DESIGNING, PILOTING, AND EVALUATING THE

INTERDISCIPLINARY INTERNET MODULE - HEALTHY HEARTS

FOR INTERMEDIATE GRADE CHILDREN

by

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(ABSTRACT)

Two issues are prevalent today in K-6 education-- the integration of the
Internet into schools, and the emphasis on guiding children to make wise and
healthy lifestyle choices. These are the two themes reflected in this study. The
purpose of this study was to design, pilot, and evaluate the Interdisciplinary
Internet Module - Healthy Hearts (IIM-HH), an on-line four-week learning
module for intermediate grade children. The module was developed to educate
youngsters about cardiovascular health, and to encourage them to adopt
healthy lifestyles and practice making wise health decisions. The module,
delivered via the Internet, allows for interactive, self-directed student learning. It
also provides intermediate grade teachers with a valuable resource for teaching
important healthy lifestyle concepts, as well as a valuable resource for
successful implementation of the Internet into existing curriculums.

The Module was piloted with two 5th grade classrooms (N=41) and their
teachers (N=2). Qualitative findings from multiple data collection sources
provided in-depth insights into the content and technical functionality of the
module, and participants' recommendations for change. The formative

evaluation revealed the changes that needed to be made before

implementation with a large population could be successful. It also revealed

that the IIM-HH has the potential to be an effective and motivational instructional

unit for both students and teachers.

DEDICATION

This dissertation is dedicated to my mother, Virginia Q. McClung.

Because of her example, I chose a career in education. Because of her

encouragement and her own display of personal strength, I have confidence to

pursue my dreams.

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I would like to, first, thank the students and teachers who participated in this study. Their time, dedication to the project, and helpful insights were imperative to the success of this study.

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dreams for our profession. Because of his example - I know that one person

can make a difference! So to my mentor -- and dear friend -- thank you.

To my family and good friends who offered their support and

encouragement throughout this process, I want to sincerely and affectionately

say "thanks".

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CHAPTER 1

INTRODUCTION

In recent years, two educational issues that have gained national attention are (1) the need to promote healthy lifestyle choices in children, and (2) the need to provide children with extended use of computer technology and new technological interventions in the school setting. Although both these issues have been recognized recently in educational reform agendas, to most they would seem unrelated in nature, and would probably not be viewed collectively in planning an educational innovation. On the contrary, this study does just that.

Promoting Healthy Lifestyle Choices in Children

In our country in 1995, about seventy percent (70%) of deaths were due to heart disease, cancer, stroke, and lung disease, in descending order (National Center for Health Statistics, 1997). Each of these leading causes of death are largely influenced by behavioral risk factors such as physical inactivity, unhealthy dietary habits, and use of tobacco products. These major health problems that confront our nation today are caused, largely, by behaviors established during youth (Kolbe, 1994). Within the last few years, emphasis has been placed on the roles of schools and parents to begin educating children at a young age on the importance of making wise choices that affect their health. The American College of Sports Medicine (ACSM), the Centers for Disease Prevention and Control (CDC), the American Heart

Association (AHA), the American Dietetics Association, the American School

Health Association, and the American Alliance for Health, Physical Education,

Recreation and Dance are some important organizations that are speaking out,

encouraging educational programs that inform children of health risks and their

impact on morbidity and mortality and that assist them in learning to make wise

health decisions. A national effort by the U.S. Department of Health and Human

Services in 1990 entitled *Healthy People 2000*, outlines the need to increase

the span of healthy life through health promotion, and encourages this

education to begin in schools with young children by teaching them how to

improve their health and avoid risks (U.S. Department of Health and Human

Services, 1991). An excerpt from the national document reads:

> *It may be easier to prevent the initiation of some health*
> *behaviors, such as smoking and alcohol and drug abuse,*
> *than to intervene once they have become established.*
> *Likewise, it may be easier to establish healthful habits,*
> *such as those related to dietary and physical activity*
> *patterns, during childhood than later in life. Childhood is*
> *the opportune period for such healthy development.*
> > *Healthy People 2000*
> > *U. S. Dept. of Health and Human Services, 1990*

Although the lifestyle choices' effect on mortality and morbidity are not

actualized until adulthood, there is increasing evidence that opinions and

choices made during childhood and adolescence have an impact of the lifestyle

choices as adults (Allensworth, 1996; Hansen, Landsmann, & Monismith, 1996;

Taubert, Moller, & Washington, 1996; Torabi & Nakornkhet, 1996). Therefore, it

is imperative that health and physical education be initiated at the elementary level, where students are given opportunities to learn the facts, to develop health-promoting skills, and, most importantly, to apply the knowledge and skills to their everyday lives (Kane, 1994; Nolte, 1994).

