INTEGRATING TECHNOLOGY INTO A GRADE FIVE RESOURCE-BASED WEATHER UNIT

ELLIS ABEL POPE

Integrating Technology into a Grade Five Resource-based Weather Unit

By

Ellis Abel Pope, B.A., B.Ed.

A project
submitted to the School of Graduate Studies
in partial fulfillment of the requirements for the
Degree of Master of Education

Faculty of Education

Memorial University of Newfoundland

October 1999

St. John's Newfoundland

TABLE OF CONTENTS

ABSTRACT

It is the responsibility of educators to prepare students for success in today's society. This success requires more than enabling students to follow direct instruction and perform rote tasks. It requires confidence, flexibility, good communication and problem solving skills as well as technological competencies. Individuals must be equipped with necessary skills to engage in lifelong learning.

A review of literature in this project indicates that when technology is integrated into the school's curriculum, it can positively influence the teaching and learning process. It provides students with the opportunity to develop lifelong skills required for success in the world outside the classroom. Appropriate integration requires a change in the school's curriculum. Teachers are willing to make this change, however, they need more than just the technology guidelines provided by the Department of Education.

In addressing this need, this project was developed to integrate technology into a resource-based weather unit. Resource-based learning allows students to use many resources so they can actively construct their own knowledge. *Integrating Technology into a Resource-based Weather Unit* is an example of how technology can be effectively integrated into the grade five curriculum. In this unit, resources and activities are carefully selected and where possible reflect a constructivist model of teaching and learning.

This project contains four chapters: Chapter I identifies the background and rationale for the project; Chapter II provides a review of literature as it relates to the project; Chapter III discusses the implementation of the project; and Chapter IV contains the actual project, including

a unit planning guide. This guide includes the objectives and skills to be achieved, centre cards and evaluation sheets, as well as student workbooks. The first three chapters provide the basis for the fourth chapter. Together, all four chapters were written to fulfil the requirements for the degree of Master of Education.

ACKNOWLEDGEMENTS

Completion of this project would not have been possible without the guidance and support of a number of people. First, a special thanks to Dr. Roberta Hammett, my supervisor who helped me develop and edit this project. I appreciate Dr. Hammett's unlimited patience, advice and assistance.

Secondly, thank you to my grade five class. The experience of teaching them has become the foundation for creating this project.

Most of all, a very special thank-you to my wife, Kimberly, whose continuous support and words of encouragement have enabled me to complete my graduate work. Her past four summers have been spent supporting me through my graduate courses and through researching and writing of this project. She is a treasure I will always cherish.

Lastly, thank-you to my little girl, Mackenzie. She arrived just in time to be the sunshine that motivated me to complete this project.

INTRODUCTION

It is the responsibility of educators to help prepare students for a proper education. We have to ensure that they all have equal access to knowledge. This involves providing students with the best possible environment for learning. This environment must take into account the rapid changes in information and technology in our society. With information changing so fast, we can no longer provide students with just a knowledge base but must also provide them with opportunities to acquire the skills needed to learn. We have to provide experiences that enable students to learn more effectively, as well as experiences that allow them to apply what they have learned to other situations. Yet, from my experience and through conversation with co-workers, I suggest technology in our grade five classrooms has not been effectively used in order to enhance the learning environment.

The major use of technology in my school emphasizes drill and practice techniques as well as word processing. Unfortunately, the Department of Education in Newfoundland has published only guidelines and objectives for the use of technology in our schools. There is no developed curriculum nor direct instructions on how to carry out these guidelines in the classroom. It is thus appropriate to develop and provide teachers a unit of study that might assist them in meeting the guidelines provided by the Department of Education for teaching technology at a grade five level. The purpose of my project is to implement these guidelines by integrating technology in a resource-based weather unit.

The weather unit, complete with suggested activities and instructions, is chapter four of this document. It is introduced in chapter one, which identifies the background and rationale for this project. Chapter two provides a review of literature relating to the concepts underpinning the

unit. Chapter three discusses the implementation of the project. Lastly, chapter four includes a unit planning guide, complete with the objectives and skills to be achieved, centre cards and evaluation sheets, as well as student workbooks.

CHAPTER ONE

Rationale / Background

A greater understanding of the need for effective technology integration in the grade five classroom can be gained by considering the past and present use of technology in our particular school. In the past, we have tried to keep up with innovative equipment but sometimes lacked knowledge of how this equipment should be integrated into the existing curricula. We had the tools but did not understand the process of using these tools for interactive learning. For example, in the 1980s, our school purchased several Commodore 64 computers for the elementary classrooms. These computers were used mainly for games such as mazes or for programs that required students to complete certain tasks at fast speeds. During this time, computers served little educational value because they were not part of the regular curricula. They were used merely as a reward for finishing work.

In the early 90s, the school spent a large amount of money on acquiring resources in technology. We took pride in buying the most modern computer hardware. We purchased twenty-four IBM 486 computers and created a laboratory setting. The problem, however, was that we bought the equipment without first taking time to see how it would match our school's goals and classroom objectives. Again, we had the technology tools but did not know what to do with them. Teachers claimed that they were frustrated because they were not informed on how to effectively integrate this technology in the curriculum. Therefore, teachers took students to the technology laboratory as a reward for being good or as a break from the daily routine. The only

difference was that all students could use computers and, as a result, they were all rewarded at the same time.

Within a year or two, we had our laboratory networked and controlled by a server. Still, no one knew how to effectively operate the local area network (LAN). Our School District Office identified our need for training and provided the personnel and time for two days of technology in-service. This training started the development of a more collaborative approach to technology use in our school. During these in-service sessions, teachers were taken to the laboratory to learn how to add students to class files and set up access to the LAN. Students could then use the programs we had selected for them. In just two days, we also had to learn all about our operating system (Schoolview) and a variety of other software programs. Because of the insufficient time for in-servicing, teachers were unable to research and experience available software, nor were they introduced to the kinds of software most appropriate to learning activities in their classrooms.

Most teachers now agree that in the rush of enthusiasm and lack of adequate preparation, they ordered educational software in the form of games. They ordered a Type I software, which is often designed to make learning quicker and easier through rote memorization. Such software does not require active involvement on the part of the student. In fact, the producer of the software program predetermines everything that happens on the screen. Type I software supported the traditional (transmission) style of teaching. Teachers taught the material and the software served as an electronic workbook allowing students to practice the skill. Students were taken to the technology laboratory only for extra practice in a learned concept. This occurred not because teachers in our school were unconcerned nor less effective; they were just not properly

informed. Personally, I was impressed by having new technology equipment in the school; it was a great improvement over just having the Commodore 64s. In my enthusiasm for using the technology tools, I did not carefully consider the kinds of uses I was facilitating.

Research indicates that this pattern was not abnormal for schools during this time. Maddux et al.(1997) in his book *Educational Computing* list several studies conducted by people such as Collis (1988), Higgins and Boone (1993), Woodward and Carine (1993), Pelgrum and Plomp (1991), and many more who found that drill and practice (Type I) software was the most frequently used kind of computer programs at the time (Maddux et al., 1997, p. 19).

Now in the late 90s, in our school we have a laboratory of twenty-five Pentium 166 computers operated by an NT server. We have access to the Internet through a satellite dish. We have scanners, CD ROMs, color printers, and a digital camera. We also have different software programs that promote a non-behaviorist approach to learning, such as *Everything Weather*, *Dinosaur Hunter*, *Ecarta 95*, *Corel 8*, and *Print Master Premium*. The grade five teachers are very excited about all these new technology tools in the school and realize the need for a different approach to teaching and learning. They want to use this new equipment to provide students with experiences that go beyond the textbook material. They want to make students part of global classrooms, making the world and its vast information accessible to their students. Still, they do not know how to attain this goal.

All students come into grade five knowing much about the computer hardware itself. They all know how to turn on and off a computer, how to open different programs, how to type effectively, how to save their work, and so forth. Yet, they have little experience using computers and other technology resources in thought-provoking activities. Their experiences have not

encouraged them to construct their own knowledge. They were not given opportunities to use technology tools for exploring, nor to accommodate for their individual differences. They have never used computers in school to branch off and investigate areas of individual interest.

The grade five teachers would now like to emphasize learner control and inquiry. They want to incorporate software that is interactive and encourages the use of different problem solving strategies. They want their students to use more than the computer itself; they prefer interactive, constructivist approaches to learning. They want students to use modems, scanners, digital cameras, etc... in a manner that enhances the learning process. Yet, in order to learn the process involved in using and integrating various types of technology, teachers need more direction and support. I believe integrating technology into resource-based units gives teachers the assistance they need. My project addresses this educational need. By creating such a resource-based unit I can share with teachers in my school and other schools in my district, suggested activities, and instructions to integrate technology into their curriculum. These activities and instructions follow the guidelines provided by the Department of Education.

CHAPTER TWO - REVIEW OF RELATED LITERATURE

Introduction

The purpose of this chapter is to review the educational literature and research related to integrating technology into a resource-based unit and to describe the theoretical foundations of various aspects of this project. I begin with a brief overview of the general curriculum outcomes published by the Department of Education and then examine various educational theorists' opinions about the importance of technology in education; about technology integration, about issues related to the selection of software and to gender equity, about constructivism, and about resource-based learning, all of which are concepts important to this unit.

General Curriculum Outcomes for Technology

In addressing the needs of students in this province the Department of Education has provided six general curriculum outcomes for technology. These outcomes are listed in a document entitled *A Curriculum Framework for Technology Education: Living in a Technological Society* (Govt of NF and Lab., 1996).

They are as follows:

- First, students will have an understanding of the nature of technology. This means students will understand the basic principles that surround technology. The students will not only understand how to use technology tools but also understand

the actual processes involved in technology.

- Secondly, students will be able to solve technology problems. Through this process students will enhance their problem solving skills. They will be able to identify needs, decide solutions, implement their solutions as well as evaluate and reflect on them.
- Thirdly, students will develop an understanding of the impact of technology. Students will have an understanding as to how technology can improve their work, and how it has an effect on society in general. It also means that students will realize how much technology will affect their workplace, careers, and the environment.
- Fourthly, students will be able to read, comprehend, write, as well as use the language and terminology of technology problems. With this knowledge they will also be able to make appropriate use of technology resources with regards to both software and hardware.
- Fifthly, students will demonstrate the role of technology as it strengthens the learning process. They will be able to utilize technology as a learning tool and develop active learning strategies. Thus, through technology students will develop the skills involved in lifelong learning.
- Lastly, students will demonstrate understanding of the role information and communications play in technology. They will be able to communicate with others through various technology resources and be able to effectively communicate about technology itself. (Govt. of NF & Lab., 1996, p. 8)

In order for students to achieve these specific outcomes, educators must provide necessary learning experiences that are conducive to active learning. The unit of study presented in this project attempts to follow these outcomes by integrating technology into a resource-based unit. By the end of the unit, students will have an understanding on how technology affects the forecasting of weather. As students follow the technology instructions they will gain a better understanding of new technological terms. Lastly, through their experience of e-mailing peers in Australia, students will also have a better understanding of the role technology plays in communication.

The Importance of Technology in Education

What is technology and how can it improve the teaching and learning process? These are two questions that must be answered to understand the importance of technology in education. In the past, the term "technology" was associated with computer hardware. Many viewed technology in education as computers in classrooms or as laboratories containing resources such as computers, CD ROMs, scanners, digital cameras, etc. However, technology is not just computers or other forms of hardware. The Government of Newfoundland and Labrador (1996), in its document entitled, *A Curriculum Framework for Technology Education* describes technology as "a unique human endeavor . . . a conscious process by which people alter their environment." It goes on to describe technology as "a set of strategies that people employ to develop solutions to needs and wants and to identify and meet opportunities." Therefore, technology is not just a tool or product but rather a process. It is a process by which students are

involved in active learning, whereby they construct knowledge from a broad range of sources and activities. This process provides students with the opportunity to develop skills related to solving real problems. This type of learning process is needed if students are to compete in a competitive world (pp.1-3).

Technology is essential to the teaching and learning process. Students live in the world of technology. Parents and society in general expect teachers to prepare students for the future. Gholson of IBM, as reported in Heide (1994), made the following predictions in 1990:

- 80% of the jobs that will be required in the year 2000 did not exist in 1990.
- 70% of new jobs will require two years of education beyond school and 35% will require four years of post-secondary education.
- Lifelong learning will become a reality. For example, an engineer's specialized knowledge is already replaced by more current information in 3.2 years.

Employers today are no longer looking for workers who follow direct instructions or perform rote tasks. They are looking for employees with problem-solving abilities who are confident, flexible and have excellent communication skills. Information is constantly changing, and skills required by the workforce constantly change. As a result, businesses are searching for people who are capable of engaging in lifelong learning and willing to upgrade their skills regularly (Heide et al., 1994, p. 8). Technology helps prepare students by providing the necessary experiences to encourage this type of learning.

The Government of Newfoundland and Labrador (1995), in its document entitled *Enabling Tomorrow's Learners, Toda y (TILE),* records recent studies that point to the need for schools to properly prepare young people with the tools needed for lifelong learning in an

advanced technology and information-based society and with the proper training for a knowledge-based economy (Govt. of NF and Lab., 1995, p.1). This document also quotes the results of studies completed by various people. Some of the research indicates how properly-used technology can have a positive impact on those engaged in the learning process. The outcomes are as follows:

- Students using computer technology persist at tasks that require higher level thinking skills (Capper, 1988).
- Students prefer computer-based instruction due to their ability to make mistakes without embarrassment (Apostolides, 1987).
- Computer-aided instruction can stimulate continuing interest in a subject or content area (Seymour, Story and Mosley, 1986).
- Computer usages positively affect students' attitudes toward school learning (Krendl & Lieberman, 1988).
- Simulated software improved the problem-solving skills of disabled students (Woodward, Carnine & Gerster, 1988).

(As cited in Govt. of NF & Lab, 1995, pp. A36-A37).

Technology can have an influence on the teaching and learning process. Whether that influence is positive or negative depends on how technology is used in the classroom.

Technology Integration

The Need for Technology Integration

If technology is to prepare students for the future it must be seen as more than another content area. If students are taught to use technology resources only in isolation from other learning, they are in danger of never learning lifelong skills that will prepare them for the future. According to Harrington (1993), schools that place technology at the center will end up isolating learners from other learners and allow computer programming to predetermine what and how a student will learn. As a separate content area, technology does not give students an opportunity to explore on their own nor does it accommodate for individual differences. The *TILE* (1995) document states that "rather than being driven by technology, education must embrace technologies and technological processes and use them as a constructive vehicle for improving the effectiveness of the system, for improving student achievement, and for increasing literacy" (p. 51). This cannot be done by isolating technology but rather by integrating it into the curriculum. The *TILE* (1995) document also states the advantages of integrating technology into the student's learning environment. It claims that "integrated technology will provide students with the learning skills, problem solving strategies, access to technologies, and the technological competencies to thrive amid constant technological change with an increasing complex learning curve" (p. 64).

Along with the *TILE* document, the Department of Education in Newfoundland and Labrador continues to support the integration of technology through a document entitled *A*

Curriculum Framework for Technology Education (1996). This document outlines the role technology is to play in our schools. It states that "technology activities, particularly those related to information, in primary, elementary, intermediate, and senior high programs can and should be integrated into the curriculum and therefore should be done in a regular class setting" (p. 61). Thus, the schools of Newfoundland and Labrador are encouraged to integrate technology into their curriculum. However, this is not an easy task; it comes with its own set of obstacles or barriers to overcome and requires teachers and administrators who are dedicated to the process.

Obstacles

Research indicates that there are at least two main obstacles that must be overcome if one is to integrate technology into the curriculum. These are the lack of funding and inadequate training. Ideally, technology integration requires that computers be placed in individual classrooms. However, even though this is ideal, it is not feasible. With limited school budgets, it is almost impossible to place computers in each classroom. Yet, this obstacle can be overcome by integrating technology into various thematic units that can be carried out in the Technology Laboratory. It would be helpful for the Technology Laboratory to be connected to the Learning Resource Centre, so that teachers could schedule their classes simultaneously into the Technology Laboratory and Learning Resource Centre to complete curriculum related projects. Maddux (1991) in *Integration verses computer labs: An either/or proposition?* agrees with the integration of technology while continuing to use computer laboratories. He feels that Technology Laboratories are still a necessity whether computers are placed in the classrooms or not, for it is

here that the most up to date and often the most expensive equipment is found. The laboratory usually contains equipment such as scanners, plotters, graphics tablets, etc. A technology teacher can be assigned to the Technology Laboratory to give direct instruction in using various forms of technology and can also be available to provide assistance to other teachers who need help in integrating technology into the school's curriculum (p. 39).

