone else critically could tell you what you were doing wrong.”

Theme 5: The Internet research guide was perceived by students to be long and a lot of extra work on top of the assignment.

Students found the number of pages in the Internet research guide daunting; in particular the *Summarising* section. They did not say that it was difficult to follow or hard to do; just that there was so much of it. The guide was not perceived as an integral part of the assignment preparation process, but as an extra task to be completed when students were already doing the assignment which added to the concern over its length.

“People think it’s more work.”

“If you maybe made it shorter”

“So they don’t think I’ve got to do all this as well.”

Teacher Interview

An interview was conducted with the class teacher after she had assessed the students’ work. The interview was based on the following questions:

1. What were your overall feelings about the guide?

2. Do you feel using the guide was a positive or negative experience for the students?
3. Did you find it a positive or negative addition to the students' assignment preparation?
4. What are your feelings on the useability and usefulness of each of the sections:

Analysing the topic

Searching and reading

Selecting

Summarising

Writing

5. What changes do you feel would improve the guide.
6. Would you use the guide again with this class? With another class? Reasons?

Overall

The teacher felt the Internet research guide was very good and helped the students focus on the task. Using the guide was a positive experience for most students. She felt this group was more focussed than last year's classes. This may have been due to using the Internet research guide, however the assignment had been revised since last year which may also have had an effect.

Analysing the Topic

The teacher felt that this section was good and she would use it without change with another two classes due to do the assignment.

Searching and Reading.

It was felt that this section could be condensed to a few key points to make it more useable.

Selecting

The section on credibility was thought to be useful, but these students did not need the section on relevance.

Summarising

The format of this section was thought to be good and not in need of change, but students needed to be given the headings only once. It was not necessary to provide lots of blank sheets.

Writing

This section the teacher felt was good. It was nice and short. The review form was fine and she would use this section without change with other classes.

The results show use of a scaffolding guide assisted students with their research. Students were able to search in a logical way, select references that were relevant and credible, present an outline of the text reflecting an ability to analyse and comprehend the content. Students were able to take on as personal knowledge what they had read as reflected in the construction of a concise set of notes on which a coherent oral presentation was based. The research guide was perceived as useful by students and the class teacher. The results are consistent with findings in the literature as discussed in the following chapter.

CHAPTER 5: DISCUSSION

The results of the study into the effectiveness of the Internet research guide are consistent with findings in the literature. The importance and effectiveness of scaffolding, the importance of students assuming responsibility for their own learning, the crucial nature of prior knowledge and experience in determining whether new information will make sense and be used to construct new personal knowledge, the active and productive nature of reading and writing as a means of learning and the usefulness of composing personal text are all assertions made in the literature borne out by the study. The study confirms the effectiveness of techniques for preparing for reading, selecting information, extracting and organising and translating information found in the literature.

Collins, Brown and Newman (1989) state that scaffolding can help a novice perform a task which cannot be managed alone. Bickmore–Brand (1996) suggests that classroom teachers can provide routines and materials as scaffolds to support students as they develop new skills. The majority of students who used the Internet research guide felt that it supported them in organising their ideas and completing the assignment. They felt that they completed this assignment more easily than past assignments. The class teacher believed that using the Internet research guide had helped students focus on the task and that using the guide was a positive experience for most students. *Analysing the Topic, Selecting, Summarising* and *Writing* were the most useful parts of the guide as scaffolds.

Cambourne (1996) asserts that one of the conditions of learning is that students assume responsibility for decision making about their own learning. In the assignment given in the study it was up to students to decide what they were going to

study within guidelines given on the assignment sheet. During the student debriefing interview the students stated that the *Analysing the Topic* section of the Internet research guide was very useful in deciding what to study and to clarify existing knowledge and key terms. It was observed that within 15 minutes of using *Analysing the topic* over half the students had been able to determine and begin analysing the topic of their research.

By establishing and organising existing knowledge in *Analysing the Topic*, students were better able to make connections between new information and existing knowledge when they accessed the Internet. Bickmore-Brand (1996) suggests that making these connections helps construction of new knowledge.