Since heart disease is the Number One killer of adults in America, and causes almost as many deaths as all other diseases combined (U.S. Department of Health and Human Services, in Allensworth, 1996), particular emphasis should be given to educating children on the importance of physical activity, proper dietary habits, and tobacco-free lifestyles as they relate to cardiovascular health (Cortese & Middleton, 1994). Although heart disease is cited as the major cause of death, the actual cause is often the lifestyle that the individual leads-- one that includes tobacco use, physical inactivity, and a diet high in fat that elevates cholesterol and promotes obesity (Allensworth, 1996; Taubert, Moller, & Washington, 1996).

As indicated in the recent *Surgeon's General's Report on Physical Activity* (U.S. Department of Health and Human Services, 1996), it is clear that there are numerous health benefits of physical activity, including the reduction of the risk of dying from heart disease. It is also clear that physical inactivity is a serious, nationwide problem, and one that needs attention at a young age. The *Surgeon General's Report* (1996) states that adolescents and young adults aged 12-21 are not vigorously active on a regular basis, and their level of physical activity decreases drastically with age during adolescence. From the *Report*, it is clear that we need to strive to educate our children and adolescents on the benefits of being physically active, and the risks involved in inactivity. Another important document that has recently been published by the National Association for Sport and Physical Education (1995) as a result of the Goals

2000: Educate America Act (1994), *Moving into the Future: National Standards for Physical Education,* identifies content standards for our nation's students in physical education. To meet these standards, curriculums throughout the K-12 program should focus on students' recognition of the importance of exhibiting a physically active lifestyle, on the development of a cognitive understanding of what constitutes a healthy lifestyle, and on the development of positive attitudes about participation in physical activities.

In addition to the importance of promoting physically active lifestyles, awareness of proper dietary habits is important at an early age because dietary patterns learned as a child may be carried into adulthood (Allensworth, 1996; Hopper, Gruber, Munoz, & MacConnie, 1996). Poor dietary habits may contribute to obesity and high cholesterol levels early in life (Allensworth, 1996). One in five adolescents and one in three adults in the United States are overweight (U.S. Department of Health and Human Services in Allensworth, 1996). In addition to increased physical activity, the goal should be to decrease fat consumption and increase fruit and vegetable intake (U.S. Department of Health and Human Services in Allensworth, 1996). Results from the 1988-91 national food consumption survey showed that only about one-fifth of the adolescents surveyed met the target goal of no more than 30 percent of calories from dietary fat and only 15 percent of those adolescents ate the recommended five or more servings of fruits and vegetables daily (Allensworth, 1996).

Another important healthy lifestyle choice that should be taught to children is that of living tobacco-free. Tobacco use is the single most preventable cause of mortality and morbidity in the United States (Allensworth, 1996; Taubert, Moller, & Washington, 1996). Tobacco use is a children's disease (Surgeon General, in Taubert, Moller, & Washington, 1996), as nearly all adult smokers began smoking before the age of 18, and a large number of

children are beginning to smoke at age ten or eleven (Taubert, Moller, & Washington, 1996). The earlier the person starts smoking the greater the risk to his or her health--"almost 3,000 young people in the United States become regular smokers every day, and nearly 1,000 of them die prematurely from diseases related to tobacco use" (President Clinton..., 1996). A survey of 4,500 schoolchildren conducted in the UK by the Imperial Cancer Research Fund (1996) reported that teenagers who smoke and teenagers who don't have very different beliefs about health risks and attitudes to smoking. Most non-smokers knew the risks involved with smoking; most of the smokers didn't. The major public health goal is prevention. These prevention programs need to begin with elementary school age children and must focus on the risks involved in tobacco use and how to cope with the social influences that young people face (Allensworth, 1996; Taubert, Moller, & Washington, 1996; Torabi & Nakornkhet, 1996).