Along with lack of funding, inadequate training is another major obstacle for integrating technology into the curriculum. Beckers (1991), as cited by Maddux et al. (1997), reports that 60% of teachers indicate they have never used a computer in their teaching. Maddux et al. (1997) also gives reference to two Offices of Technology Accessment (OTA) reports (1988, 1995). These reports indicate that a vast number of teachers have had little or no training in technology and that this is the single most important reason that technology is not used appropriately in our schools (p. 101). Other research, such as studies completed by Goodson (1991), MacArthur & Malouf (1990), Woodhouse & Jones (1988) as cited in MacArthur et al., (1995, p.47), indicate that teachers need both in-service education on specific technology applications and long-term support in order to integrate technology with the curriculum in meaningful ways. Teachers do not use new software and hardware that they are uncomfortable with. Teachers are tired of in-services that cram all they need to know about software and hardware into one day. They leave more confused than they were at the beginning of the in-service.

What is Needed to Effectively Integrate Technology?

To integrate technology effectively into the curriculum, training must be a gradual ongoing

process. Research supports this type of professional development. Researchers such as Sheingold and Hadley (1990) found that development in technological knowledge is best carried out as a gradual process (as cited in MacArthur et al., 1995, p.47). Boe (1989), Vogel and Aiken (1985), Wedman (1986), Woodhouse and Jones (1988), and Hurst (1994) also found that programs should be continuous and not a one day event (as cited in Govt. of NF and Lab., 1994). This could be done by providing teachers with at least a two day computer in-service with their District Computer Specialist each term. In the first term, teachers could be introduced to new software. In the second term, teachers could be given another in-service relating to the use of peer coaching as well as given a chance to suggest areas in which they need extra help. Professional development could then occur throughout the year. Furthermore, each school could form a committee of lead teachers in the area of technology. These lead teachers could provide support to the staff. This support is key to successful integration of technology. With proper assistance and support throughout the year, teachers would not feel overwhelmed or pressured by new technology, but would develop a familiarity with technology in a nonthreatening environment.

Although integration should be our goal, much must be done to ensure the integration is successful. Various studies have been completed that can give better insight as to what is needed in order to effectively integrate technology into the curriculum. Treagust and Rennie (1993) in their article *Implementing Technology in the School Curriculum* report a study completed with six secondary schools in Western Australia. Each school endeavored to implement technology into their curriculum; however, only six of them were successful. Based on this study, Treagust and Rennie identify several factors that are crucial to the success of curriculum initiatives. These factors or conditions can be applied when attempting to integrate technology. First, they suggest

that time be given for someone to reflect upon and provide an overview of what is happening in the school. Secondly, the faculty should be directly informed on what is happening or on what is intended to happen. Thirdly, teachers need time and assistance to constantly evaluate and change their curricula and teaching strategies. They also need time to implement the required changes and reflect on student outcomes (p. 8). Therefore, when integrating technology into the curriculum someone such as the Technology or Learning Resource Teacher should be given time to oversee and reflect on how technology is integrated. This teacher should be given the responsibility to inform and discuss, with the staff, the direction the school is taking in relation to technology. Lastly, this teacher should be willing to work with the other teachers in developing, implementing, and evaluating units of study that integrate technology into the curriculum.

Zorfass (1993), in her article *Curriculum: A Critical Factor in Technology Integration* refers to a study completed by the Education Development Centre (EDC). This study, funded by the U.S. Department of Education, offers a better understanding of how teachers can successfully integrate technology into the curriculum. This study was completed over a five-year period. At the beginning of the project the research team identified how technology was used in language arts, mathematics, social studies classrooms, as well as resource rooms and computer laboratories. The team was trying to identify if teachers were using technology to promote problem solving techniques, critical thinking, cooperative learning and the development of skills. These researchers found that only a few schools were integrating technology in such a way that met these criteria.

From their findings, the EDC indicated that successful technology integration should start with a strong effective curriculum. "In stead of relying on technology applications to bring about

remarkable changes in teaching and learning, schools need to reevaluate, renew and revitalize their curriculum" (p. 15). The EDC felt this could be done by developing units of study that provide the context for using various technology applications. These units would help students analyze and organize information as well as provide them with the opportunity to express what they have learned (pp.14, 15).

The study completed by the EDC also provided useful information about promoting successful technology integration. First of all, teachers must continuously communicate and collaborate with colleagues and have time to reflect on the effectiveness of their projects. Secondly, teachers must have ongoing access to technology assistance and resources. Lastly, administrators need to support teachers' efforts to change (p. 14). This is further supported by Arzt (1991), Lockard et al (1994), and Wiburg (1994), as cited in Mann (1994a).

Consequently, it is not enough to equip schools for technology education, but much guidance and assistance is needed. Integrating technology into the curriculum is not an easy process. Success requires a considerable amount of time and effort from all those involved. As research indicates, we cannot fail to make technology integration a vital part of the teaching and learning process. Research shows that technology integration is needed for students to develop learning skills, problem solving strategies, and technological competencies. Schools that ignore technology integration, are in fact, ignoring the goal to prepare students for success in a competitive world. (Duncan, 1996; Harrington, 1993; Strommen & Lincolin, 1992; Treagust & Rennie, 1993).

Selecting Appropriate Software

Type I, Type II Software

Along with technology integration an important factor critical to the development of technology education is the appropriate selection of software. The *TILE* (1995) document, stresses the importance of selecting software to support curriculum integration. Teachers have the tendency to purchase software without any prior knowledge on how it fits into their curriculum. Many times this results in the selection of software that does not meet the teacher's goals or curriculum objectives. The *TILE* (1995) document, therefore, states that educators must consider the needs of students, teachers, as well as curriculum in relation to the capabilities of the software being considered (Govt of NF and Lab., p.23).

There are many kinds of software on the market today. There is software (Type I) which follows a more traditional type of teaching and learning and there is software designed to provide new and better ways of teaching (Type II) (Maddux, 1997, p. 18). For the user, Type I software is relatively passive. The producer of the software determines what and how the students learn. It often ivolves a linear approach to learning, since the learner cannot branch off to other areas of interest. This kind of software is also characterized by drill and practice techniques. Teachers teach the material and the software serves as an electronic workbook which allows students to practice the skill. It does not give students an opportunity to explore ideas on their own or even accommodate for individual differences (p. 18-23).

Type II software is designed to provide teachers and students with new ways of learning

that are not possible without the computer. It promotes a nonlinear approach to learning. Students can branch off and explore other areas of interest. Its emphasis is on learner control. As educators, we must be careful to select software that is interactive and encourages the use of different problem solving strategies.

Multimedia & Hypermedia Programs

Nonlinear software can take the form of interactive multimedia and hypermedia programs. Multimedia is the use of text, graphics, animation, pictures, videos and sound to present information whereas hypermedia uses several means to present information through the use of links. Multimedia in itself is not a type II software. It becomes a type II software when it is interactive. Vaugh (1994) provides an excellent definition that shows the relationship between multimedia, interactive multimedia and hypermedia. He says that:

> Multimedia is a . . . woven combination of text, graphic art, sound, animation, and video elements. When you allow an end user - the viewer of a multimedia project - to control what and when the elements are delivered, it is called interactive multimedia. When you provide a structure of linked elements through which the user can navigate, interactive multimedia becomes hypermedia (as cited in Maddux ,1997, p. 184).

Najjar (1996) in his article, *Multimedia Information and Learning* reviews studies from a wide variety of fields to show that interactive multimedia may help people to learn more information more quickly compared to the traditional classroom. His meta-analysis examined 200 studies (Bosco, 1986; Flether, 1989, 1990; Khalili & Shashaani, 1994; Kulik, Bangert, & Williams, 1983; Kulik, Kulik, & Bangert-Drowns, 1985; Kulik, Kulik & Cohen, 1980; Kulik, Kulik & Schwalb, 1986; Schmidt, Weinstein, Niemic, & Walberg, 1985) that compare learning in

a traditional classroom with learning through multimedia in the classroom. In his meta-analysis, he found that learning was not only enhanced when presented through multimedia programs but appeared to take less time. However, Najjar points out that there could be other explanations for these findings. For example, interactive multimedia programs by nature involve interactivity. Students have more control over the learning pace and it's also a novelty to the students. Either one of these elements could have improved the learning process without using multimedia (Najjar, 1996, p.129 - 132).

Even though multimedia in itself cannot guarantee interactive learning, it may offer other advantages in the learning environment. Najjar's research does indicate that there is empirical support to suggest that multimedia information provides learning advantages in several specific situations. First, there is a learning advantage when the media supports dual coding of information. When multimedia uses more than one type of media it allows students to construct a particular piece of knowledge while using at least two different channels such as visual, mental or audio. For example, a child who is presented with a picture of a scanner (visual) and sees the word scanner (nonverbal) will later better identify a scanner. Secondly, multimedia provides learning advantages when the media used in the program support one another. Thirdly, there is a learning advantage when the media are presented to students with low prior knowledge. Najjar found that students with high prior knowledge were able to make connections just as well with text alone (pp.133-137).

While multimedia may improve the learning environment, it is actually interactive multimedia or hypermedia programs and their associated activities that are recommended. They are a form of type II software. Hypermedia programs encourage the development of many of the

desired outcomes required in developing skills for lifelong learning. By linking together all the forms of media in a program, the software allows individual students to learn differently and gives them some control over the learning environment. With hypermedia the user can highlight different words and immediately other documents containing related text appear. Students can control their own speed and paths based on their abilities and needs (Yang, 1997, p.5). A study completed by Becker and Dwyer (1994), revealed that students who have used hypermedia are more self-determined and have higher levels of intrinsic motivation as well as an increased sense of control (p. 155-172). Oblinger (1992) states that multimedia and hypermedia "have been hailed as the greatest revolution in information technology since the printing press". He goes on to say that "hypermedia is a more natural learning process in that it mirrors the way individuals think by allowing them to use their preferred learning modes" (cited in Adams, 1996, p. 19, 20). Adams quotes several other common beliefs about hypermedia and its source, such as:

- Students display a more positive attitude towards learning (Hay, Guzdial, Jackson, Boyle, & Soloway, 1994).
- It has the potential to facilitate and motivate cooperative learning activities (Perzylo & Oliver, 1992).
- It promotes metacognitive learning in that it requires the transfer of knowledge from one situation to another (Hay, 1994).

(as cited in Adams, p. 21).

Since hypermedia programs provide students with a greater degree of learner control, it is important that teachers guide students in their learning. Teachers can monitor students to insure that they connect new information with prior knowledge and use a variety of learning strategies.

The unit of study in this project makes use of hypermedia programs, such as *Everything Weather*, and various Internet sites. The links in these programs provide students with control of their learning environment.

Simulation Programs

There are several types of software that use hypermedia. Simulation programs use hypermedia in order to allow students to react to certain situations. This type of software is beneficial in Technology Education because it places students in specific scenarios and encourages them to use various problem solving techniques in order to endure. For example, students may be placed on an island and have to come up with various survival skills. Simulation programs are hypermedia because students can make unique decisions that allow them to explore different parts of the program. In these programs, students are in control. Simulations are interactive and require students to engage in higher order thinking skills. The program *Everything Weather* provides students the opportunity to solve problems while being presented with various weather scenarios.

CD ROM Storybooks

Like simulation programs, hypermedia CD-ROM storybooks enhance technology integration. Matthew (1996) claims that "CD-ROM storybooks provide a rich source of multi-sensory information for students of all ages and reading levels" (p. 73). Research by Stine (1993);

Miller, Backstock, and Miller (1994); and Matthew (1995), as cited in Matthew (1996, p.73) indicates that these CD-ROMs have the potential to increase students' reading achievement. However, in order to be effective, the content must complement the curriculum. What's more, the animation and sounds, as well as video and graphics, should not distract students from learning but rather enhance their understanding. In selecting proper CD-ROM stories teachers should look for software that highlights chunks of the text that is read, provides pronunciation of selected words, and allows students to interact with the story. Teachers can also provide a more interactive environment by providing lesson plans to go along with the stories. These lesson plans should promote a higher level of thinking (Matthew, 1996, p. 73). The CD program, *Everything Weather* used with this project provides students with real life stories that relate to weather conditions. While the text may not be underlined as the students read, important or difficult words are linked to their proper pronunciation and meanings.

Word Processing

Word processing programs are a type of application software beneficial in Technology Education. With word processors students can write, edit, print and save their work. According to Maddux (1997) there are several advantages for students using word processors. First, word processing makes editing easy. Students are more inclined to edit their work if they can change it on the screen rather than rewrite their whole text. Secondly, a word processor saves time. Students can spend more time thinking about the content of their writing rather than grammar and spelling. These errors can be fixed later. Thirdly, most word processors contain many

interactive windows. For example, a student can be writing in one window and open another window that contains useful notes or an outline. Fourthly, some word processors contain prompts to stimulate self-questioning or hints to help students write. These prompts or hints help students think about or analyse what they are writing. Word processors allow students to think about their own thoughts (pp. 237-248).

Maddux mentions several studies and literature reviews that provide mixed results for the use of word processors in improving students' writing skills. Some studies show that students improve in their writing skills when using word processors, and others show no difference. However, Collis (1988) reviewed a number of studies (as cited in Maddux et al., 1997, p. 250-251) indicating that students develop a more positive attitude when writing with a word processor.

Word processing software can be a good choice of software. Yet, like all other software, a word processing program must be appropriate to the student's age and ability. Educators should allow students freedom in writing while at the same time provide them with a purpose. As well, we must continue to teach proper writing skills (Maddux et al., 1997, p.254). The unit of study presented in this project encourages students to use *Word-Perfect 8* in presenting the information found about their assigned topic.

In selecting software it is also important to examine its attributes and instructional methods because attributes plus instructional methods equal achievement. If we want our students to achieve, we will choose software that has easy-to-use buttons and links and that promotes the use of a variety of learning or instructional strategies.

Equity Issues

Gender Considerations

Literature review indicates that there exist some gender differences in regards to the use of technology. These gender differences must be recognized and dealt with if educators are to provide students with equal access to education. There are significant gender differences in equality of access to and performance with technology. Male students appear to dominate computer interactions. A great deal of research seems to prove that girls on the whole are less motivated by computers than boys (Hammett, 1997a; Nelson & Watson, 1991; Okebukola, 1993; Maddux et al, 1997; Weinman & Haag, 1999). Nelson and Watson found that social interactions can affect, in different ways, the attitudes and motivation of children especially in relation to gender. These social interactions can involve the influences of parents, their peers, and school (p. 345).

Nelson and Watson's (1991) studies indicate that parental factors are the primary contributing factor as to why boys have more computing experience than girls. The research shows that when parents place a computer in the home, it is mostly intended for male users. Also, the father rather than the mother is often the helper when it comes to computers. This is supported by Cully (1988) in stating that boys are more likely to have access to computers than girls, and that boys are more likely to feel that computers are bought for their use (as cited in Hammett, 1997a, p. 11). Furthermore, Nelson and Watson reveal that fathers also neglect to show the relevancies of computers to their daughter's future the same as they do with their sons.

Lastly, they found that three times as many boys than girls attend computer camps or classes. Hess and Miura, (1995) found that non-participation in computer camps negatively influences girls' interest and efficacy with computers (as cited in Hammett, 1997a, p. 11). Nelson & Watson, 1991 believe parents lack the motivation to engage girls in computer classes (p. 348).

As previously mentioned, Nelson and Watson indicate that social interactions with other children can influence gender equity. Hammett agrees with this; in her article *Computers in Schools: White Boys Only* (1997a) she indicates that gender differences occur mostly in high schools where students are most likely to be influenced by peer pressure. Hammett also indicates there is an influence of socialization and role stereotyping so that once a group establishes a territory such as a computer room, other groups tend to stay out in unspoken agreement (p. 10).

Hammett (1997a) describes the role of the school in influencing gender equity with relation to the use of technology. From her review of literature she found that computer rooms are often located near science or math areas. These are areas that are often dominated by male students. She also states that male teachers are often assigned to teach computer classes. This may give girls the message that computers are mainly male oriented activities. Furthermore, Hammett also found that teachers can contribute to gender inequity in computing. Hammett reviews a study completed by Saunders (1990), which reveals that teachers choose boys rather than girls to assist in computer activities and often make more eye contact with boys when referring to technology (p. 9).

In addition to the influences of parents, children and school, Okebukola (1993) reports that software producers also have an impact on gender equity relating to use of technology. He found that the majority of games available for children attract male users over females. Software

is often about male related themes such as violence (p.186). Nelson and Watson's (1991) review of literature also indicates that most educational programs are centred around male oriented interests, including themes such as adventure, science and war (p.348).

However, Nelson and Watson (1991) did find that there is no significant sex type difference in preschool, and early elementary grades as it relates to computer attitudes and performance. Gender differences do not appear until third or fourth grade. They feel this is a result of the changes made in technology. Preschool and primary students are growing up in a time when technology is changing and being integrated in all curricular activities; therefore there is a decrease in gender difference (p. 347). It can also be the case that peer pressure is not as dominant at preschool and primary levels.