McGinley and Tierney (1988) emphasise that reading and writing are active and productive processes. Writing before reading helps activate students' existing knowledge and helps them become engaged in what they then read. Writing after reading results in learners performing better at description, interpretation and generalisation and induces one to think carefully about what has been read. In the study students were given the opportunity to write before reading in *Analysing the Topic*. They then had to write after reading to complete the summaries then go on to compose their text using the *Writing* section as a scaffold. Students who didn't want to use the Internet research guide stated it was "extra work," "troublesome," "an extra thing on my mind." The Internet research guide requires students to be active learners and engaged in what they are reading and writing. This is not an easy, passive process and is a necessary part of constructing new knowledge. To create a three minute oral presentation students had to extract, organise and translate

information and compose concise notes or palm cards. Students who used the Internet research guide in its entirety were able to do this.

The literature suggests strategies for helping students with reading and writing. Morris and Stewart-Dore (1985) and Graham and Robinson (1989) state that students need to be prepared for reading and that it is important to establish what is known and identify key terms before starting to read. Pearce (1985) suggests that students must analyse the question as preparation for reading. *Analysing the topic* fulfilled this role in the Internet research guide. Students who liked using the guide felt that this section helped them work out what information to look for when they began reading by establishing key terms and main ideas which could be used as search terms. The student debriefing interview revealed that students felt this section helped them organise their ideas on what they were going to study and what they already knew about the topic. *Analysing the topic* had to address the issue of students preparing to read from a vast amount of textual information on the Internet rather than one text the teacher has already read as the structured overview or graphic outline suggested by Morris and Stewart-Dore (1985) and Graham and Robinson (1989) are designed for.

There were no suggested techniques in the literature for helping students select a search engine and how to most effectively use the search engine to find information. The *Searching and Reading* section of the Internet research guide was designed for this purpose. The section was used very little in the study. Observation of the students using the Internet confirmed that students in this school were well versed in accessing an appropriate search engine and had little need of a scaffold for this part of the process. In addition the class teacher felt this section was too long and needed to be condensed to a few key points.

When selecting text Pearce (1985) outlined five steps to follow when skimming the text to determine if it is relevant and Devine (1981) listed 10 questions to ask to determine if a text is credible. The *Selecting* section of the Internet research guide was based on these steps and questions. Whilst the steps and questions addressed relevance and credibility, the students and the class teacher felt the section was too long. As a result it was not used a lot, though the students did find the questions for establishing if the author was credible useful as there is a lot of information on the Internet without credible authors. It was suggested by the class teacher that further condensing of the section would make it more useable.

Morris and Stewart-Dore (1985) suggest the use of a skeleton outline as a means of extracting and organising information. They suggest producing it helps develop understanding as it stimulates re-reading to check facts and understanding. The *Summarising* section of the Internet research guide is based on this premise. Students found this section useful, in particular the *In My Own Words* section which required them to reformulate main ideas into their own words. The class teacher also felt this section was good and not in need of change, though she felt students did not need to be given multiple copies.

Morris and Stewart-Dore (1985) state that students need to retell information as personal knowledge for some meaningful purpose to encourage students to avoid verbatim copying. It was observed during the student presentations that those students who completed all parts of the Internet research guide were able to retell information as personal knowledge. The group which could not explain the details of

their topic on genetically modified organisms did not submit *Analysing of the Topic* or the summary sheets.

From the above discussion it can be seen that the study confirmed the theoretical assertions drawn from the literature. Application of the techniques for helping students prepare for reading, select text, extract and organise information and translate textual information was generally successful with some modification to the length of sections *Reading and Searching* and *Selecting* being recommended.

CHAPTER 6: LIMITATIONS, CONCLUSIONS AND IMPLICATIONS

Limitations

The purpose of the study was to develop and evaluate a scaffolding guide to help lower secondary science students use the Internet. Specifically how to search for, select and organise information for the construction of personal text from sources on the Internet.. In drawing conclusions from the trial of the guide, the limitations of the study need to be considered.

Participants

The study was conducted in a high fee, independent girls' school in an affluent suburb. The school emphasised computer literacy and had the resources available to provide students with ample opportunity to develop sound computing skills. The students who participated in the study had previously completed six hours of instruction on using Internet search engines. The sample did not include boys nor a range of socio-economic backgrounds or school facilities. The participants were therefore not representative of the general student population.