In providing education for our young children on these cardiovascular risk factors, or any other health-related issue, consideration must be given to *who* will provide the instruction of these important topics in our elementary schools. Typically, the classroom teacher in the elementary grade setting is responsible for teaching the health curriculum, and often the physical education curriculum. Rarely do preservice teacher education programs require more than one or two courses related to either of these areas of instruction. When classroom teachers are responsible for teaching physical education and health related issues, they often put little time into preparation of meaningful activities for the students, and overall, treat these subjects as inferior to other curricula areas such as reading, science, and mathematics (Faucette & Hillidge, 1989; Hamburg, 1994). Some teachers indicated their lack of emphasis on health and physical education is due to their lack of time and energy to prepare and

implement because of other demands placed on them throughout the curriculum, their lack of knowledge about the subject areas, and their feelings about the lack of value of the subjects (Faucette & Hillidge, 1989). In order to promote healthy lifestyle choices in children, classroom teachers must first be educated on the importance of health and physical education in the school curriculum, and then must be given the knowledge and the tools to help them provide meaningful learning experiences for their students.

One means of providing knowledge, instructional tools, and cognitive activities for classroom teachers and their students could, perhaps, be through the use of computer technology, specifically the Internet.

Internet Usage in Education

Many in powerful decision-making positions that affect our educational system are convinced that technology is one viable option as a "means to meet the ends" of a quality, individualized, education for every student (Boyer, 1992). Use of the Internet for educational purposes is seen as the newest technological intervention, and has gained support from the federal government down to small private sectors within individual communities. In his State of the Union address on February 4, 1997, President Clinton called for a "10-point plan of action" to ensure that the students in our country have the "best education in the world" and are prepared for the 21st century (President Clinton's Call to Action....1997). As part of this plan, the President reiterates his administration's desire to have every classroom and library in every public school connected to the Internet and to ensure that all students become technologically literate by the year 2000. According to a report from the

National Center for Education Statistics in February 1997, sixty-five percent of U.S. public schools had access to the Internet in the fall of 1996, but only fourteen percent of all public school instructional rooms were on-line. With a ruling by the Federal Communications Commission on May 7, 1997, discount education rates ("E-Rates") will be made available for schools and libraries for Internet connection, making the technology more available to all students, regardless of economic status or demographic location ("Statement by U.S. Secretary of Education....1997). With the help of this legislation, President Clinton's vision of Internet access for all schools and all students could be realized. Additionally, CEOs of large corporations are providing resources and incentives for schools and teachers. For example, AT&T, Microsoft, and Apple Computer are all offering schools and teachers special discounts on computer hardware, as well as Internet access (News and Resources, 1996a, 1996b, 1996c). States have begun initiatives to have all schools on-line (News and Resources, 1996b, 1996c). Private sectors are contributing to the "technology in education revolution" as well, as demonstrated in some areas where private companies are offering financial support to match federal monies for President Clinton's $2 billion, 5-year Technology Literacy Challenge Fund, which will be used to train and support teachers on Internet skills and to develop resources to help teachers integrate the Internet into the curriculum (News and Resources, 1996c). But with all of this public demand to have computers with Internet access available for all students in our country's schools, can this new technological intervention help teachers teach and students learn?

Many believe that the availability and accessibility of such a wealth of information and telecommunication features made possible by the Internet offer endless possibilities for positive contributions to school curriculums and student learning.   Proponents believe that the Internet has the potential to provide teachers and students with exceptional educational opportunities that would normally be outside the classroom realm, such as global communications with others, hands-on research, and access to primary source information and processing capabilities otherwise not accessible in the school setting. (Honey & McMillan, 1993; Kinzie, Larsen, Burch, & Baker, 1996; McCarty, 1995; Peha, 1995; Scott, Cole, and Engel, 1992; Steen, Roddy, Sheffield, & Stout, 1995). Student learning can possibly be enhanced by increasing the range and scope of what is normally available to them and by providing independent learning and collaborative learning opportunities not easily sustainable in the regular classroom. Furthermore, it is believed that the Internet can serve as a motivating force that will contribute to active learning, and will allow consideration of a multitude of concepts and ideas that are new, and perhaps outside the realms of a student's ecological environment (Bradsher & Hagan, 1995; Harris, 1995; Honey & McMillan, 1993; O'Neil, 1995; Peha, 1995). But before considering the impact that the Internet has on teaching and learning, teachers must first be able to effectively implement its use into their curriculums.