Bohlin (1993), who reviewed literature on computers and gender equity, indicates the seriousness of the gender equity.

> Educators cannot afford to ignore this critical fact that females perceive their competency to learn about computers to be significantly lower than their male counterparts. A significant long-term problem may be perpetuated by this inferiority perception-decreased participation can limit career choices, thus producing fewer computer role models. This spiralling effect may continue to produce a substantial gap, resulting in a dramatic failure by the educational system (as cited in Maddux et al., 1997, pp.94, 95).

The Government of Newfoundland and Labrador (1996), in its document entitled *A Curriculum Framework for Technology Education; Living in A Technological Society* acknowledges the problem of gender inequity and indicates that an approach which fosters gender equality is essential. It clearly indicates that teachers should structure the learning experience to appeal to the interest of both genders (p.60).

Prevention Strategies

Maddux et al. (1997a) provide several strategies for preventing gender inequity. First, computer in-service programs can show teachers how to use computers and their applications in gender-neutral ways. Secondly, teachers can screen materials for gender bias. Thirdly, teachers can refer to famous females who worked with computers and mention the females who made contributions to the world of technology. Fourthly, teachers can consistently encourage the participation of female students in computer activities. Fifthly, teachers can increase access to technology applications. The more students use technology the more motivated they are to continue using it. Hammett in her article, *Computers in School; White Boys Only*, supports this strategy and suggests that "care should be given to involve reluctant or uninterested students in free time computer use by providing as wide a variety of programs and computer software as possible" (p. 11). The sixth strategy for preventing gender equity is for teachers to outrightly address the problem of stereotyping. Furthermore, teachers can stress the importance of technology in tomorrow's world. In addition, they can involve female peer role models, those who are leaders, to assist with computer demonstrations. Lastly, Maddux mentions that teachers should give positive feedback and opportunities equally to both genders. He cautions educators not to overpraise females but give the same praise as they would for males (pp.96-97).

Nelson and Watson (1991) add to Maddux's suggestions by including what parents and software designers can do to prevent gender inequity in technology. They suggest parents encourage their daughters to engage in computer-based activities from preschool years, throughout elementary and even in secondary schools. A study completed by Ames and Archer

(1987) as reported in the Nelson and Watson article, *The Computer Gender Gap,* stresses parental encouragement. According to Nelson and Watson, Ames and Archer studied 500 mothers of children from kindergarten to fifth grade and revealed that parental encouragement can overcome the negative impact of school influences. This was so, with respect to other gender differences and when home and school computer experiences were of minimal importance. Lastly, Nelson and Watson indicate that software designers have a major role to play in considering gender when producing new software. Their research indicates that "sex-type themes produce a significant decrease in positive education outcomes for females" (p.349- 351).

In implementing the unit of study in this project, gender equality issues will be discussed with volunteers. Some of these prevention strategies will be presented to parents in the form of guidelines. Volunteers will also be instructed to watch for any student who frequently controls the mouse or keyboard at any centre.

The integration of technology is expected to bring about remarkable changes to the teaching and learning process. However, educators are only able to succeed if they prepare all students, both male and female, for the future. Dr. John Goodlad, a national leader in school renewal states in the video, *Information power*, that "it is our moral responsibility to ensure that each student will be provided with equal access to knowledge" (Britannica Learning Materials, 1991). Therefore, it is up to educators to make sure technology is not viewed as a necessity for males only. Educators should also make parents aware that the way they treat computers at home will influence their child's attitude towards technology and its role in their future.

Constructivism

Underlying Principles of the Constructivist Model

Integrating technology requires a guiding philosophy that will lead to effective changes within the curriculum. Strommen & Lincoln (1992) believes that this philosophy or theory must be constructivism. which is based on the premise that children actively construct their own knowledge (p. 2). Copley (1992) describes the constructivist approach as follows:

> The constructivist model. one of facilitating learning, views teachers as facilitators whose main function is to help students become active participants in their learning and make meaningful connections between prior knowledge and new knowledge and the processes involved in learning. The role of students from this perspective is to construct their own understandings and capabilities in carrying out challenging tasks (cited in Maddux et al., 1997, p.78).

Maddux et al.(1997) provide a similar definition of the constructivist model as it relates to instruction. They say that:

> Constructivist instruction is really not instruction in the traditional sense. It is guidance and mentoring that focuses on the child and his or her interest, background, and experience. Constructivist instruction is often situated or anchored instruction that puts the learner in the role of a problem solver who must collaborately work with other learners to learn the basic skills and acquire knowledge in order to solve the problem (p. 184).

This is a switch from the traditional approach to learning. Students are no longer passive receptors of knowledge. Applying the constructivist model to the teaching and learning process means that students will not simply absorb information provided to them through teachers, nor will they learn through rote practice, but students will actually invent their ideas. The constructivist model provides students with the opportunity to explore and be actively involved in

their own learning. Seymour Papert as recorded in Tappscott (1999) puts it well when he says "the scandal of education is that every time you teach something, you deprive a child of the pleasure and benefit of discovery" (p.9).

Constructivist theory has emerged from the work of developmental theorists such as Jerome Bruner, Jean Piaget, and Lev Vygotsky. There are at least two different strands of the constructivist theory: the cognitive and social constructivist. Cognitive constructivist adopt their ideas from Piaget. They stress how children construct their own knowledge through assimilation and accommodation. Social constructivist share many of Piaget's ideas, especially in relation to how children learn. However, they have adopted ideas from Ley Vygotsky who emphasizes the importance of interaction with others. Vygotsky claims "what a child is able to do in collaboration today he will be able to do independently tomorrow"(as cited in Maddux et al., 1997, p.80). Thus constructivists have differences of opinion, however, they all have the common belief that learners are to construct their own knowledge whether individually and collectively (Maddux et al., 1997, pp.77- 83)

Grabe and Grabe (1996) in the article *Cognitive Learning and Technology Tools,* state that there is no single constructivist model but rather a number of common ideas or principles that are accepted by those who call themselves constructivist. They provide two of these principles:

- What a person knows is not actively received but assembled by the learner.
- Learning serves as an adaptive function. It is considered the storage of useful personal knowledge (p.61).

Applying the Constructivist Model to Education

The principles underlying the constructive model can be applied to education. The constructivist model promotes the same learning strategies that are needed to prepare students for the future. These learning strategies involve students in thought-provoking activities that help them develop lifelong learning skills. Research on constructivism and education provides educators with information about applying a constructivist model to the teaching and learning process.

Brooks and Brooks' study *In Search of Understanding: The Case for Constructivist Classrooms* provides five principles of constructivist learning that are related to classroom teaching:

- Constructivist teachers start with what the students already know and help them understand new information by making material and subject matter relevant to them. However, relevance does not need to preexist in students. For constructivist teachers help students see the importance of new knowledge while they explore new materials and solve problems.
- Constructivist teachers see the viewpoints of their students as "windows into their reasoning." Teachers talk and listen to their students to allow them to come up with their own answers.
- Constructivist teachers often present material holistically. Students can then break up the wholes into parts that they can understand and work with.
- Before beginning a new lesson, constructivist teachers determine the students'

prior knowledge on the subject. The teachers can then alter the curriculum so to cater to students' distinctive learning styles.

- Constructivist teachers assess student learning while they teach to gain insights into students' understanding as well as the level of cognitive development.

(As cited in Southwest Educational Development Laboratory, 1996).

The constructivist model emphasizes the learning experience. Duffy and Bednar (1991) agree with Brooks and Brooks' views but also refer to several recommendations that advocates of constructivism make about appropriate learning experiences. First, the goal of any educator should be to focus on the ability to preform relevant tasks rather than on accumulation of specific facts. Secondly, learning should focus on allowing students to explore alternate perspectives, evaluate ideas, and provide learning experiences that involve communication and access to real world examples. Thirdly, teachers should model the appropriate skill for each new situation (Grabe, 1996, p. 61).

The ideas associated with the constructivist model resemble the objectives required for technology education, especially with its emphasis on improving student understanding and thinking skills. In using the tools of technology, teachers can follow the constructivist approach to learning while at the same time developing the skills required for technology education. There even exist various forms of software that correspond with a constructivist model of learning. Constructivist software also allows students to make many choices about what they will explore and in what sequence different aspects of a topic will be studied. Maddux et al. (1997) state that, "since children must construct or build their own reality, they need multiple representations, or

views, of a concept or issue" (p. 79). Through the use of constructivist software, technology can provide multiple representations or views.

Advantages Associated with Constructivist Software

Maddux et al. (1997) provide seven potential advantages that simulation software share with most constructivist software. First, they are fun in that they are more attractive. Secondly, they are inexpensive, at least less expensive than allowing students to learn in the real world. For an example, it would be less expensive for students to experience a virtual trip across Canada by train than it would to take them on the actual trip. Thirdly, they are safe because it can provide experiences in areas that normally would be too dangerous to allow students to freely experiment with in the real world. Fourthly, most constructivist software use cognitive flexibility in hypertext format or participation in anchored instruction experiences which makes transfer by the learner of what is learned to the real world easier. Fifthly, they provide a less threatening and low anxiety environment. Students see challenges as play and they are far more willing to respond with little or no anxiety. The sixth advantage for constructivist software is that they encourage socialization and collaboration. Lastly, constructivist software promote realism that can be adjusted for maximum learning. In many situations, real events occur too fast or too slow to be conducive to learning. Constructivist software can speed up or slow down the programed events to maximize learning (pp. 223 -225).

While there are advantages of constructivist software, one must keep in mind that they are only potential advantages and they are found in most, not all, software. The responsibility,

therefore, is on the educator to view and select proper software. In selecting and using constructivist software, there are also some potential problems that educators need to overcome.

Problems Associated with Constructivist Software

As well as listing the advantages of constructivist software, Maddux (1996) lists several problems associated with using software that emphasizes the constructivist approach to teaching. It is important that these problems be addressed with possible solutions for each one. First of all, not all attributes within the software are easy to use. It is important to select software that contains attributes that are not difficult for the intended learners to use. When the attributes are difficult to understand, they hinder the learning process. Students become overwhelmed with the operation of the software and as a result they are not motivated to explore. The instructional methods as well must provide positive feedback and encourage further exploration. The software must challenge the students, but not be so difficult that students become discouraged. Neither can it be so easy that they become bored. Good attributes along with good instructional techniques facilitate achievement. Secondly, using the constructivist software approach requires a lot of time. Students need time to interact with the software, to work through problems, and to develop learning strategies. In a school that shares one computer laboratory with a number of classes, time is restricted. Lesson plans need to be developed to somehow obtain the maximum use of time without limiting the students' ability to learn.

The constructivist approach to learning also requires a different type of evaluation. This is especially true when using computer software. Parents are familiar with a traditional form of

evaluation. This kind of evaluation requires a student to study a particular textbook for a test that includes recall questions. Parents also expect to see an average mark that indicates if their child has learned the material. The constructivist approach emphasizes skills rather than content. Consequently, there is a need for various forms of evaluation. As well, parents must be made aware of and helped to understand these forms of evaluation.

Furthermore, students are used to competition rather than collaborative learning. Constructivist software encourages collaboration rather than competition. Students have to learn how to work effectively with each other. They must listen to others and not dominate the group. They must realize they are working together to construct knowledge.

Finally, when using constructivist software teachers need to learn when not to intervene. Teachers must determine how much instruction to give the students. Most teachers get involved when they feel that a student is heading in the wrong direction. Yet, learning does not necessarily come from a fixed sequence of ideas. Teachers need to know when to step back and allow students to discover new ideas and concepts their own way. As well, some teachers feel the need for some sort of instruction. They need to be aware of how much instruction they can give without placing emphasis on content rather than learning strategies. In selecting software for the weather unit provided in this project, I considered these problems and took steps to ensure that the software incorporated was conducive to learning.

According to Maddux et al. (1997) "constructivist teaching requires flexibility, on the spot analysis and decision making as well as a comfortable confidence that students can learn and achieve without constant teacher-centred instruction and direction" (p. 234). In order for educators to adapt this constructivist approach to education, a change has to occur in the way

they think about the teaching and learning process. As research indicates, there are problems to overcome and this is not an easy task. It requires a gradual step by step process as teachers provide opportunities for students to construct their own knowledge and learn from the experience themselves.

Resource-based Learning

Defining Resource-based Learning

Effective integration of technology can be accomplished through resource-based learning. Today, we live in an age of information and technology where never before has change occurred so rapidly. As previously noted, students no longer require just the basic content of knowledge, but now require a knowledge of skills that will enable them to become lifelong learners. There must be a conceptual switch from what to learn to how to learn. In response to this, educational literature now indicates there must also be a change in the way educators do things. There has to be a change in the curriculum to meet the needs of the students. In recognizing this new need for developmental skills, the Department of Education in Newfoundland has placed emphasis on resource-based learning as a part of the instructional process.

Partners in Action (1982) defines resource-based learning as an "education model that actively involves students, teachers and teacher librarians in the meaningful use of a wide range of appropriate print, non print, and human resources" (cited in Brown, 1988, p.6). Each resource provides students with alternative learning activities to meet their various needs. Students are

given the opportunity to develop independent learning skills that will enable them to become life-long learners. Resource-based learning applies not just to a course or subject; it is the entire curriculum.

This understanding demonstrates the importance of resource-based learning in order to meet the needs of our students today. It accommodates student individual differences and provides learning strategies necessary for independent lifelong learning. Through this type of learning students will understand how to retrieve, evaluate, process and present the fast producing information in our society in a way that they understand best. It corresponds with the constructivist model in that students are actively involved in constructing their own knowledge.

Early Beginnings

In order to understand resource-based learning it is important to look at its beginnings with British writers such as Norman Beswick and L.C Taylor. Norman Beswick (1977) provides a definition of resource-based learning. He describes it as an umbrella term that encompasses many different teaching approaches at many different levels. He claims that it is the responsibility of teachers and schools to provide various learning experiences that appeal to the unique learning styles of the students. Beswick believes resource-based learning emphasizes individuality (*Learning to Learn*, 1991, p.4).

Taylor (1971), in his book *Resources for Learning* , compares two main categories of teaching; teaching-based and resource-based. Taylor explains the differences between both in relation to how the student learns. In teaching-based students learn by being told; in resource-

based they learn from "an active, personal interaction with people and things" (p. 233). Taylor provides better understanding by placing these two concepts on a continuum. At one end there is the extreme "in which everything is arranged to permit children to catch the perishable words that fall from a teacher's lips" (p.173). Then there is the other extreme "where children learn chiefly from materials or from one another, directly or independently" (p. 174). Taylor gives us examples of resource-based learning that sometimes exist as variations within the teaching-based system. He mentions the use of laboratories, students working in groups, money being spent on resources in science, and the use of lively discussions and various activities in art classes. He claims that science and art classes are getting away from teaching-based instruction and leaning towards resource-based (Taylor, 1971, p.234).

Taylor also makes the distinction between using resources and resource-based learning. It is possible to have resources, but if they are structured to time and place, and to what is being used, then it is teaching-based. If students can work with resources at their own pace and time then it is resource-based. Therefore, in resource-based learning, students must only be guided in their work (p. 174).

The writings of Taylor and Beswick have become more important as we approach the 21st Century. Their concept of resource-based learning not only provides us with various teaching approaches, but now provides students with necessary skills to cope with the rapid change in information and technology.

Benefits of Resource-based Learning

The Government of Newfoundland and Labrador (1991) published a document entitled *Learning to Learn*. This document contains policies and guidelines for the implementation of resource-based learning in our province. It is evident from *Learning to Learn* that there are many advantages to implementing a learning resource program. First of all, resource-based learning makes use of various teaching strategies. Not all objectives can be met the same nor can all students learn under the same conditions. Resource-based learning allows students to learn from various methods. This accommodates for a variety of learning styles. Students can create, analyse, dramatize, write, construct, produce, compute and these are just a few. Technology adds to these teaching strategies by allowing students to surf the Internet, interact with thought-provoking computer programs, and present material through various methods. Students can produce video or web page presentations and use a wide range of technology resources such as graphic programs, digital cameras and scanners to enhance the quality of their work.

While using different teaching strategies, resource-based learning also makes use of various learning locations, facilitators and resources. For example, field trips, computers, Internet, guest speakers and atlases are some of the many resources that can be used. All of these strategies enrich the curriculum, motivate students and accommodate individual differences in learning, whether they are differences in learning style, ability, needs, interest, or prior knowledge (pp.5-17). A study cited in the article *Teachers' Views of the Implementation of Resource-based Learning (1992)* reports that teachers feel the materials and opportunities students are exposed to in this kind of learning are superior to those in the textbook method of

teaching. They also feel that the needs of students can be more adequately addressed with resource-based learning (Meyer et al.,1992, p. 8-16).