Sample size

Only one class of 21 students participated in the study. The small sample size means the results must be seen in the context of a case study with conclusions drawn from the results applicable to this sample only and not generalisable to the wider student population.

Assignment

The students were required to prepare a three minute oral presentation on one application of genetics with students being assessed on thoroughness of information, confidence of presentation, use of AV material discussion of ethical implications and

keeping to time. Students were not required to submit a written report. The assumption of the research questions was that students would prepare a written piece of work that could be assessed. As this was not the case, research questions 2d and e could not be answered as originally framed, but were addressed in terms of the oral presentation.

Conclusions

The purpose of the study was to develop and evaluate a guide for students when using the Internet to search for and select information for a lower secondary science assignment. In particular a number of research questions were posed.

What skills are needed by students to search for and select useful information from the Internet and construct a personal text from that information?

This question was addressed by conducting a literature review. A study of relevant literature revealed that the skills needed by students to successfully search for and select useful information from the Internet and construct a personal text include:

1. Establish what is known about a topic before starting to read about the topic (Morris & Stewart-Dore, 1985).
2. Analyse the research question (Pearce, 1985).
3. Gain a general idea of the main ideas of a text by skim reading headings, topic sentences and diagrams (Education Department of Western Australia, 1987).
4. Read critically and make judgements about the objectivity and reliability of the text (Devine 1981).

5. Internalise information by extracting and organising information from the text (Morris & Stewart-Dore, 1985).
6. Retell information as personal knowledge and thereby come to 'own' ideas encountered in reading. This should be done through the construction of written text for an audience (Education Department of Western Australia, 1987).

The sections of the Internet research guide *Analysing the Topic, Searching and Reading, Selecting, Summarising and Writing* were designed to provide a scaffold for students to develop these skills.

Does using the guide to scaffold students' research support quality learning as evidenced by

a. Students search in a logical way avoiding navigational problems

The Internet research guide helped students search in a logical way by providing a scaffold for them to clarify and analyse the topic of the research, establish what was known about the topic and identify key terms and ideas that would be used as search terms. The guide also helped the students establish the credibility of the author of articles. Use of the *Searching and Reading* section was minimal as were the points on establishing relevance as this particular group of students were practiced in these skills and the scaffolding was not needed.

b. Selected references are relevant and credible

The information used by students in their presentations was relevant to the topic of their research and credible.

c. Students present a skeleton outline of the text reflecting an ability to analyse and comprehend the content

Students produced outlines of the text in the form of a summary sheet in which they recorded information under the headings of *Sub-headings*, *Key words and phrases* and *In my own words*. Students were able to use *In my own words* to write simpler, less technical versions of what they had recorded under *Key words and phrases* and to record definitions of scientific terms. This reflects an ability to analyse and comprehend the text.

The point was raised by students that often articles on the Internet are very long and they may only need one section for their assignment. This is reflected in the students' summary sheets as often only one or two sub headings are referred to. This would suggest the students are analysing the text previous to writing the summary to determine which sub-headings are likely to contain relevant information.

d. Students take on as personal knowledge what they have read as reflected in written work that does not include verbatim copying and is written as a constructed text.

Students had a time limit of three minutes in which to give an oral presentation on an application of genetic technology including ethical implications. To do this successfully, students' needed a sound understanding of the articles collected in order to construct a concise set of notes on which to base a coherent presentation.

Some students used the Internet research guide to thoroughly analyse the topic and summarise the formal, academic text of the articles retrieved from the Internet. These students produced palm cards or notes written in a conversational tone suitable for addressing an audience of their peers. Their notes explained the methods and uses of the chosen technology, were logically ordered, included their own interpretations and thoughtful, informed discussion of ethical issues. No student who used the

Internet guide as intended gave a presentation suggesting a lack of understanding of the topic.

Students' whose presentation notes were more disjointed and relied more heavily on direct reference to the original articles had, in general, made little attempt to analyse the topic, particularly determining what was already known about the topic and considering key words and ideas. The summary sheets were virtually unused.

e. The final piece of work addresses the original research question.