In order for any technological intervention to bring added value to an educational setting, teachers must be trained in the use of the technology, and must be given resources to make the best use of the intervention. In a recent

review of nine case studies where technology (i.e. computer usage) was implemented into the schools, a deciding factor for the successful implementation was the teachers' experiences with and attitudes about the technology intervention (Means, Olson, & Singh, 1995). Similarly, Davidson & Ritchie (1994) reported that teachers attitudes about and experiences with the use of the Internet in the classroom determine its effectiveness, and are influenced by such factors as preparedness, usefulness, and ease of incorporation into the curriculum. The *Education Technology Survey* (1995) of 1000 teachers found that, although three-fourths of the teachers felt that the use of the Internet prepares young people for the Information Age, the teachers also reported that the three greatest barriers to Internet usage in the school setting is their lack of knowledge, their lack of workshops or training, and their lack of time to learn how to use the technology to benefit their curriculums. In our nation's plan for education reform, the need to educate teachers on technology implementation is not ignored. Although President Clinton calls for teachers to find creative new ways to exploit the powers of technology, and to use it as an integral part of their teaching, he also points to the need to provide all teachers with training, support, modern computers, and effective software and on-line resources (President Clinton's Call to Action...1997).

<u>Justification of the Study</u>

In reviewing the aforementioned literature, one could conclude that there is a need in our country to improve the health of our nation, and to begin by

educating our children on health risks that can potentially affect their lives,

including sedentary lifestyles, poor eating habits, and the use of tobacco

products. Also, it is obvious that our country has placed significant emphasis on

the use of the Internet for educating our students, and our leaders are calling for

new, innovative ways to make the best use of the Internet to help our students

learn, including the development of on-line resources for teachers and students.

It is also obvious that consideration must be given to how we might help

teachers provide important health information through meaningful learning

activities, and use the Internet successfully in the curriculum. The literature

suggests that in order for most elementary classroom teachers to successfully

teach their students about important health risks that can affect their lives, and to

provide opportunities to apply factual information and health-promoting skills to

their everyday lives, resources must be provided that give the teacher the

knowledge and instructional strategies to use in their curriculums, with limited

time required for preparation and implementation. Similarly, to successfully

implement Internet usage into their curriculums, the literature tells us that

classroom teachers need to be able to see the relevance and usefulness of the

information on the Internet, they need to be able to easily incorporate the

information into their curriculums, and they need guidance in using the Internet

information effectively and expeditiously. Considering these factors that can

potentially contribute to successful implementation of instruction in important

health and physical education topics, and in the use of the Internet as the

medium for delivery of instructional content, this study focuses on the

development of an instructional module on cardiovascular health designed for elementary grade students.   The module, delivered almost exclusively via the Internet, can potentially engage the students in active learning experiences that will promote the learning of important wellness topics. It can also allow students to gain experience in computer / Internet usage - an experience that many feel is imperative to adequately prepare our young people for the 21st century (President Clinton's Call to Action...1997; Boyer, 1992;).

Although the use of the Internet medium for instructional purposes in elementary schools is a new innovation that is only beginning in our country, it is not the technology, itself, that defines the innovation. It is, rather, the innovative methods for designing, planning and conducting the actions of the Internet that will allow this technological intervention to add real value for education (Hannafin & Hopper, 1993; Trentin, 1996). Therefore, the purpose of this study was to design, pilot, and evaluation the educational innovation for intermediate grade children called the Interdisciplinary Internet Module - Healthy Hearts (IIM-HH).