The second advantage of implementing resource-based learning is that it emphasizes active learning. Students are actively involved in their own learning; they learn what they experience. There is less memorization of material and more understanding. This coincides with the constructivist model of learning.

Thirdly, resource-based learning emphasizes the development of various learning skills. These skills prepare students to be successful in the world outside the classroom. The benefits will be lifelong. Students learn information retrieval skills, such as learning how to locate various resources whether through the use of a computerized cataloguing system, encyclopaedias, or even the Internet. Once students learn how to find the material, they begin to learn selective skills as they decide what information is relevant.

The fourth advantage of resource-based learning is that it emphasizes informational processing skills, which involves organizing, comparing and contrasting, identifying biases, etc. It allows students to make choices and be responsible for the choices they make. It makes learning more relevant and personal.

Fifthly, resource-based learning encourages students to think critically. It promotes taking risks and develops students into problem solvers. Lastly, resource-based learning encourages students to interact in groups and therefore develop good team skills (Govt. of NF and Lab., 1991, pp. 2-10).

Implementing Resource-based Learning

Using a variety of resources will not itself produce resource-based learning. In order for resource-based learning to be effective, cooperative planning must occur with all those involved. Individual responsibilities and roles have to be made clear. As well, the principal must support this initiative within the school. These issues based on the information provided by the *Learning to Learn* (1991) document, are further discussed below.

In implementing a resource-based program, the classroom teacher needs support. There has to be an interaction of cooperating people. It involves the cooperation of the entire staff working together. Together teachers need to decide the skills that are necessary if students are to become lifelong learners and at what grade each skill will be introduced, developed, or maintained. This provides a continuous learning path. Many schools do this through a learning skills continuum. Beswick (1977) believes strongly in the cooperation of all staff members:

> Moreover, because of the interlocking contributions of different people of different skills. it is impossible any longer to separate off and say, "This is only your concern, and this mine." A teacher cannot plan for resource-based work without an understanding of his colleagues acting in the media production and media library modes; equally, neither of them can proceed meaningfully without an understanding of the teachers purposes and practice, and those of each other (p.242).

Teachers bring together expertise in their fields to plan, develop, implement, and evaluate resource-based learning experiences (Brown , p.10).

According to Ress (1995) resource-based learning definitely requires the cooperation of the classroom and resource-based teacher. Together they meet to develop a resource-based plan. They first look at the goals and objectives within curriculum guides. They determine where

students are when it comes to prior knowledge and skills. Then they develop objectives for the learning-based experience. Based on these objectives, as well as considering the students needs and their required skills, the classroom and resource-based teacher then decide upon instructional strategies, and learning techniques. Teachers need to realize that each student is different and the method of learning can differ. An instructional strategy good for Susan may not be good for Paul. Therefore, together the resource-based teacher and the classroom teacher use various teaching strategies to provide room for individual choices for each student's achievement of the assigned objectives. Furthermore, while continuing to cooperate, the resource-based teacher and classroom teacher choose learning resources and locations, and schedule the appropriate resources, facilities and personnel. Lastly, individual roles of all those involved are decided upon. (Ress, 1995, p.1).

The Role of the Teacher

In implementing their plan the teacher and resource-based teacher at times assume different roles. The *Learning To Learn (1991)* document describes the roles of the teacher. It first maintains that the teacher's role is that of guiding students in active learning. That does not mean the teacher's role is simply that of observation, but "they become a guide and monitor the learning process by questioning, prompting, assisting, and clarifying" (p.14). In other words, they making sure learning occurs and students develop the necessary skills.

Secondly, teachers need to evaluate students' achievements. This involves checking to see that students are meeting the objectives assigned for them, or if they are developing the skills

required. If not, the teacher has to consider extra teaching strategies to maximize the student's learning.

Thirdly, teachers must evaluate the instructional process to see if the learning activities are effective and the resources appropriate to meeting the assigned objectives. The teacher must also consider student motivation throughout the unit and decide if any changes are needed to enhance or increase student learning (p.24).

Role of the Resource-based Teacher

As well as cooperating with the classroom teacher in developing curriculum units, the resource-based teacher has a unique set of responsibilities in order to prepare students for the rapid changes of the 21st century. The *Learning to Learn* (1991) document outlines the roles of resource-based teachers. It is their responsibility to ensure that learning strategies and skills become a part of the school's curriculum. This can be accomplished by meeting with the school staff to develop a continuous learning skill's plan for the entire school. It is then the responsibility of resource-based teachers to provide a copy of the newly produced school learning skill's continuum and ensure that it is being followed when developing resource-based units. Together, the staff will decide the skills to be integrated at each grade level.

Another important role of the resource-based teacher is to encourage the integration of technology so that students and teachers will understand and utilize the most recent approaches to learning and research. This involves staff in-services and hands-on learning experiences for the students. This part of the implementation process is important in ensuring students will have the

access and understanding of many different resources, enabling them to be lifelong learners (pp.24-25).

Role of the Principal

Lastly, the *Learning to Learn* (1991) document describes the roles of the principal. If teachers are to change our curriculum and implement resource-based learning as a way of preparing our students for an information rich society, it is crucial to have the principal's support. Teachers must feel encouragement from the principal. For many teachers it is a drastic change to go from teaching-based to resource-based learning. To go from a classroom structure where seats are arranged in rows and students are silent listeners to a classroom where students are put in groups to be active learners can be difficult. At one time a classroom teacher was viewed as a good teacher if the noise level in the class was minimum. Principals felt that if classes were noisy then learning could not occur. Resource-based learning at times is the opposite. Students are interacting at different centres and the noise increase could mean there is active learning occurring. Principals must recognize this difference and support teachers in their new ways of teaching. This support may mean defending them when criticized by more traditional teachers.

Feedback from the principal is important. Teachers value the compliments of their principals. A teacher who is trying a different way of learning will find it difficult and will be constantly evaluating his or her own progress. Teachers need positive feedback from the principal. They need to know someone is recognizing the value of the extra effort put into preparing students for this information age. It is of no use for the principal to just think teachers are doing a

good job; this needs to be communicated to them.

Principals need to realize that developing students for the future is challenging. Changing to a new way of teaching does not come easy. Principals need to assess teachers' needs and provide opportunities for professional development and in-service especially in the area of resource-based teaching.

"To succeed, the principal needs to ensure that resource-based learning is a part of the structure" (Brown p.16). Teachers need to see that it is the way of the school. The Learning Resource Centre becomes an important site in the school. Scheduling must be done with enough flexible time for the resource-based teacher to meet and help develop unit plans with other teachers. Field trips, guest speakers, computer interactions or relevant videos cannot be seen as treats outside the curriculum; they must be valued as powerful resources within it. Principals need to stress time on task, but must recognize that it does not always require students to be in the classroom. Principals should realize the need for change in the organization of classrooms. This includes such matters as the development of classroom learning centres and different arrangement of seating, not only for primary but for all grades. A colourful, decorated room must not be labelled as a kindergarten room, but all rooms must be created as an atmosphere of active learning (Govt. of NF & Lab., p. 23).

Resource-based learning requires the support of all those involved in the school. This change will not be easy for principals and they will need the support of their staff in return, along with support at the district level. It is time for change. Students are no longer served by the memorization of knowledge but need to develop skills to know how to construct knowledge. This change will not be easy but with all those involved pulling together, the weight becomes

lighter and the path clearer.

Conclusion

As educators it is indeed our responsibility to help prepare students to be successful in the world outside the classroom. As previously mentioned, employers are no longer looking for workers that will follow direct instruction and perform rote tasks. Businesses are looking for employees that are confident, flexible, and have good communication, problem-solving, and technological skills. With information changing so rapidly, society also requires that students be engaged in lifelong learning. With this in mind, we need to ask the question "What is the most effective way to educate our children?"

Technology can influence the teaching and learning process. However, in order for technology to effectively provide necessary learning skills, it must not be taught in isolation. This chapter, through the review of educational literature, emphasizes that technology taught as a separate curriculum does not engage students in active learning. It does not provide them with skills to be lifelong learners. Therefore, technology should be integrated into the curriculum.

Literature about integrating technology into the curriculum indicates that educators should be careful in selecting software, consideration should be given to the attributes and instructional methods of the software. Literature also emphasizes the need for educators to take precautions and use various prevention strategies to prevent gender inequity. This is important if educators are to provide equal access to a proper education.

Research indicates that technology integration requires a change in the school's

curriculum. It requires a change in the teaching and learning process. Literature also places much emphasis on the constructivist model in influencing these changes in the curriculum. The constructivist model promotes a process of learning where students are actively involved in constructing their own knowledge by engaging in thought provoking activities. However, educators need guidance in accomplishing this task. Literature suggests that individual units of study incorporating technological applications and tools can be an effective way to integrate technology into the curriculum. These units of study can be guided by principles of constructivism. Resource-based learning can be the basis for developing these units.

Through resource-based learning, students are involved in various learning strategies. Resource-based units incorporate various resources that allow students to be actively involved in constructing their own knowledge. They promote risk-taking and develop problem solving skills. Through various centres, resource-based learning encourages students to interact in groups and thus develop good team skills. Resource-based learning provides for real life situations and makes use of various learning locations, facilitators and resources. Based on the review of educational literature, integrating technology into resource-based units can effectively enrich the curriculum. It provides the opportunity for students to develop necessary skills required for a competitive world.

CHAPTER THREE - IMPLEMENTING THE PROJECT

Project Description

This project involves creating a grade five resource-based unit on weather which integrates technology. Through this resource-based unit, students will further explore concepts or themes by interacting with various software and hardware. Teachers will be facilitators of learning rather than givers of information.

As the review of literature indicates, students will be provided with the opportunity to develop learning skills, problem solving strategies and technology competencies when technology is integrated into the curriculum. It is natural to integrate technology into resource-based units since resource-based learning has become a guide for the development of curriculum in our province. *Learning to Learn* (1991), a document prepared by the Department of Education for this province, states the following:

> The main goal of resource-based learning is to provide the opportunity for all students to develop independent skills, in conjunction with the acquisition of a basic body of knowledge which will enable them to become lifelong learners. Full attainment of this goal will require that resource-based learning be implemented in every classroom in the province (p. 1).

Chapter two of this project reveals that resource-based learning provides the experiences for students to understand how to retrieve, evaluate, interact, process and present the fast producing information in our society in a way that they understand best. Therefore, it is through resource-based learning that this project addresses the need of integrating technology into the grade five curriculum.

Weather is the theme for this unit since it is a major topic in the grade five science program. Literature indicates the importance of cooperative planning when implementing a resource-based unit. Thus, for this project, several meetings were held with the learning resource teacher and all the grade five teachers. The special needs teacher was also involved to advise on various teaching strategies for the special needs students in grade five.

Unique characteristics of each class were discussed at these meetings as well as the general prior knowledge of students in relation to computer use and weather. It was discovered that students were introduced to the concept of weather in grade three. They have also been using computers since grade two for word processing and various games that concentrate on drill and practice techniques. During this use of computers, students learned basic operating components. At these meetings, objectives of the unit and the activities in various learning centres were collaboratively decided upon. These objectives were based on the learning outcomes identified in the grade five curriculum. Furthermore, skills to be achieved were identified and incorporated from the school's skills continuum.

As agreed, the grade five teachers began this unit by introducing the topic of weather in their own classrooms. Students were given the chance to discuss what they already knew, and an opportunity to brainstorm what that they would like to learn. To help make this unit relevant to the students, a field trip to the nearest weather station is appropriate. While at the weather station, it is important for students to realize how technology has changed the way one forecasts the weather. This will help students understand the relationship between science and technology which is stressed in the grade five, General Science Outcomes. As indicated in chapter two, both prior knowledge and relevance are important principles in the constructivist model of learning.

Student Grouping

In carrying out the actual project, it is suggested that students be grouped into groups of four or five. If students are familiar with group work and have developed skills in this area, as was the case in this project, they can select their own groups. Special needs students can be a part of this grouping as well. The special needs teacher can be aware of the location of each special needs student to ensure that they are not overwhelmed with difficult tasks. The special needs teacher can closely monitor and assist students when needed. This sort of social grouping benefits both high and low achievers. High achievers have the opportunity to learn by generating and articulating explanations to others in their group and low achievers have the opportunity to learn by observing learning strategies used by their partners.

After all students are assigned to a group, they are to decide upon a weather topic to research. Topics for research include stormy weather, tornadoes, hurricanes, whirlwinds, clouds, lightning/thunder, weather instruments or the water cycle. A group can choose a topic not listed, but it must be approved by their teacher. When groups have completed all centres, they are expected to combine all their information into some kind of presentation. For example, they can write a research paper on their topic. This research paper could be typed up using *Word-Perfect 8*. From the review of literature, it is evident that word processing software allows for easy editing. Students can spend more time thinking about the content of their writing rather than grammar, since these errors can be fixed later. Instead of writing a research paper students can choose a different method of presentation, such as a Web page or video production. In this way, students are allowed to use different ways of representing knowledge. This element of choice is

supported by the constructivist theory. It further coincides with the Learning Outcome (5) in the *Elementary English Language Arts: A Curriculum Guide: Grades 4-6.* It states that "students will be expected to interpret, select, and combine information using a variety of strategies, resources, and technologies" (Govt. of NF and Lab., 1998a, p. 70).

The Role of Parents

Parents are encouraged to take an active role in carrying out this project. High level of parent involvement is identified by *Adjusting the Course 11* as one of the major features which characterizes an effective school (Govt of NF & Lab., 1994, p. 20). All parents are invited to help, and those who volunteer their services will be placed on a schedule. A parent meeting is conducted to explain all centres and to identify the centre at which they feel most comfortable.

At this meeting, parents are provided with important guidelines to follow while assisting students at individual centres. These guidelines are based on information obtained from the review of literature in chapter two. They address the need for parents to assist or guide students in solving problems rather than providing the answers. They encourage parents to be aware of group dynamics, to make sure no one person is dominating the group, and to see that each member is given the opportunity to equally contribute to the discussions. Parents are also to ensure that students understand the required instructions and stay on task. As well, these guidelines address the problem of gender equity. Research indicates that male students appear to dominate computer interactions. Therefore, parents are encouraged to support girls in using the required technology and to refer to both sexes when questioning how certain computer tasks are

performed.

Instructions

Instructions are included at each centre. Instruction cards indicate various options. At certain centres, instructions are posted about how to use various technology resources. These instructions may contain difficult terms related to technology. In some cases definitions are provided on additional sheets; in other cases students are expected to look up the term in the dictionary or use context clues to understand their instructions. One of the General Curriculum Outcomes mentioned in chapter two requires students to use language and terminology related to technology so that they can appropriately use technology resources.

Centres

This project consists of twelve different interactive centres. All centres have been designed to match various learning outcomes in the grade five curriculum. Not all centres deal directly with technology, in that the main purpose is only to integrate it into the unit. Centres provide opportunities for students to learn various skills that enable them to become lifelong learners. Using technology is but one of these skills.

In Centre One, students are given the opportunity to predict the meaning of important words that relate to weather, such as evaporation, precipitation, climate, etc. Students may use their science textbook and other weather related material to read the words in context. After their

prediction is made, they must look up the correct meaning and record it in their own words. Learning Outcome 4.3 places emphasis on providing students with the opportunity to use a variety of strategies to construct meaning or verify their understanding of information (Govt. of NF and Lab., 1998a, p.68). This centre gives students the opportunity to use several types of text and on-line dictionaries to construct their own understanding of important words. The use of an online glossary of weather terms (www.super.net.uk/Education/ online/weather/a.html), with instructions is available. As mentioned in chapter two, constructivists view the construction of knowledge as an important element to the teaching and learning process. Parents are to closely monitor the use of the online dictionary to ensure students do not stray to other potentially harmful Internet sites.

In Centre Two, students use the Internet to record the weather forecast for Central Newfoundland. Instructions are posted and a parent provides further assistance. Through Netscape Communicator, students can visit various forecasting sites such as *Weather Network, Newfoundland and Labrador Weather Information, Weather Underground* and *Environment Canada Weather Information*. Students can then choose the site they prefer and record their weather forecast. Once they have the forecast recorded, they will E-mail their weather-pals in Australia and inform them of that day's weather conditions. Australia is chosen since its seasons are opposite from that of Newfoundland. By comparing forecasts students will observe how climate differs around the world.