Students were given guidelines within which they determined their own research questions. The assignment required them to research an aspect of genetic technology. Students chose topics such as genetic fingerprinting, cloning, and genetic disease. They then determined which aspects of the topic they would explore. Student presentations did address their research questions but how much this can be attributed to use of the research guide and how much to the students' determining their own course of research rather than having the question decided for them is difficult to say.

3. Do students and the classroom teacher perceive the guide to be useful and a resource they want to use?

Having used the Internet research guide, twice as many students said they would like to use it again as said they would not like to use it again. Those that would like to use it again found it helpful primarily for organising and finding information. Those that did not want to use it again cited "wouldn't use it", "it's extra work" and "too troublesome" amongst their reasons. The class teacher felt the Internet research

guide was useful and had helped students focus on the topic. She planned to use sections of the guide without modification with other classes. The teacher felt *Searching and Reading* and *Selecting* needed simplifying before being used again.

Implications for Further Development of the Guide.

The students, teacher and researcher were all in agreement as to which parts of the Internet research guide proved to be useful in their current and which parts were in need of further development and the type of development that needed to be done.

The sections on *Analysing the Topic* and *Writing* were considered by all to be useful and easy to follow. The *Summarising* section did not need to be rewritten, but in any future trials students would only need to be given one copy of the table rather than several blank ones. Students were daunted when they initially encountered the *Summarising* section by the amount of blank space they felt they had to fill. By providing just one copy of the summarising guide and getting students to draw up their own copies for articles after the first one, they develop the section for themselves as they go rather than being confronted with a lot of empty pages all at once.

The sections on *Searching and Reading* and *Selecting* were the two sections which everyone agreed were in need of change. The section on *Searching and Reading* was intended to give students some guidelines as to how to search using two of the most commonly used search engines *Yahoo!* and *Infoseek*. However it was too wordy and students were not going to keep referring back to it once they started using the Internet. The teacher suggested condensing the section to a few key points. This

could be done with the points presented in table form for easier reference and incorporating a couple more search engines to give more choice.

The section on *Selecting* was intended to prompt students to question the relevance and credibility of an article before selecting it for use in the assignment. Again, the problem was that it was too wordy for students to refer to as they searched the Internet. The students and teacher also felt that for this particular group of students the points on assessing the relevance of the article were unnecessary. Whilst this may be so for the students in this study, it may not always be the case, so a revised version of the guide would still include both relevance and credibility, but both could be condensed and put in a format more easily used as a quick reference.

Implications for Further Research.

Once the Internet research guide has been revised it would be necessary to carry out further trials in order to draw more generalisable conclusions. Trials would need to be performed in several schools to obtain information from students with a range of:

- previous experience in using the Internet;
- existing skills needed to complete science assignments;
- attitudes to science and assignment preparation; and
- computer facilities available at school and at home.

Feedback from boys as well as girls would also be needed to give a more complete picture.

In any further trials it would be desirable for the guide to be included as an integral part of the assignment rather than something separate from the assignment.

Students in this trial who did not like using the guide felt that they were doing a lot of extra work for no extra marks. Through inclusion of the guide as part of the assignment, students may begin to develop an understanding that learning from constructing personal text is not a passive act of cutting and pasting, but a process of active learning which requires effort and practice of skills.

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APPENDICES

Internet Research Guide

Analysing the topic

- What is the topic of your research?
- Write two or three questions to guide your research.

- What do you already know about the topic? Talk about it and write down everyone's ideas.

- Some of the main ideas/ key words/ terms related to the topic are:

| | | | |
|----|----|----|----|
| 1. | 2. | 3. | 4. |
|----|----|----|----|

- Other ideas connected to these are:

| | | | |
|----|----|----|----|
| a. | a. | a. | a. |
| b. | b. | b. | b. |
| c. | c. | c. | c. |
| d. | d. | d. | d. |

Searching and reading

Go to one of the search sites on the Internet such as Yahoo! or Infoseek. Use the words on the previous page to search for articles related to your research question.