Statement of the Purpose

The purpose of the study was to design, pilot, and evaluate an Interdisciplinary Internet Module - Healthy Hearts (IIM-HH) for intermediate grade children. Five research questions guided the formative evaluation of the design of the module:

1. Does the technical design of the IIM-HH allow students and teachers to use all sections of the module efficiently and effectively (technical functionality)?

2. Is the content of the IIM-HH appropriate for intermediate grade students and teachers (content functionality)?

3. What contextual factors should be considered for the HH module to be functional and effective in a particular school (classroom) setting?

4. What are the students' views and recommendations for change related to the implementation and effectiveness of the IIM-HH ?

5. What are the teachers' views and recommendations for change related to the implementation and effectiveness of the IIM-HH ?

Significance of the Study

Educators, researchers, and health promotion professionals continually encourage new programs that will teach children the importance of living healthy lifestyles and making wise health decisions (Allensworth, 1996; Hansen, Landsmann, & Monismith, 1996; Hopper, Gruber, Munoz, and MacConnie, 1996; Taubert, Moller, and Washington, 1996; Torabi and Nakornkhet, 1996). National leaders, researchers, teacher educators, and teachers in the field call for resources to assist teachers in the successful implementation of the Internet into the classroom (Shotsberger, 1996; Harris, 1995; Peha, 1995; Steen, Roddy, Sheffield, & Stout, 1995). Huberty and Klein (1996), Mauldin (1996), and Patton (1990) urge researchers to evaluate new

interventions and programs formatively and in the context of the targeted population so as to gain valuable insights into the "hows" and "whys" of successful implementation. These researchers reiterate the need for descriptive research on the implementation of a program, using a variety of data collection approaches.

This study addresses all three of these recommendations. First, it provides a new and innovative way of delivering important information to children to encourage physical activeness and wise health choices. Second, it provides the information via the Internet in a self-contained module that can be easily incorporated into the existing intermediate grade curriculum. Third, through the formative qualitative evaluation of the module, students' and teachers' opinions and recommendations for change will facilitate the improvement of this IIM-HH for future use with many children.

<div align="center">Limitations of the Study</div>

1. The participants' views and recommendations for change may not have represented those of other intermediate grade teachers and students.

2. The students' experiences with the IIM-HH was limited by the teachers' implementation of the module into the class curriculum.

3. The students' experiences with the IIM-HH was limited by the amount of computers with Internet access, and the time available for students to use the computers.

4. The instructional setting for computer usage in the research setting may not represent that of other intermediate grade school settings.

5. Due to the school's particular instructional setting for computer usage, students were not permitted to use the IIM-HH at their discretion.

6. The novelty effect may have contributed to positive opinions about the IIM-HH.

Delimitations of the Study

1. The participants in the study was delimited to two teachers and two classes of intermediate grade students in the field study.

2. The selection of the participants was delimited to those that were enrolled in the class, and who selected to participate by returning consent forms.

3. Data collection was limited to those teachers and students who volunteered to participate in the project and who have Internet access.

5. Data gathering was confined to formal and informal interviews, observation by the investigator, participants' written documentation (exit slips and weekly logs), electronic submissions in the IIM-HH, and questionnaires.

Basic Assumptions

1. It was assumed that the data collected would reflect the participants' true opinions and recommendations for change.

2. It was assumed that each teacher would treat the implementation of the module as an important part of his/her curriculum.

3. It was assumed that the students would view the module as an important
    part of their school work.

Definition of Terms

Browser - a generic term for an application that displays Web pages; Examples:
    Netscape Navigator 3.0, Microsoft Internet Explorer, 3.0

Computer-mediated instruction - any instructional activity using a computer as
    the delivery system

Content functionality (in reference to the IIM-HH) - refers to how well the content
    "works" in delivering the instruction, including the appropriateness of the
    content, how appealing and motivational it is to the students, its
    completeness, and usability.