With the help of a parent, students are encouraged to use the digital camera to take pictures of their group and the weather conditions outside. They learn how to download pictures from the camera and send them as attachments to the school in Australia. Students then check

their class E-mail for messages from their pen-pals about their forecast and make comparisons between the two. An understanding of the roles information and communication play in technology is another general outcome for technology. The Internet is a new tool for most teachers. Yet, most students are very familiar with its potential. *Teen Research Unlimited* (1997) reveals that teens feel being on-line is as "in" as dating and partying (as cited in Tapscott, 1999, p. 7). Tapscott (1999) indicates that through the Internet students learn about peer relationships, teamwork, critical thinking, and friendships across geographics (p. 8). Since this is the case, it is important to make use of this valuable resource.

The Internet is also chosen as a resource to this project because it is a hypermedia environment. Research in chapter two indicates that hypermedia programs provide students with more self-determination, motivation and a greater sense of control. However, parents must be aware that this is an area that needs close guidance or supervision. Research also indicates that when students use constructivist software, they require time to interact and can easily be attracted to links not related to their research.

Lastly, in this centre, students announce the day's weather forecast over the school's P.A. system. These types of announcements are in accordance with Learning Outcome 2.4 where grade five students are expected to engage in and respond to oral presentations (Gov. of NF and Lab.,1998a, p. 64).

In Centre Three, students use a range of reference texts to find information on their particular topic. They are given the opportunity to use both print and non-print (CD-ROM) encyclopaedías. Various types of non-print encyclopaedias are available from the reference section of the Learning Resource Centre. The *Multimedia Canadian* and *Groliers*

Encyclopaedias are also available for students to use. An instruction card is posted and a parent is assigned to help students using the CD ROM. This centre will last two sessions and groups who are finished early can continue their search by way of the Internet. This centre coincides with the Essential Graduation Outcomes for grades 4-6 where at "the end of grade six, students will be expected to use a range of reference texts and a data base or an electronic search to facilitate the selection process" (Govt. of NF and Lab., 1998a, p.25).

In Centre Four students can choose various audio-video tapes such as *Tell Me Why: Weather* by Leonard Bendell, *Weather Fury* by Spencer Christian and *Understanding Weather* by Bill Nye. Students can watch any of these videos to attain information on their topic. Students are expected to take two sessions in completing this centre. However, these videos are also available and placed in a separate area for students who finish other centres early.

Centre Five involves the use of journals, another important form of reference used in research. Students at this centre are asked to read the article "Ice Age" by Anthony Wilson in the January 19, 1998 issue of *Macleans* (page 12-17). They are then to answer questions that relate to the ice storm that took place in Montreal last year. Students who finish early can use the magazine guides to look up articles related to weather and their topic. In the *Elementary English Language Arts: A Curriculum Guide: Grades 4-6*, grade five students are encouraged to use more than one source and type of information on a particular topic. Learning outcome 7.3 expects students to "apply strategies to analyse a text" and "to demonstrate growing awareness that all texts reflect a purpose and a point of view" (Govt. of NF and Lab., English, 1998a, p. 74). Making the material relevant to the students also coincides with the constructivist approach to learning. Since the ice storm is something the students are familiar with, learning becomes more

relevant.

In Centre Six, students can have some fun expressing what they have learned through art. Students are given various types of materials (paints, pencils, cloths, construction paper, cotton balls, clay, etc.) to create a weather scene of their choice. Students are given the freedom to produce this scene in any form. The Essential Graduation Learnings expect students to be able to express themselves through art (Govt. of NF and Lab., Science, 1998b, p. 3).

In Centre Seven, students interact with a CD program entitled *Everything Weather*. This CD allows students to view, record, and interact with information related to various weather conditions. According to Learning Outcome 8, "grade five students are expected to use writing and other forms of representation to explore, clarify, and reflect on their thoughts, feelings, experiences, and learnings; and to use their imaginations" (Govt. of NF and Lab.,1998a, p. 76). The use of this CD program gives students the opportunity to use other forms of representation and translate ideas from one medium to another.

Everything Weather is a good software selection because it is a type two, hypermedia program that uses several methods to present information via links. It is constructivist software because it allows individual students to learn differently and gives them some control over the learning environment. With this program, students can highlight different words and immediately other documents containing related activities or texts appear. Students can control their own speed and path based on their abilities and needs. A study completed by Becker and Dwyer (1994) reveals that students who have used hypermedia programs are more self-determined and have higher levels of intrinsic motivation as well as an increased sense of control (p. 155-172). Since this hypermedia program gives students a greater degree of learner control, it is important

that teachers guide students in their learning.

Everything Weather is also a simulation program in that it provides students with the opportunity to react to various real life situations. For example, they can track actual hurricanes as they occur and also follow the paths of the most famous storms in history. Students can also become weather makers and change rain to snow, and sleet to freezing rain by interacting with temperatures and wind speeds. As shown in the review of literature in chapter two, simulation programs allow students to engage in higher order thinking skills.

Problems associated with constructivist software were considered when selecting the program *Everything Weather*. The software is challenging but not too difficult and its functions are not too hard to understand. It does contain a lot of information and links, therefore a general guide is provided to keep students on track without restricting them, as well as a list of suggested ideas for exploring the program. Parents are encouraged to monitor the students' interactions with the program but yet allow them to discover new ideas and concepts their own way.

In Centre Eight, students are involved in an actual science experiment. By using a beaker, thermometer, salt, grid paper, ice cubes and a hot plate, students have a better understanding of freezing points. Students place the thermometer in with the ice. Then, they prepare a graph (use grid paper or *Word-perfect 8*) to show temperature changes in comparison to time. They are encouraged to record the results for 5-minute intervals. They are to predict how long it will take for the temperature to rise and then stop. They check their predictions with the actual times. Then, they try the experiment again, only this time they add various amounts of salt. After making their predictions they record their results again. Students are to respond to questions in their booklets such as, "What effect does salt have on the freezing point?" and "Why do you think

salt is placed on the roads in the winter?" Students are then given the opportunity to think of or create other experiments that may support their answers to the above questions.

Students who are finished the first experiment can try to "Bottle a Tornado." Instruction cards are available for both experiments and a parent is assigned for extra help. Students are also expected to complete a science write-up. This write-up encourages them to exercise certain scientific skills, as mentioned on page 117 of the *Elementary Science: A Curriculum Guide: Grades 4-6.*

In Centre Nine, students are given the opportunity to write creatively. Suggested weather topics are available but students can use their own topic as long as it relates to weather. Students are to follow the various stages of the writing process. Learning Outcome 10.1 expects grade five students to use a range of pre-writing, drafting, revising, editing, proofreading and presentation strategies.

Centre Ten allows students to record information from another form of text. Students are to go through several copies of *The Telegram* to look for articles about weather. They are to read the articles and record how current weather conditions have an impact on various aspects of life. This centre relates to the learning outcomes in Language Arts and Social Studies. In Social Studies students are expected to see the relationship between one's climate and living conditions.

Centre Eleven relates to weather instruments. Students must realize that instruments measure conditions that cause change in our weather. The *Elementary Science: A Curriculum Guide: Grades 4-6,* encourages teachers to give students the opportunity to collect a variety of data on the weather using instruments that they have constructed themselves (p. 116). In this centre, students are to make the weather instrument of their choice. A list of instruments along

with proper instructions is found on the Internet site: http://www.miamisci.org/hurricane /conditions.html. Once the instrument is made, students must produce a chart to predict the weather conditions for the next few days. This prediction must come from using their instruments. Full instructions are provided for this centre and a parent is assigned for further assistance.

Centre Twelve is an extra centre for high achievers. In this centre, students will use the Internet as an interactive program that allows them to investigate various factors which affect the outcome on forecasted temperatures. These factors can include such things as day or night, clear or cloudy skies, windy or calm, and whether or not there is any precipitation. Students are to read the information given on each factor and how it relates to forecasting the weather. Then using the scenarios provided on the Internet, students must suggest what impact each component has on the forecasted temperatures.

This is a challenging task, but students can use the links to move back and forth from information on each component to the scenarios themselves. Even though this may be somewhat difficult, it is played as a game and students are therefore more willing to take risks and less worried about being wrong. As indicated in chapter two, constructivist software provides a less threatening and low anxiety environment. Students can print off the scenario table provided on the Internet to record their results. The Internet site is "Forecasting Temperatures: scaffolding activity" at http://ww2010.atmos.uiuc.edu/(GH)/guides/crclm/act/ ftmp. rxml.) .

If students are finished either centre early, they can do anything that will improve the quality of their presentations. First of all, they can do their own Internet search. Students are encouraged to use Yahooligan. Yahooligan is a search engine for kids. It filters out improper sites. Students can use Yahooligan to search for information related to their topic. They can also

scan pictures for their research paper. A list of instructions are posted by the scanner.

Evaluation

Four different types of evaluations are used in this project: self evaluation, on the spot evaluation, project productions and group evaluations. Examples of these evaluations are located at the end of this project. Grade five learning outcomes place much emphasis on self-evaluation. Through a questionnaire, students have the opportunity to rethink the contributions they make and the tasks they are able or unable to complete independently. The *Elementary English Language Arts: A Curriculum Guide* (1998a) notes how encouraging questions used in self evaluations can cause students to reflect on their learning (Govt. of NF and Lab., 1998a, p. 15).

On-the-spot evaluation consists of a checklist. This checklist is completed by parents assigned to the particular centre. After students are finished with a centre, the assigned parent checks off one of the three possible categories: completed independently, completed with help or unable to complete. This is done for students on an individual basis. Observation is one form of assessment mentioned in the *Elementary English Language Arts: A Curriculum Guide (1998a)*. It states that observation through a checklist can provide information on students' level of participation in a given task and on the students' performance on a particular skill (Govt. of NF and Lab., 1998a, p. 15).

At the very end of the unit, the teacher evaluates the group's project, whether it is a written report, web page or video production. Emphasis is placed on content related to their chosen topic, sources used, design and layout of the project. Group projects also involve students

in oral presentations. Each group is responsible for presenting the project to the rest of the class. Evidence must show that students have a good knowledge base of their topic. The *Elementary English Language Arts: A Curriculum Guide (1998a)* supports the assessment of projects for it is useful in evaluating skills related to organizing and presenting information. It also provides an opportunity to assess students' ability to apply what they have learned (Govt. of NF and Lab., 1998a, p.15).

Lastly, individual groups have an opportunity to evaluate the project itself. Through a questionnaire, students make suggestions on how this project could be more effective. A true evaluation of this project can come from those who have experienced it.

CHAPTER FOUR

INTEGRATING TECHNOLOGY INTO A RESOURCE-BASED WEATHER UNIT

Weather

Integrating Technology into a Grade Five Resource-based Unit

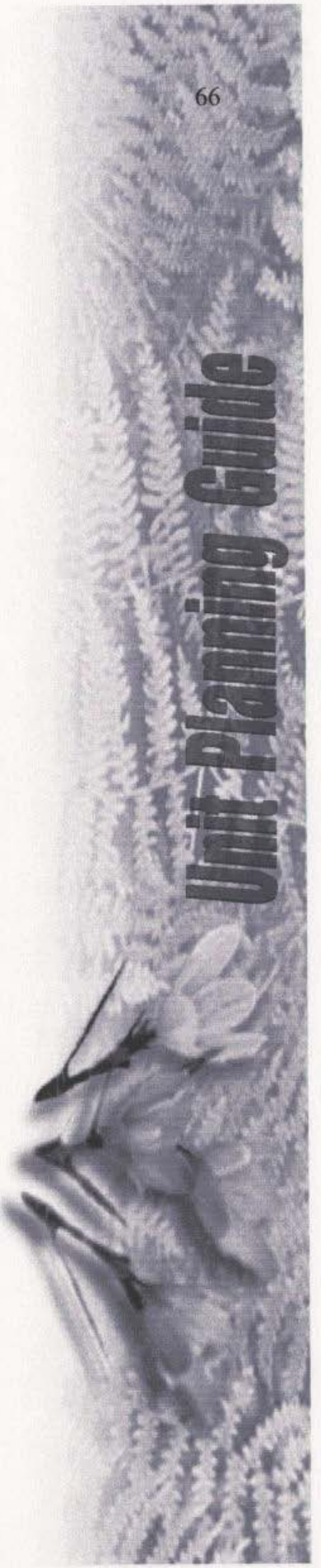
Writer: Ellis Pope
Learning Resource Teacher
Lewisporte Middle School

Project Supervisor: Dr. Roberta Hammett
Associate Professor, Faculty of Education
Memorial University of Newfoundland

Table of Contents

Unit Planning Guide

1. Goals
2. Objectives
3. Values
4. Skills
5. Responsibilities
6. Resources
7. Evaluation



Unit Planning Guide

Grade: Five

Characteristics of Learners:

The class is of mixed maturity levels. Some students are reading well above grade level and can attend to tasks until completion. Others are reading at or below grade level and/or have very short attention spans. There are also those who have difficulty with reading and need some individual help at certain centres.

All students have been introduced to the topic of weather in grade 3. Therefore, they have some general knowledge on the concept of weather. All students have also been using computers since grade two for word processing and various games that concentrate on drill and practice techniques. Therefore, they now understand the basic operating components of computers.

Topic: Weather

General Goals:

- to acquire knowledge about weather while improving research skills.
- to increase students' skills in various areas of technology.
- to improve students' knowledge of sources of information available.
- to provide opportunities for students to listen, speak, read, write and record data. Therefore to improve proficiency in language.

Objectives: Students will:

1. use the Internet to find the forecast for Central Newfoundland on any particular day.
2. use several different types of text and on-line dictionaries to learn new terms associated with weather.
3. research topics such as hurricane, thunder/lightening, tornado, whirlwind, clouds and water cycle.
4. use newspapers to understand the relationship between one's climate and living conditions.
6. demonstrate how weather instruments measure the various conditions that affect our weather.
7. use current events to understand how weather affects our daily lives.
8. have a better understanding of weather while at the same time improve their skills in technology.

Values: Students will:

1. learn to work in a group situation, where the group shares the responsibility of working at each task.
2. understand how weather is an important part of our lives and it affects everything we do.
3. learn that climate varies in different places and it affects the way we live.

4. learn how technology can enhance the quality of their work.

Skills: In this unit students will be introduced to or will develop the following skills:

- choosing the appropriate source for specific information
- use of regional newspapers to obtain current information
- separating fact from opinion
- finding supporting data
- locating all kinds of materials in the learning resource centre
- taking information from a number of sources and integrating it into a report
- making inferences
- noting important details in paragraphs, stories, or picture descriptions
- using guide words, subheadings and the index in an Encyclopaedia
- using a computerized data base to retrieve information
- using the Internet to find information
- interacting with various computer programs
- using alphabetical order
- using cross references
- using videos to obtain information
- acquiring the ability to skim (read to make a quick survey) and scan (read for accurate information)
- distinguishing between relevant and irrelevant facts
- drawing meaningful conclusions
- summarizing information
- detecting bias
- reporting information in paragraph form
- making simple outlines
- using a range of prewriting, drafting, revising, editing, proof reading and presentation skills
- compiling a bibliography
- making weather instruments by following instructions on the Internet
- producing a chart to predict the weather conditions for the next few days
- using graphic programs to enhance the quality of work
- recognizing cause and effect relationships
- using on-line glossaries
- selecting correct meanings for words
- using a word processor to write a report
- using spell check
- using a scanner to scan pictures
- using attachments to send pictures through the Internet
- creating a web page

Specific Responsibilities:

(A) of the teacher:

- Introduce the theme.
- Conduct a survey for weather preferences.
- Present material to students.
- Introduction of specific skills such as research paper and note skills.
- Work with Learning Resource Teacher when deciding which resources are to be used and how they are to be integrated.
- Arrange for parent volunteers.
- Evaluate theme and learners.

(B) of the Learning Resource Teacher:

- Search the Learning Resource Centre and Internet to find available and suitable materials on the topic.
- Teach students skills related to the organization of the Learning Resource Centre and knowledge acquisition.
- Set up centres and book a block of time in the Learning Resource Centre and Technology Lab.
- Contact resource people in the community who may be able to add interest and information to the unit.
- Contact a school in Australia to see if students there would exchange weather information through e-mail.
- Assist students with the use of all technology (ie, Internet, Scanner, Digital Camera).
- Assist teachers, as mutually agreed on, either in the classroom or in the Learning Resource Centre.