All search engines are a little different, but each will have a text box which is where you type in the word or words you want to search for and a search button which you click to begin a search. You can get help by clicking a **Help** button (it may be labelled Tips or Huh?). Click **Back** after reading the information to get back to the page with the text box.

Yahoo!

You can type a term into the text box straight away, but Yahoo! lists categories under the text box. Click on one of these and you will get a more specific list from which to choose. Type in a word from those you wrote on the previous page and search the category you have chosen.

Infoseek

If you are using Infoseek you can type in a single word or several words to make the search more specific. Here's how you do it:

- **“human digestive system”** If the words are between quotation marks, they will be found in the exact order you type them.
- **digestion-human** If the words are separated by hyphens Infoseek will find both words as long as they are close together in the document.
- **[digestion human]** If the words are in brackets Infoseek will find the words if they appear together, but not necessarily in the order you type them in.

Selecting

Is the article relevant?

When you have found an article, you need to decide if it is talking about what you need to know:

- Read the title. This explains what the article is about.
- Read the first paragraph to find out what is included in the article.
- Read the sub-headings which are the main topics in the article.
- Look at the pictures. They help explain the text.
- Read the conclusion. It summarises the main points and arguments presented in the article.

Does the article talk about what you need to know? Will it help you answer your research questions?

No? Leave it!

Yes? Read on:

Is the article objective, balanced and is it written by a credible author?

Not all information on the Internet is written by people who are being 100% truthful or know what they are talking about. go through this checklist to decide if the article is good enough to use.

- Who is the author? Does the author have the background to write about the topic?
- Does the author seem biased, give strong opinions or use strong language?
- Will the author gain something by persuading readers to believe his or her point of view?

Do you still think the article is worth using?

No? Leave it.

Yes? Make a copy. (Your teacher will explain how)

When have I got enough information?

Look back to the questions you wrote to guide your research. When you have collected enough information to answer these questions you can move on to summarising the articles.

Summarising

A summary of the articles helps you pick out the important details and organise the ideas. this makes writing your assignment much easier. Complete a summary sheet for each of your articles.

Summary Sheet.

| | | |
|----------------------------------|---|---|
| Reference | _____ () _____ | _____ |
| | Author Year Title | Internet address |
| Sub headings | Key words and phrases | In my own words |
| Write important subheadings here | Read the section of the article following the sub-heading and record the key words and phrases relevant to your topic | Write down in your own words the main ideas in this section of the article. |

Summary Sheet.

| | | | | |
|-----------|--------|------|-------|------------------|
| Reference | _____ | () | _____ | _____ |
| | Author | Year | Title | Internet address |

Sub headings

Key words and phrases

In my own words

Writing

1. Draft.

Decide on the format you want to use. An article? Poster? Overhead transparency? Booklet?

Decide on your headings and subheadings. Jot these down leaving space to fill in the details.

Now use your summary sheets to help write a rough draft. Think about who your audience is and write for them.

Think about if and where you want to include diagrams. As you write, chat to friends and your teacher about what you're doing. You may get ideas on improving your work as you draft.

2. Review

When your draft is finished, choose a classmate to work with and review each other's work. On the review form write down what you think the person has done well, if anything is unclear and suggestions for improvement. Do this by completing the sentences.

Review for _____

1. I really like...

2. Can you explain...

3. Maybe you could...

signature: _____

(Writing cont)

3. Redraft and Edit

Use the review to help redraft your work. Get your work checked for spelling and grammar and any tidying up that needs doing.

4. Final Copy

When you are happy with it, produce your final copy.

5. Present your work to your audience.

You may do this personally or you may have decided to publish copies of your writing.

6. Response.

Give your audience an opportunity to respond. For example, what have they learnt? what did they find most interesting?

Internet Research Guide - What did you think?

1. How did you feel about using the Internet research guide?

- a. Like
- b. No feelings
- c. Dislike

Reason:

2. How did the Internet research guide compare to what you have used before to prepare assignments?

- a. Better
- b. No different
- c. Worse

Reason:

3. How do you feel the assignment you have prepared using the Internet research guide compares to other assignments you have done?

- a. Better
- b. No different
- c. Worse

Reason:

4. Would you want to use the Internet research guide again?

- a. Yes
- b. No

Reason:

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