Formative evaluation - a form of evaluation where continuous reporting of the
    investigator's findings during the course of the study lead to
    recommendations for change (Bogdan & Biklen, 1992)

HTML (HyperText Markup Language) - the language used to create the
    documents displayed in Web browsers (December, 1996)

Hypermedia - the use of hardware and software to instantaneous link
    information stored on different types of media (i.e. sound, video,
    graphics) from one information source to another (Wishnietsky, 1992)

Hypertext - text that allows for non-linear navigation through informational
    materials using links within the text (Wishnietsky, 1992)

Icon - a small graphic representation of an object or idea

Internet - a large network of networks that connects computers all over the world

    (Steen, Roddy, Sheffield, & Stout, 1995).

Instructional design - the part of the instructional development process which

    consists of specifying the objectives, sequencing the instruction, and

    determining the guiding learning principles, instructional models,

    techniques, and media for meeting the instructional goals (Gentry, 1994)

Instructional development - a systematic approach to the design, production,

    evaluation, and implementation of systems of instruction (Gentry, 1994,

    p.381).

JavaScript - a language that Netscape created so that one can control the

    browser through HTML (The Net, June 1996)

Learning principles - statements which are based on learning theories

    (Shambaugh and Magliaro, p. 30)

Medium- (singular for media) the way in which instruction is delivered (i.e.

    books, computers, videotape, film) (Rothwell & Kaganas, 1992)

On-line computers - computers that are connected via a modem to an on-line

    service that allows them access to the Internet

Server -a computer that provides centralized services on a network

Technical functionality (in reference to the IIM-HH) - refers to the way in which

    the technological medium "works" in delivering the instruction, including

    the effectiveness of the functions of the technological medium (i.e.

    Internet website), ease of use of the functions provided by the

technological medium, and efficiency, strengths, and weaknesses of the

medium in an instructional setting

Telecomputing - using a computer that is connected to the Internet or to an on-

line service (U.S. Department of Education, 1994)

 World Wide Web (the Web, or WWW) - the multi-media dimension of the

Internet, including full color graphics, sound, video, and hypermedia

(Neal, 1995; Steen et al., 1995)

Summary

Two issues that are prevalent today in K-6 education-- the integration of

the new technological intervention, the Internet, into elementary schools

throughout the country, and the national attention to guiding children to make

wise and healthy lifestyle choices that have a lifelong impact-- are the themes

around which this study was developed.   As the Interdisciplinary Internet

Module - Healthy Hearts (IIM-HH) was designed, piloted, and formatively

evaluated, the qualitative findings from multiple data collection sources will give

in-depth insights into the content and technical functionality of the module, and

of the participants' views and recommendations for change. Upon completion of

this study, the IIM-HH will be redesigned and finalized, based on these findings,

in hopes of providing intermediate grade teachers with a valuable resource for

teaching important healthy lifestyle concepts, and at the same time, a valuable

resource for successful implementation of the Internet into the existing

curriculum. Most importantly, it is hoped that the design and content of the IIM-

HH will be motivational for intermediate grade children, and will foster active

learning that will result in wiser health choices throughout their lives.

CHAPTER 2

REVIEW OF LITERATURE

The literature review for this study encompasses four areas. This first relates to computer technology in K-12 education. It is followed by a review of the interdisciplinary approach to instruction. Third, the development of instruction is reviewed. Lastly, section four is a review of educational theories that lend a foundation for the study.

Computer Technology in Education

The review of literature on computer technology in education begins by defining computer technology, including the Internet and its subsidiaries. The history of computer technology, and specifically the Internet, in our schools follows. Then, a review of the literature on the various roles of computer technology for educational purposes is discussed. To conclude this section, the literature is reviewed on how computer technology might contribute to learning, and how variables impact successful implementation of technology into school curriculums.

Defining Computer Technology and the Internet

Instructional technology has been defined as the "systematic, scientific development and delivery of instruction" (White & Purdom, 1996). Computer technology simply refers to the use of computers to provide that systematic instruction.

The Internet is a large network of networks that connects computers all over the world (Steen, Roddy, Sheffield, & Stout, 1995). It provides a "virtual global community" by allowing anyone who is connected to the Internet to communicate with others anywhere, and anytime, and contains information on practically any topic imaginable that can be obtained through text, graphics, and video and audio features. The Internet provides a host of services, including electronic mail (e-mail), file transfer, gopher, mailing lists, newsgroups, search tools, and the World Wide Web (i.e. WWW or the Web).