Resources:

Print Non-fiction

Bonsall	*The How and Why Book of Weather*	551.5 BON
Booth	*Voices in the Wind*	(Non-catalogued)
Brandt	*What Makes Rain*	551.57 BRA
Branley	*Snow is Falling*	551.5 (two copies)
Dorros	*Feel The Wind*	551.5 DOR
Flint	*Weather and Climate*	551.6 FLI
Forsdyke	*Weather and Weather Forecast*	500.9 FOR
Lehr	*Weather*	551.5 LEH (two copies)
Merk	*Storms*	551.55 MER
Merk	*Clouds*	551.57 MER
Merk	*Weather and Us*	551.5 MER
Merk	*Studying Weather*	551.5 MER
Merk	*Weather Signs*	551.6 MER

Milgrom	*Understanding Weather*	551.6 MIL
Moncure	*What Causes It?*	551.5 MON
Paola	*The Cloud Book*	(Non-catalogued)
Parker	*The Earth and How It Works*	551 PAR
Rocwell	*The First Snow Fall*	551.57 ROC
Schmid	*The Air Around US*	551.5 SCH
Stacey	*Snow*	551 STA
Stacey	*Rain*	551 STA
Stacey	*Ice*	551 STA
Stacey	*Fog*	551 STA
Tannehill	*All About Weather*	551.6 TAN

Fiction:

Barrett	*Cloudy With a Chance of Meatballs*	E BAR (two copies)
Hall	*Forecast*	F HAL
Peters	*Water's Way*	(Non-catalogued)
Tregebov	*The Big Storm*	(Non-catalogued)

Journals:

Maclean's - "Ice Age"

Newspapers:

The Telegrams

Non-Print

Videos:

Bendell Leonard	*Tell Me Why Weather*	VID 551
Christian Spencer	*Weather Fury*	VID 551
Nye Bille	*Understand Weather*	VID 551

Multi Media:

Everything Weather (CD)

Contents of Unit:

Centres will be set up as follows:

Centre One:	Dictionary Centre
Centre Two(a):	Forecasting the Weather Centre
Centre Two (b):	Weatherpals Centre
Centre Two (c):	Comparing the Weather Centre
Centre Three:	Encyclopaedias Centre
Centre Four:	Video Centre
Centre Five:	Magazine Centre
Centre Six:	Art Centre
Centre Seven:	CD ROM Centre
Centre Eight:	Experiment Centre (Freezing Points and Bottle a Tornado)
Centre Nine:	Creative Writing Centre
Centre Ten:	Newspaper Centre
Centre Eleven:	Weather Instruments Centre
Centre Twelve:	Interactive Centre for High Achievers

In carrying out the actual project, it is suggested that students be grouped into groups of four or five. If students are familiar with group work and have developed skills in this area, as was the case in this project, they can select their own groups. Special needs students can be a part of this grouping as well. The special needs teacher can be aware of the location of each special needs student to ensure that they are not overwhelmed with difficult tasks. The special needs teacher can closely monitor and assist students when needed. This sort of social grouping benefits both high and low achievers. High achievers have the opportunity to learn by generating and articulating explanations to others in their group and low achievers have the opportunity to learn by observing learning strategies used by their partners.

Once all students are grouped, they are to decide upon a weather topic to research as they travel to various centres. Topics for research include stormy weather, tornadoes, hurricanes, whirlwinds, clouds, lightning/thunder, weather instruments or the water cycle. However, a group can choose a scenario table provided on the Internet to record their results. The Internet site is called Forecasting Temperatures: Scaffolding Activity. It is located at the following site: http://ww2010.atmos.uiuc.edu/(GH)/guides/crclm/act/ftmp.rxml.

If students are finished either centre early, they can do anything that will improve the quality of their web page. They can do their own Internet search. Students are encouraged to use Yahooligan. Yahooligan is a search engine for children. It filters out improper sites. Students can use Yahooligan to search for information related to their topic. They can also scan pictures for their web pages, or use Corel Draw to add graphics. A list of instructions will be posted for both the scanner and Corel Draw. Other Internet sites will also be posted such as a site to locate different weather proverbs, or a place to ask questions to Mr. Weatherman.

Evaluation

Four different types of evaluations are used in this project: self evaluation, on the spot evaluation, project productions and group evaluations. Self evaluation consist of a questionnaire, students have the opportunity to rethink the contributions they make and the tasks they are able or unable to complete independently.

On-the-spot evaluation consists of a checklist. This checklist is completed by parents assigned to the particular centre. After students are finished with a centre, the assigned parent checks off one of the three possible categories: completed independently, completed with help or unable to complete. This is done for students on an individual basis.

At the very end of the unit, the teacher evaluates the group's project, whether it is a written report, web page or video production. Emphasis is placed on content, sources used, design and layout of the project. Group projects also involve students in oral presentations. Each group is responsible for presenting the project to the rest of the class. Evidence must show that students have a good knowledge base of their topic.

Lastly, individual groups have an opportunity to evaluate the project itself. Through a questionnaire, students make suggestions on how this project could be more effective.

Centres

1. Dictionary Centre
2 (a). Forecasting the Weather Centre
   (b). Weatherpals Centre
   (c). Comparing the Weather Centre
3. Encyclopaedias Centre
4. Video Centre
5. Magazine Centre
6. Art Centre
7. Everything Weather Centre
8. Experiment Centre
9. Creative Writing Centre
10. Newspaper Centre
11. Weather Instrument Centre
12. Interactive Centre for High Achievers
13. Extented Activity

Centre 1: Dictionary Centre

1. Using your booklets put the following words in alphabetical order.

weather	cirrus cloud	wind chill factor	climate
evaporation	cumulus cloud	anemometer	Celsius scale
condensation	stratus cloud	wind vane	meteorologist
precipitation	rain gauge	thermometer	chinook
temperature			

2. Make oral predications on the meaning of each word. You may use your Science textbook or any other weather related material to read the words in context. See which member of your group can come the closest to the exact meaning.

3. After each prediction, use the dictionaries provided to find the correct meaning. In your booklets write the meaning in your **OWN WORDS.**

You may also use the on-line glossary of weather terms located at:
http.//www.weatherpost.com/longterm/glossary/glossary.htn

Centre2(a):Forecasting the Weather

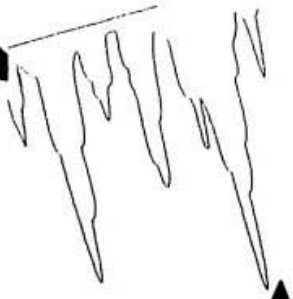
1. Using the Internet, locate and record the weather forecast for Central Newfoundland. Record this in your book.

You may visit and choose the web site they prefer.
The following are some suggested sites:

Weather Post
http://www.weatherpost.com/navpages/frame_set_inter.htm

The Weather Underground
http://www.wunderground.com/global/CA_NF.html

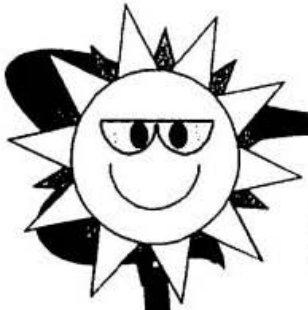
Environment Canada
http://www.ns.ec.gc.ca/weather/index_e.html



Centre 2(b): Announcing Today's Forecast

Fill out the Announcement Form in your booklet.

Use this form to announce today's forecast over the school's P. A. System.



Centre 2(c): Comparing the Weather

1. E-mail your corresponding class in Australia. Inform them of today's weather.

2. Check our class e-mail. Open mail from Australia. Record what they have to say about their weather.

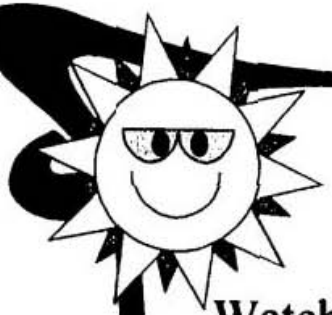
3. In your booklet compare our forecast with that of Australia.

Centre 3: Encyclopedias

- Use both print and non print encyclopedias to find information on the topic you have been assigned.
- Use your booklets to record your information. Make sure you record the sources in your bibliography.
- Print encyclopedias are located in the Reference Section of the Learning Resource Centre.
- *Multimedia Canadian*, *Grolier Encyclopedia* and *Encarta* are provided with this centre. Instructions for using these CDs are posted.

Instructions for Encarta

1. Login to the computer.
2. Click on the Start button.
3. Go to Programs.
4. Find and click on Encarta.
5. Click on Encyclopedia Articles.
6. Click on Find.
7. Type the topic in slot indicated.



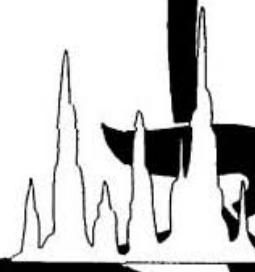
Centre 4: Video Centre

Watch one of the following videos to obtain information about your topic. Choose the video that you feel will be most appropriate. The following videos are available at this centre:

Tell Me Why: Weather	by Bendell Leonard
Weather Fury	by Spences Christain
Understanding Weather	by Bill Nye

Use the remote control to fast forward, rewind and pause for selections needed. Don't forget to mention the video used on your reference page.

* These videos are also available for students who are finished their other centres early. Therefore, groups may need to borrow videos from this centre.



Centre 5: Magazine Centre

1. Read the article, **"Ice Age"** by Anthony Wilson-Smith in the Jan. 19, 1998 issue of *Macleans* (Page 12-17).

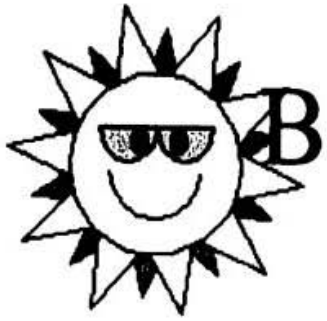
2. Answer the questions provided in your book.

If finished early you may use the available magazine guides to look up articles related to weather and your particular topic.

Centre 6: Art Centre

Use the material provided to create a weather scene of your choice.

This scene may be in any form and you may use other resources than those provided.



Be Creative !

Centre 7: Everything Weather

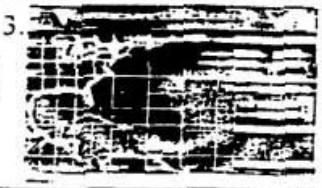
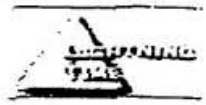
1. Log into the computer and place the *Everything Weather* CD into the CD-ROM. Click on:
   Start ➜Programs ➜Everything Weather
   ➜Everything Weather.

2. Once into the program find your particular topic, then use the picture, video and book options to write jot-notes.

3. Make sure you take some time to explore the program yourself. Some suggested ideas are provided at this centre.

★ Important instructions related to this program are posted above the computer.

SUGGESTED IDEAS FOR EXPLORING EVERYTHING WEATHER

CLICK ON...	TO...
1 	1. Follow a timeline of changes in meteorology and see how the latest tools in weather forecasting work.
2. 	2. Get to know the clouds by name and understand the weather they foretell.
3. 	3. Track actual hurricanes as they occur and follow the paths of some of the most infamous storms of modern times.
4. 	4. Investigate the relationship between thunder and lightning, as well as sound and light.
5. 	5. Become a "weathermaker" and change rain to snow, and sleet to freezing rain.
6. 	6. Explore the reasons for as well as the effects of wind chill.
7. 	7. Search for articles, graphs, photographs and videos in a weather-topic index.
8. 	8. Access the glossary for concise explanations of weather terms and related events.

Centre 8: Experiment Centre

1. Follow the instructions to complete the experiment related to Freezing Points.

2. Complete the Science Experiment form in your booklets.

* If extra time remains, follow the instructions provided to completing the experiment entitled "Bottle A Tornado".

Instructions - Freezing Point

Provided on this table, you should find the following materials:

beaker	**ice cubes (in cooler)**
thermometer	**salt**

To understand how temperature changes in comparison to time, do the following:

- **Place the thermometer in the beaker of ice.**
- **Record the temperature using the table provided in your booklet. Continue to record the temperature every five minutes.**
- **Predict how long it will take for the temperature to stop rising. When it stops, compare the actual time with your predictions. How close were you?**
- **Complete steps 1 - 3 again but this time add various amounts of salt. What effect does salt have on the freezing points? From looking at your results why do you think salt is placed on the roads in the winter?**

Challenge - Bottle A Tornado!

You will need

- 2 - L clear plastic pop bottle
- small piece of plasticine
- pencil

In Action:

1. With a partner, fill your bottle about two thirds full of water and carefully dry off the bottle neck both inside and out.

2. Mold your plasticine into a ball that is larger than the neck of your bottle. Push a pencil half-way through the middle of the plasticine ball. Now mold the plasticine ball into a plug shape.

3. Seal the opening of the bottle with the plug. Once the plug is in position, loosen the pencil and then remove it. You should have a plug in the bottle neck with a hole in the centre.

4. Holding your bottle low in the sink to avoid splashes, quickly turn it upside-down and give it a few circular swirls to start your tornado. If your bottle only bubbles or does nothing, tip is upward and make the hole in the plug a little larger with the pencil before you try again.

5. Refill the bottle and let your partner make a tornado.

6. Write your own definition of a tornado using the facts from page 118, your own experience making a tornado, and the information on the following page.

Centre 9: Creative Writing Centre

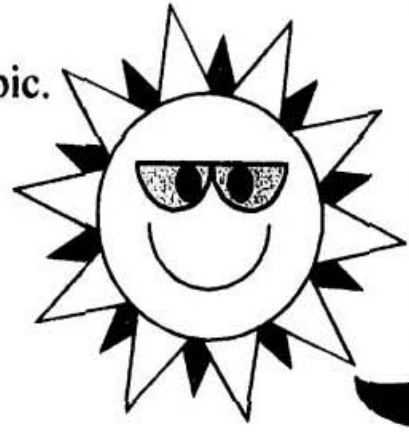
It has rained for a week. In front of your house the street is like a river. The electricity in your house is off. Only candles burn at night. You can't go outdoors. Write a story about this experience. Consider how you would feel, what you would do, and the hardships you and your family would endure.

or

Write an experience something like the one above except relate it to an Ice Storm, Hurricane, Tornado etc.

or

Be very creative and select your own topic.



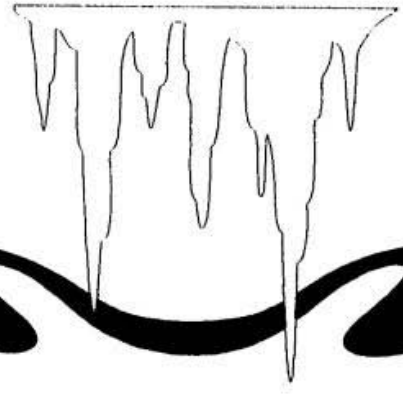
Make sure you follow the writing process!!!

1. List, organize ideas
2. Write first draft (on paper provided)
3. Edit first copy
4. Write final copy (in your booklet)

Centre 10: Newspaper Centre

1. *The Telegram* can provide us with information on current events that surround us. Look through the issues provided. Read the articles that relate to the weather and how its conditions have had an impact on its surrounding areas.

2. After reading the articles, answer the questions provided in your book.



Centre 11: Weather Instruments

- Make the Weather Instrument of your choice. A list of instruments along with proper instructions is found on the following Internet site:

  http://www.miamisci.org/hurricane/conditions.html

Use your instrument to predict the weather conditions over the next few days. Record your predictions and compare with actual weather conditions.

Centre 12
Interactive Centre for High Achievers

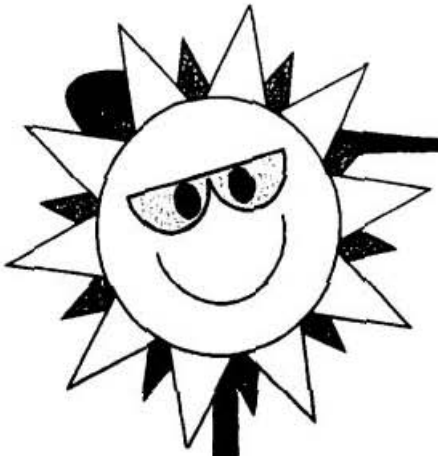
Investigate the various factors that affect the outcome on forecasted weather. You can do this by reading the information located at:

http://ww2010.atmos.uiuc.edu/(GH)/guides/crclm/act/ftmp.rxml

After reading the information, print off the scenarios provided at the site. (Go to File, then Print)

What impact will each scenario have on forecasted temperature?

* You may use the links provided on this site to move back and forth from the information to the scenarios.



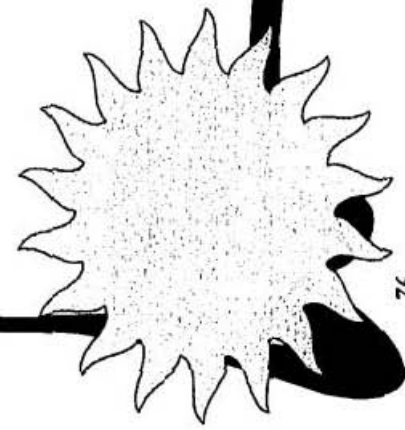
Extended Activity

Finished your centre early? Why not send some information to our corresponding class in Australia.

You may make use of the scanner to scan pictures of your school, your group, or even weather scenes.

You may also use the digital camera to take pictures.

* Follow instructions posted by the scanner.