The Web is the multi-media dimension of the Internet, and the primary tool which allows access to many of the other Internet services. It is a dynamic environment where the hypertext system (hypermedia) allows links to instantaneous connect the user to other Web sites. Before the Web was introduced, information on the Internet was text-only, and command-line interfaces were used to navigate from one service to another on the Net. The Web made information available on the Internet more exciting by including full color graphics, sound, video, and hypertext links (Neal, 1995; Steen et al., 1995).

Electronic mail is another feature of the Internet. It is a text feature that allows mail to instantaneously be sent and received to/from others with Internet access.

To access the Internet, computers must be connected "on-line" through Internet service providers, such as large companies like *America On-line*, educational systems and universities, or any of the other few dozen providers

that are available in most large cities (Hafner, 1996). Once computers have

Internet connection, a browser is necessary to access the Web. A browser is

simply application software that allows the user to view and search the Web

information. Presently, the two most popular Web browsers are *Netscape*

Navigator and *Microsoft Internet Explorer* (Hafner, 1996).

The History of Computer Technology in our Schools

With the arrival of microcomputers in schools around 1978, educational

use of computer technology began (Reusser, 1997; White & Purdom, 1996).

Inspired by Skinner's behaviorist conception of learning, programmed learning

applications that reinforced tasks were developed for instructional purposes.

These drill and practice programs, also described as "computer-assisted

instruction (CAI)", were developed mainly to supplement the basic skills

materials already intact in the classroom (Scott, Cole, & Engel, 1992). By the

mid- 1980's, newer technologies emerged into the CAI paradigm, that included

more sophisticated programs such as CD-ROM applications. Educators began

to see computer technology as a general purpose tool that could be a viable

medium as a "conveyer of pedagogy" (Taylor, 1980, in Scott, Cole, & Engel,

1992). The 1983 National Commission on Excellence in Education report, *A*

Nation at Risk, was the first formal national document to include computer

literacy as an important educational goal (Scott, Cole, & Engel, 1992). By the

late 1980's, many more educators had embraced the idea of integrating

computers into the existing curriculum to enhance teaching in traditional subject

areas. Large corporations (i.e. Jostens Learning Corporation, Ideal Learning

Systems) began to develop "integrated learning systems (ILS)", which were

computer-managed instructional systems that provided the integration of

hardware, software, and curriculum for instruction. Computers were used in

schools for word processing, "instructional gaming", and as a tool to provide

modeling and simulations. By the early 1990's, educators began to see

computers not only as tutors and tools, but also as tutees. Students began to

use computer technologies to explore and create. Programs like Papert's

LOGO for programming, and Apple's *HyperCard* for creating hypermedia saw

their way into classrooms. Most recently, the Internet is being integrated into

educational settings. The Internet, with its distance learning and

telecommunication capabilities, provides new possibilities for the contributions

of computer technology in K-12 education.

The History of the Internet

The Internet began in the early 1970's as a Defense Department network

and was implemented to support military research. The ARPAnet, as it was

called, was designed to study ways that networks could be built to withstand

partial outages and still function (Fraase, 1995, p. 8). Although the Internet had

a slow beginning, by the early 1980's, the National Science Foundation (NSF)

upgraded the ARPAnet to include five supercomputer centers around the US

where researchers could connect via telephone lines from one regional network

to another. In 1987, Merit Network, working with IBM and MCI, provided the

NSF the means to connect regional networks over the phone lines at an

extremely fast speed of 1.5 million bits-per-second. Thus, the Internet as we know it was born. (Steen. et al.,1995) Although there is no real way of knowing for sure, it has been estimated that there are 20 to 30 million users from over 70 countries now using the Internet, and the numbers are growing in leaps and bounds. (Steen, et al., 1995) According to Steen et al., one prediction is that there will be around 500 million people connected to the Internet by the year 2000!