Posted Instructions

1. Scanner
2. Digital Camera
3. Photo Deluxe Software
4. Using E-mail
5. Using the Internet

Posted Instructions

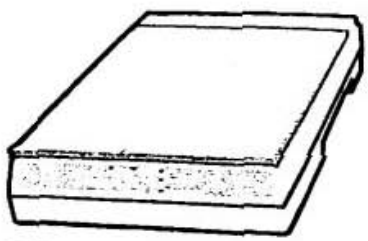
Scanner Instructions

1. First go the START button with the mouse.
2. Click on START.
3. Move up to Programs.
4. Go over to the right and move down to PhotoStacker Pro - go over to the right and click on PhotoStacker Pro.
5. Press ESC after the computer is into the program.
6. Go to File and go down to ACQUIRE... to scan the image.
7. If you want your picture colored, make sure that the IMAGE TYPE is on RGB True Color.
8. Change your RESOLUTION to about 295-300 for a good quality (higher the resolution...the slower the scanner).
9. Make sure the picture is in place.
10. Click on PRESCAN button to see what is on the scanner.
11. Take your mouse and select what you want in the picture.
12. Click on SCAN button to scan your picture.
13. Click X on the top right hand corner of the computer frame.
14. To make picture better go to IMAGE and select BRIGHTNESS & CONTRAST.
15. You may also use the tools provided to make any desired change.
16. Next Save your work on your disk:

    ➜ FILE ➜ SAVE AS

    Change drive to "a" ➜ File type to "jpeg"

    Give your picture a name in the file name box.



Digital Camera Instructions

Digital Camera - DC220 

1. No film goes in this camera - pictures automatically go from camera to computer.

2. You can add sound to your pictures or put the pictures on the computer and e-mail to family and friends.

3. Turn on the camera by pushing the **POWER** button. (Watch for green light to stop blinking - the camera is ready)

4. There is a **DIAL** on the back of your camera. Remember to have the dial turned to **CAPTURE** mode whenever taking pictures. The other options such as **REVIEW**. **CONNECT** and **INFO** are explained on the definition sheet provided with these instructions.

5. Choose one of the following **MODES:**
   1. **Quality** (*good, better, or best*)
   2. **Picture Type** (*still, burst, timelapse*)
   3. **Flash Setting** (*auto, red eye, fill, off*)

   In order to do this, refer to the **SCROLL** and the **SELECT** button on top of the camera. The **SCROLL** button will allow you to select the different modes and the **SELECT** button will allow you to choose the various settings in each mode. All selections can be viewed through the **DISPLAY WINDOW** on top of the camera.

Digital Camera Instructions - Continued

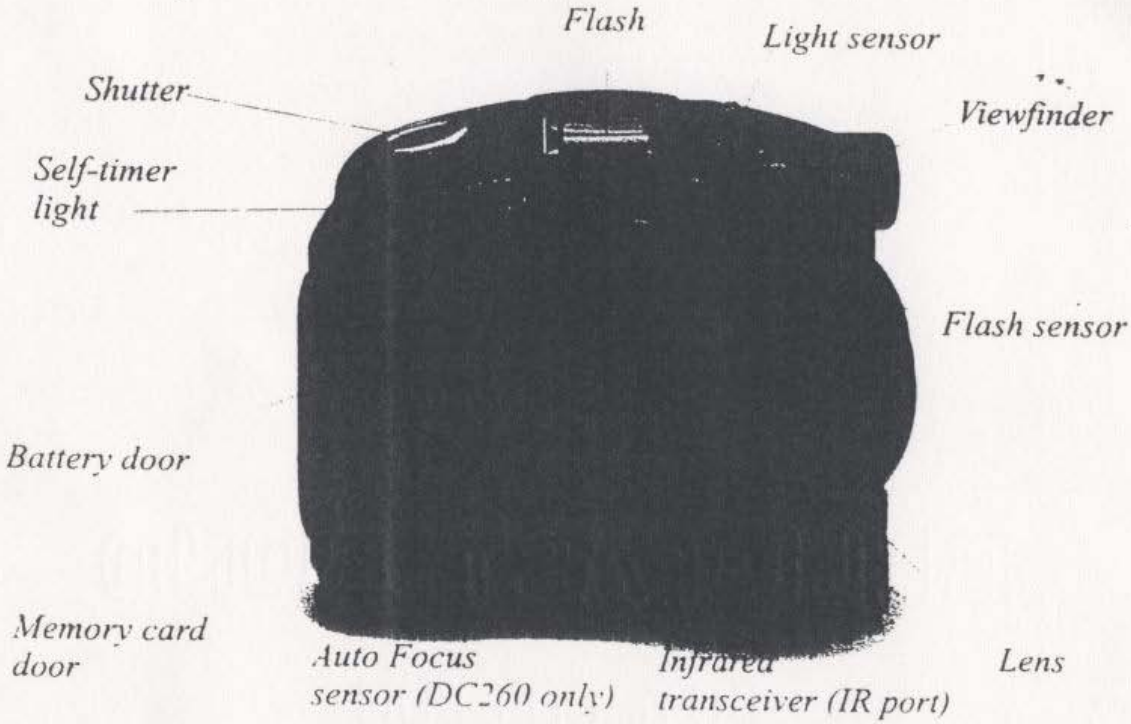
6. Place the subject (what you want in your picture) in the **VIEWFINDER.**

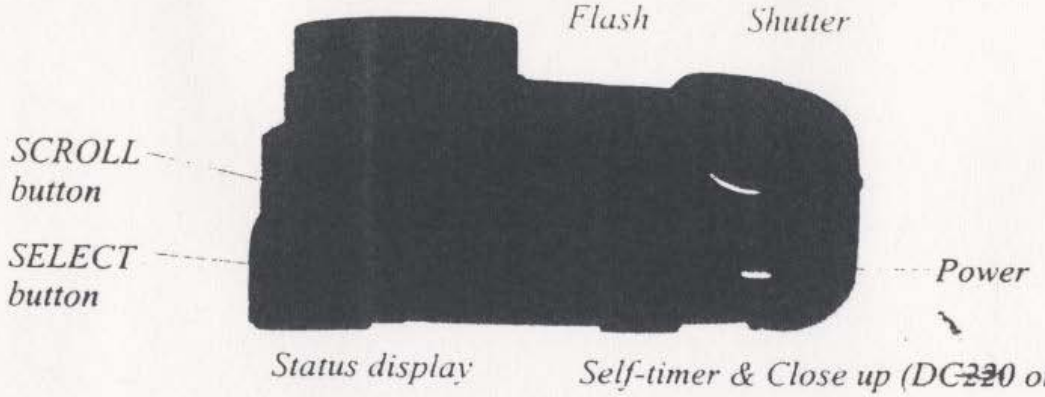
7. Press the **SHUTTER** button - if you are taking a still picture, press and release. If you are taking a burst picture, hold down the **SHUTTER** button for as long as you want the camera to fire.

8. If you want to review your picture set the **MODE** dial to **REVIEW**. Once you review you can magnify or delete the picture by using **SOFTKEYS.** Remember to keep noting how many pictures you have left. This can be done by referring to the number on the bottom right in the display window on top of the camera. You can always **DELETE** unwanted pictures in **the REVIEW** mode.

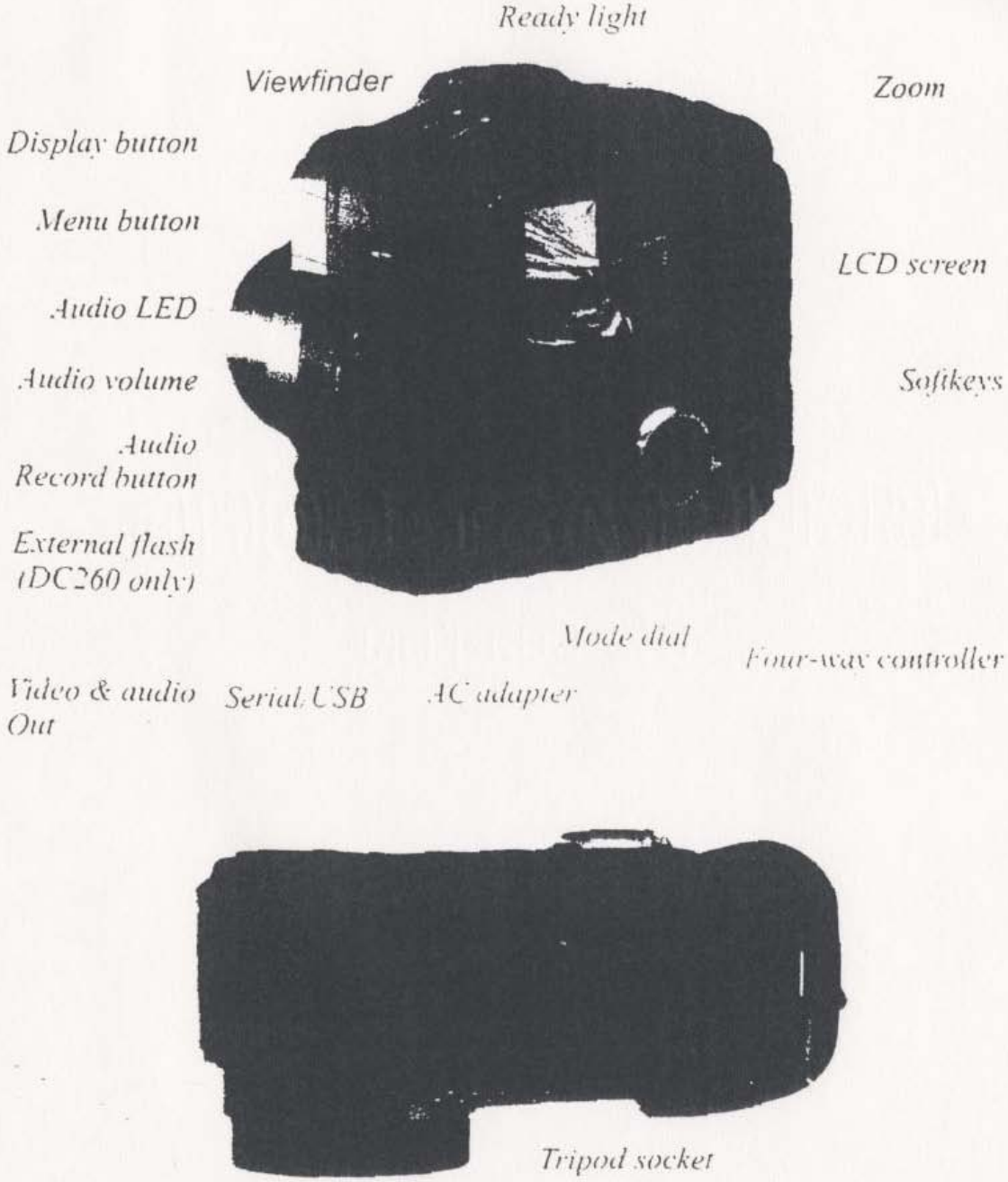
9. Turn Camera off when you are finished.

DC220 Digital Camera





DC260 Camera - Continued



☞ The camera shown is a DC260. In cases where the features differ from the camera shown, the User's Guide will note it.

CLOSE-UP / SELF TIMER

For close up or self timer pictures push the button at the right of the display located on top of the camera.

*** When the "close up" option is in the DISPLAY BOX, the picture will be viewed in the LCD SCREEN on the back of the camera.**

*** When the self timer comes up in the display box you will have 10 seconds before the picture will be taken.**

ZOOMING

Move the ZOOM button to adjust the lens.

Move the button to the right (toward TELEPHOTO) to zoom in on your subject.

Move it to the left (toward WIDE angle) to zoom away from your subject.

USING PHOTO DELUXE 2.0

A. Connecting the Camera to the Computer

1. Attach cable provided to the proper slots in both the camera and computer.
2. Turn the camera POWER on.
3. Turn the camera DIAL to CONNECT.

B. Operating the Program

1. Using the Computer:

   Click on START ➜ PROGRAMS ➜ ADOBE ➜ PHOTODELUXE 2 ➜ PHOTODELUXE 2

2. Using the side menu click on GET PHOTO.
3. Using the top menu click on GET PHOTO.
4. Click on CAMERA icon and then on CAMERA CONTENTS. This connects you to the Camera.
5. A list of pictures will appear. Use the scroll bar, find and click on your picture. (it is indicated by the date).
6. Click FULL VIEW and wait for it to load on.
7. If everything looks okay, click on TRANSFER.

8. You will now be asked to enter a new name for your photo. After you have done this:
Click on OK ➜ CLOSE ➜ CLOSE TWAIN

9. Double click on PICTURE and close "My Photo" window at bottom of screen.

10. On top of the menu select TOUCH UP button and go through any of the needed options on the screen. For example you can crop your picture by selecting SIZE ORIENTATION at the top menu. Click on TRIM to take unwanted areas out of the picture. To do this you, put your curser on the picture and draw a box around what you actually want. When you are finished let the mouse go and it will do the trimming for you.

11. Click DONE. If you want more Special Effects use the menu on the left of screen.

2. To send photo to disk, click SEND from side menu.

3. Click on EXPORT ➜ EXPORT ➜ OTHER EXPORT

You can now save your photo to your disk.
➜Save in a: ➜ Type in File Name ➜ Save as JPEG
➜Save OK ➜ Done

4. To transfer picture into the Internet :
Click on SEND ➜ INTERNET ➜ E-MAIL Icon.

Go through options 1 to 4, make the changes needed, then at option 4: Click on Mail ➜ Mail Icon ➜ OK
➜Select address required ➜ OK

To Check E-Mail

a. **Login to the Computer:**
Click on Netscape Communicator.
In location box type: WWW.HOTMAIL.COM

On the Hotmail web page enter:
User name: grade51
Password: lewisporte
Press ENTER

b. **To Send Mail:**
Click on Compose at the top left hand corner.
Fill in address and type message.
When finished click on SEND

c. **To Send Picture:**
Use the Attachment Box and follow the instructions provided on the page.

d. **To Check Mail:**
Go to the INBOX page.
Click on NEW MAIL listed.

e. **To Reply to Mail:**
Click on REPLY at the top of the menu.

Using the Internet:

- Login to the computer.
- Double click on Netscape Communicator.
- Put correct address in the Top Location Box.
- Press Enter.
- To search for a topic, you can use a search engine such as Yahooligans at:
  http://www.yahooligans.com/
  Then proceed to put your topic in the search box.

Student Booklet

Centre 1: Dictionary Centre

Write the following words below in alphabetical order. Use the World Book Dictionaries to record the meanings of the words.

weather	cirrus cloud	wind chill factor	climate
evaporation	cumulus cloud	thermometer	Celsius scale
condensation	stratus cloud	anemometer	meteorologist
precipitation	rain gauge	wind vane	chinook

1. _____ : _____

2. _____ : _____

3. _____ : _____

4. _____ : _____

5. _____ : _____

6. _____ : _____

7. _____ : _____

8. _____ : _____

9. _____ : _____

10. _____ : _____

11. _____ : _____

12. _____ : _____

13. _____ : _____

14. _____ : _____

15. _____ : _____

16. _____ : _____

17. _____ : _____

Centre 2 - Forecasting the Weather

1. What is today's forecast for Central Newfoundland?

2. What is today's forecast for Australia?

3. How does our forecast compare to the forecast for Australia?

Centre 3 - Encyclopedias

Use the print Encyclopedias in the Reference Section of the LRC and the non print Encyclopedias (CD Rom) to find the information on the topic you have been assigned. Make sure you record the source in your Bibliography.

Centre 4: Video Centre

View one or more of the videos provided to write jot notes below on your chosen topic.

Centre 5 - Magazine Centre

Maclean's - "Ice Age"

Read the article - "Ice Age". Then answer the following questions.

1. Describe the storm mentioned in this article.

2. How did the storm affect the people? Land?

3. Do you feel the title "Ice Age" is a suitable title? Why or why not?

4. Where did the ice storm occur first? When did it hit?

5. How many millimeters of rain was dumped on Montreal the first day of the storm? How does this compare with the storm of 1961?

6. What did Wilson-Smith mean when he said they had to "declare a state of emergency?"

Centre 6: Art Centre

Describe how you created your weather scene.

Centre 7 - Everything Weather

Use the CD program *Everything Weather* to find the information on the topic you have been assigned. Make sure you record the source in your Bibliography.

Centre 8 : Instructions - Freezing Point

Provided on this table, you will find the following materials:

beaker	ice cubes (in cooler)
thermometer	salt

To understand how temperature changes in comparison to time do the following:

- Place the thermometer in the beaker of ice.
- Record the temperature using the table provided in your booklet. Continue to record the temperature every five minutes.
- Predict how long it will take for temperature to stop rising. When it stops, compare the actual time with your predictions. How close were you?
- Complete steps 1 - 3 again but this time add various amounts of salt.
- What effect does salt have on the freezing points? From looking at your results, why do you think salt is placed on the roads in the winter? *Try to think of or construct other experiments that may support your answer to this question.*

SCIENCE
GRADE 5
WEATHER ACTIVITY - FREEZING POINT

Challenge: _____

_____

Material: _____

_____

_____

_____

_____

_____

Hypothesis (Prediction): _____

_____

_____

Procedure: _____

_____

_____

_____

_____

_____

_____

_____

_____

Observation:

Predicted time temperature stopped falling:_____

Table # 1

Time	Temperature
5 Min.	
10 Min.	
15 Min.	

Table # 2 (with salt)

Time	Temperature
5 Min.	
10 Min.	
15 Min.	
20 Min.	
25 Min.	
30 Min.	

Conclusion: _____

_____

_____

_____

Centre 8: Extended Experiment

Challenge - Bottle A Tornado!

You will need: 2 - L clear plastic pop bottle
small piece of plasticine
pencil

In Action:

1. With a partner, fill your bottle about two thirds full of water and carefully dry off the bottle neck both inside and out.

2. Mold your plasticine into a ball that is larger than the neck of your bottle. Push a pencil half-way through the middle of the plasticine ball. Now mold the plasticine ball into a plug shape.

3. Seal the opening of the bottle with the plug. Once the plug is in position, loosen the pencil and then remove it. You should have a plug in the bottle neck with a hole in the centre.

4. Holding your bottle low in the sink to avoid splashes, quickly turn it upside-down and give it a few circular swirls to start your tornado. If your bottle only bubbles or does nothing, tip is upward and make the hole in the plug a little larger with the pencil before you try again.

5. Refill the bottle and let your partner make a tornado.

6. Write your own definition of a tornado using the facts from page 118, your

own experience making a tornado, and the information on the following page.

SCIENCE

GRADE 5

WEATHER ACTIVITY - Bottle A Tornado!

Challenge:_____

_____

Materials: _____

_____

_____

_____

_____

Hypothesis (Prediction): _____

_____

_____

Procedure:_____

_____

_____

_____

_____

_____

Results:

Conclusion:

Centre 9: Creative Writing Centre

Final Copy

Centre 10: Newspaper Centre

Look for articles in the **Evening Telegram** on weather. Answer the following questions.

1. What is the headline of your article? Is it a suitable title? Why or why not?

2. Who wrote this article? Do you think he or she did a good job reporting the condition to the readers? Why or why not?

3. What is the date and volume number of the Evening Telegram you are using?

4. According to your article, what was the weather condition like? How did this condition affect the people in the area?_____

5. Write a summary indicating the main point mentioned in your article?

Centre 11 : Weather Instruments

Weather Instrument Created: _____

DAY 1	
Predicted Forecast	Actual Weather

DAY 2	
Predicted Forecast	Actual Weather

DAY 3	
Predicted Forecast	Actual Weather

DAY 4	
Predicted Forecast	Actual Weather

DAY 5	
Predicted Forecast	**Actual Weather**

Bibliography

Record the sources you have used in obtaining information in your booklets.

Non - Fiction Books

1. _____ (Surname Name) , _____ (First Name) .(_____) (Year). _____ (Title).
_____ (Where Published) : _____ (Publishing Company) . _____ (Pages Used).

2. _____ (Surname Name) , _____ (First Name) .(_____) (Year). _____ (Title).
_____ (Where Published) : _____ (Publishing Company) . _____ (Pages Used).

3. _____ (Surname Name) , _____ (First Name) .(_____) (Year). _____ (Title).
_____ (Where Published) : _____ (Publishing Company) . _____ (Pages Used).

4. _____ (Surname Name) , _____ (First Name) .(_____) (Year). _____ (Title).
_____ (Where Published) : _____ (Publishing Company) . _____ (Pages Used).

5. _____ (Surname Name) , _____ (First Name) .(_____) (Year). _____ (Title).
_____ (Where Published) : _____ (Publishing Company) . _____ (Pages Used).

6. _____ (Surname Name) , _____ (First Name) .(_____) (Year). _____ (Title).
_____ (Where Published) : _____ (Publishing Company) . _____ (Pages Used).

7. _____ , _____ .(_____). _____.
Surname Name First Name Year Title

_____ : _____ . _____.
Where Published Publishing Company Pages Used

8. _____ , _____ .(_____). _____.
Surname Name First Name Year Title

_____ : _____ . _____.
Where Published Publishing Company Pages Used

9. _____ , _____ .(_____). _____.
Surname Name First Name Year Title

_____ : _____ . _____.
Where Published Publishing Company Pages Used

10. _____ , _____ .(_____). _____.
Surname Name First Name Year Title

_____ : _____ . _____.
Where Published Publishing Company Pages Used

11. _____ , _____ .(_____). _____.
Surname Name First Name Year Title

_____ : _____ . _____.
Where Published Publishing Company Pages Used

12. _____ , _____ .(_____). _____.
Surname Name First Name Year Title

_____ : _____ . _____.
Where Published Publishing Company Pages Used

Newspapers

1. _____ (_____). _____.
Author of article (or Editor) Date Title of article

_____. _____.
Name of Newspaper Pages used

Magazines

1. _____ (_____). _____.
Author of article (or Editor) Date Title of Article

_____, _____, _____.
Name of Magazine Volume # Pages used

Internet

1. _____, (_____). _____.
Author Date Title

[Online] . Available: _____.
Web Address

2. _____, (_____). _____.
Author Date Title

[Online] . Available: _____.
Web Address

3. _____, (_____). _____.
Author Date Title

[Online] . Available: _____.
Web Address

4. _____, (_____). _____.
Author Date Title

[Online] . Available: _____.
Web Address

Video

1. _____ (Author), (_____) (Year). _____ (Title).

_____ (Where Published), _____ (Publishing Company).

2. _____ (Author), (_____) (Year). _____ (Title).

_____ (Where Published), _____ (Publishing Company).

3. _____ (Author), (_____) (Year). _____ (Title).

_____ (Where Published), _____ (Publishing Company).

Encyclopedia

1. _____ (Title of Encyclopedia). (_____) (Date). _____ (Topic).

_____ (Where Published): _____ (Publishing Company).

2. _____ (Title of Encyclopedia). (_____) (Date). _____ (Topic).

_____ (Where Published): _____ (Publishing Company).

CD Rom Program

1. _____ (Surname) , _____ (First Name) . _____ (Title of Program) [CD ROM]

_____ (Where Published) , _____ (Publishing Company) .

2. _____ (Surname) , _____ (First Name) . _____ (Title of Program) [CD ROM]

_____ (Where Published) , _____ (Publishing Company) .

3. _____ (Surname) , _____ (First Name) . _____ (Title of Program) [CD ROM]

_____ (Where Published) , _____ (Publishing Company) .

Remember when recording for your research paper you always underline titles, and put topics in quotation marks. On the final copy of your research paper you should sort the bibliography in *alphabetical* order by the author's surname.

Evaluation Sheets

1. On the Spot Evaluation
2. Self- Evaluation
3. Group Evaluation

On the Spot Evaluation

CENTRE _____				
STUDENTS	**Completed Independently**	**Completed with Help**	**Completed with Difficulty**	**Incomplete**
1.				
2.				
3.				
4.				

CENTRE _____				
STUDENTS	**Completed Independently**	**Completed with Help**	**Completed with Difficulty**	**Incomplete**
5.				
6.				
7.				
8.				

CENTRE _____				
STUDENTS	**Completed Independently**	**Completed with Help**	**Completed with Difficulty**	**Incomplete**
9.				
10.				
11.				
12.				

Student Self-Evaluation Form

Theme:_____ Name:_____

The activity I enjoyed the most was:_____
because: _____
_____

The hardest activity was: _____
because: _____
_____

I helped the theme succeed by: _____
_____
_____

In Group Task:

I had no problem with: _____
_____
_____

I did however, have a problem with: _____
_____
_____

In Independent Task:

I had no problem with: _____
_____
_____

I did however, have a problem with: _____
_____
_____

Project Evaluation Form

(Completed by Student Groups)

Theme: _____

Group Members Names: _____

Date: _____

What we were confused about?

_____

_____

_____

_____

What dis we really like?

_____

_____

_____

_____

What are our suggestions for improvement?

_____

_____

_____

_____

_____

_____

_____

_____

REFERENCES

Adams, P. E., (1996). Hypermedia in the classroom using earth and space science CD-ROMs. *Journal of Computers in Mathematics and Science Teaching, 15*(½), 19-34.

Barker P. & King, T., (1993). Evaluating interactive multimedia courseware - A methodology. *Computers in Education 21*(4), 307-319.

Becker, D. A., & Dwyer, M., (1994). Using hypermedia to provide learner control. *Journal of Educational Multimedia and Hypermedia, 3*(2), 155-172.

Beswick, N. (1977). *Resource-based Learning.* London, Alta: Alberta Education.

Britannica Learning Materials. (1991). *Information Power* [Video]. (Available from Britannica Pl., Box 2249, Cambridge, Ont. N3C 3N4).

British Columbia Teacher-Liberians' Association. (1986). *Fuel for Change* [Video]. (Available from British Columbia Teachers' Federation, Vancouver, B.C.).

Brown, Jean., (1988). *Resource-based Learning.* St. John's, NF: Memorial University, Faculty of Education.

Ducan, S.L.S. (1996). Cognitive apprenticeship in classroom instruction: Implications for industrial and technology teacher education. *Journal of Industrial Teacher Education* [On-line], *33*(3). Available: http://scholar.lib.vt.edu/ejournals/JITE/v33n3/ducan.html

Friske, J., Knezek, D., Taylor, H., Thomas, L. & Wiebe, J. (1994). ISTE's technology foundation standards for all teachers: Time for a second look? *Journal of Computing in Teacher Education, 12*(2), 9-12.

Geis, George, (1993). Hype and hypertext. *Performance & Instruction, 2,* 15-17.

Government of Newfoundland and Labrador (1998a). *Elementary English Language Arts: A Curriculum Guide (Interim Edition).* St. John's, NF: Author.

Government of Newfoundland and Labrador (1998b). *Elementary Science: A Curriculum Guide (Interim Edition).* St. John's, NF: Author.

Government of Newfoundland & Labrador, (1996). *A Curriculum Framework for Technology Education: Living in a Technological Society.* Dept of Education & Training. St. John's: Queen's Press.

Government of Newfoundland and Labrador, (1995). *Technology in learning environments: Enabling tomorrow's learners today.* Dept of Education & Training. St. John's: Queen's Press.

Government of Newfoundland and Labrador. (1994). *Adjusting the Course Part II: Improving The Conditions for Learning.* St. John's, NF : Author.

Government of Newfoundland and Labrador. (1992a). *Learning to Learn: From Theory to Practice.* St. John's, NF: Author

Government of Newfoundland and Labrador. (1992b). *Our Children, Our Future, The Royal Commission of Inquiry into the Delivery of Programs and Services in Primary, Elementary, and Secondary Education.* St. John's, NF: Author.

Government of Newfoundland and Labrador (1991). *Learning to Learning: Policies and Guidelines for the Implementation of Resource-based Learning in Newfoundland and Labrador.* St. John's, NF: Author.

Grabe, M. & Grabe, C., (1996). Cognitive learning and technology tools (Chapter 2). In *Integrating Technology for Meaningful Learning.* Toronto: Houghton Mifflin.

Haycock, Ken. (1991). Evaluation of the Teacher-Librarian: A discussion guide. *Emergency Librarian, 18*(4), R1-R3.

Haycock, Ken. (1992). *What Works: Research about Teaching and Learning Through the School's Library Resource Centre.* Vancouver, B.C.: Rockland Press.

Hammett, R. F. (1997a). Computers in schools: White boys only? *English Quarterly, 28*(4), 8-16.

Hammett, R. F. (1997b). Just what are we reading? Books on CD-ROM. *Teaching and Learning Literature,* (Jan/Feb), 2-7.

Harrington, H., (1993). The essence of technology and the education of teachers. *Journal of Teacher Education,44*(1), 5-15.

Harris, J. (1995). Organizing and facilitating telecollaborative projects. *The Computing Teacher, Feb.(*8), 34-38.

Heide, A., Henderson, D., (1994). *The Technological Classroom; A Blueprint for Success.* Toronto, Ont.: Trifolium Books Inc.

Johnson, Doug. (1996). "Evaluating the impact of technology: the less simple Answer." *From Now On, A Monthly Electronic Commentary on Educational Technology Issues, 5*(5).

Kent. P. (1995). *Computers - Constructionism - Constructivism* [On-line]. Available: http://metric.ma.ic.ac.uk/~pkent/construction/constructivism.html.

Kinnaman, D. E., (1994). Do you really need a computer curriculum? *Technology and Learning, March*, 1994, 70.

MacArthur, C., Pilate, V., Kercher, M., Peterson, D., Malouf, D. & Jamison, P. (1995). Mentoring: An approach to technology education for teachers. *Journal of Research on Computing in Education, 28*(1), 46-84.

Maddux, C. D. (1991). Integration verses computer labs: An either/or proposition? *Educational Technology, 31*(10), 36-40.

Maddux, C. D., Johnson, D. L., & Willis, J. W. (1997). *Educational Computing: Learning with Tomorrow's Technologies.* (2nd Ed.). Needham Heights, Mass: Allyn & Bacon.

Mann, B.L., (1994a). Approaching change: Searching for the best policies to bring computers into our schools. *Prospects, 1*(3), 10-13.

Mann, B.L., (1994b). Computing then and now. *The Morning Watch: Educational and social analysis, 22*(1-2), 50-57.

Matthew, K. I., (1996). Using CD-ROMs in the Language Arts classroom. *Computers in Schools, 12*(4), 73-80.

Meyer, J., & Newton, E. (1992). Teachers' views of the implementation of resource-based learning. *Emergency Librarian, 20*(2), 13-18.

Najjar, J. L., (1996). Multimedia information and learning. *Journal of Educational Multimedia and Hypermedia. 5*(2), 129-149.

Nelson, S. N., & Watson, J., A., (1991). The computer gender gap: Children's attitudes, performance and socialization. *Journal of Educational Technology Systems, 19*(4), 345-353.

Okebukola, P. A., (1993). The gender factor in computer anxiety and interest among some Australian high school students. *Educational Research, 35*(2), 181-187.

Park, O., (1991). Hypermedia: Functional features and research issues. *Educational Technology (August)*, 24-29.

Peled, Z., Peled, E., Alexander, G., (1992). A taxonomy for computer software adoption policy. *Journal of Educational Computing Research, 8*(1), 81-100.

Pence, H. E., (1996). What is the role of lecture in high-tech education? *Journal of Educational Technology Systems, 25*(2), 91-96.

Reil, M.., (1994). Educational change in a technology-rich environment. *Journal of Research on Computing in Education, 26(*4), 452-473.

Ress, M.., (1995). Resource-based Learning: What is resource-based learning? *Learning Resource Homepage.* [On-line]. Available: http://calvin.stem-net.ca.nf~mress/rbl.html

Southwest Educational Development Laboratory (SEDL). (1996) Is it constructivism? *SEDLetter* [On-line], 9(3). Available: http://www.sedl.org/pubs/sedletter/v09n03/construct.html.

Strommen, E. F., & Lincoln, B. (1992). *Constructive Technology, and the Future of Classroom Learning* [On-line]. Available: http://www.ilt.columbia.edu/k12/livetext/docs_/construct.html.

Tappscott, D.(1999). Educating the net generation. *Educational Leadership 56*(5), 6-15.

Taylor, L. C. (1987). *Resource-based Learning.* 2nd ed. Harmondsworth, England: Penquin Books.

Thacker, Angela (1995). New competencies needed to travel the information superhighway and not be road-killed; A pre-conference institute with Dr. Jean Brown and Allister DyKe. *Impact, 4*(2), 6-8.

Treagust, D. F., Rennie, L. J. (1993). Implementing technology in the school curriculum: A case study involving six secondary schools. *Journal of Technology Education* [On-line], 5(1). Available: http://scholar.lib.vt.edu/ejournals/JTE/jte-v5n1/treagust.jte-v5n1.html.

Weinman. J. & Haag, P., (1999). Gender equity in cyberspace. *Educational Leadership 56*(4), 44-49.

Wolf, C. R., (1995). Focussing on critical-thinking skills: Problem solving and argument analysis. *Teaching of Psychology, 22*(1), 29-32.

Yang, C., & Moore, D. (1995). Designing hypermedia systems for instruction. *Journal of Educational Technology Systems, 24*(1), 3-30.

Zorfass J. (1993). Curriculum: A critical factor in technology integration. *The Computing Teacher, (Feb.)*, 14-15.