Internet usage in education began as a means for college/university professors to exchange ideas and collaborate with others on various projects and multi-site research (Watts & Castle, 1992). By the early 1990's, the federal government was supporting the use of the Internet in K-12 education by encouraging public schools to gain access to the Internet to provide networking throughout our educational system and to provide students the skills and knowledge needed to be adequately prepared for the workforce of tomorrow (Electronic Learning, 1996). With the Goals 2000 legislation in 1994, and, now, with the President's Call to Action (1997) and the Federal Communications Commissions ruling for "E-Rates" throughout the country's K-12 educational system, that goal has the potential to become a reality (Statement of the Vice President...1997).

The Role of Computer Technology for Educational Purposes

With the Goals 2000 legislation of 1994, educational reform came to the forefront of the U.S. federal government's agenda, and a national effort began

to improve learning and teaching in our country. This agenda calls for changes in the *way* we educate our students, and in the *tools* we use to educate. It emphasizes teaching our students to think critically, to learn in authentic situations, and to use technology as a tool to help accomplish these tasks, which will all help better prepare them with the skills necessary to be productive in the 21st century ("Overview of Technology and Education Reform", 1997). President Clinton, in his Call to Action, notes the importance of technological literacy for our students today. He defines technology literacy as "computer skills and the ability to use computers and other technology to improve learning, productivity, and performance", and says that preparing our students for computer usage is just as essential as teaching them other basic skills such as reading and writing (President Clinton's Call to Action..., 1997).

In meeting these national goals in education, the roles of technology are more clearly defined in terms of how technologies are used with students, rather than the technologies themselves. These roles can be most easily identified by classifying them as *tutorial, exploratory, tool*, and *communication* ("Overview of Technology and Education Reform", 1997).

Tutorial uses of technologies include drill and practice type programs and tutoring systems such as most Computer Assisted Instruction programs. This use of technology essentially provides the same things that schools have traditionally done for students, but in, perhaps, a more systematic and efficient way. Exploratory uses of technology are most often used as an exciting addition to classroom instruction, but rarely are used effectively to provide a

major part of the core curriculum (Levin & Meister, in "Overview of Technology and Education Reform", 1997). Technologies used as tools to support active learning, such as the use of word processors, spreadsheets, hypermedia, and network search tools give students opportunities to experience complex, authentic tasks. The communication uses of technology also allow students to participate in authentic tasks, and foster cooperative learning among peers and others within the ecological and social contexts of the student, and throughout other contexts as well. According to this national report from the U.S. Department of Education (Overview of Technology and Education Reform, 1997), if our goal is to provide students with an *authentic* kind of education that is structured around the challenging tasks that are necessary to adequately function in the 21st century, then the most relevant use of technology in education is as *tools* and *communication channels* .

Another way to view the role of technology in education is suggested by Dr. Seymour Papert, a noted MIT professor and theorist on children's learning and computer usage. Dr. Papert recognizes two distinctively different roles of technology in education. One is the role of technology as a means to "improve established practices", the other is the role of technology to create "the opportunity for radically new practices" (Papert, 1995). He believes that society sees technology's main purpose in education as filling the first role - to be a tool to help teachers and students better do what they already do. Papert believes that we need to also consider technology in the second role - as a means to change education, probably by taking small steps to bring about innovations to

the existing educational system, and closely examining how students learn, or do not learn, through technology.

The Literature on Computer Technology and Learning

A meta-analysis of 50 years of research on "what helps students learn" attempted to arrive at some consensus on what influences affect learning the most (Wang, Haertel, and Walberg, 1994). They found that the greatest influence on learning is the student's aptitude. In their definition, aptitude includes (1) metacognitive processes (comprehension monitoring), (2) cognitive processes (such as IQ, prior knowledge, and subject area knowledge), (3) social and behavioral attributes (positive, nondisruptive behavior), and (4) motivational attributes (attitude toward subject matter). The category of *Classroom Instruction and Climate* had collectively nearly as much influence as the *Student Aptitude* category. Included in the *Class Instruction* category was (1) classroom management (the teacher activities that increase student engagement, decrease disruptive behavior and make good use of instructional time, such as group alerting, learner accountability, smooth transition, teacher "with-it-ness"), (2) student and teacher social interactions (frequency and quality of), (3) quantity of instruction (good use of instructional time by teacher), (4) classroom climate (the socio-psychological aspect of the classroom, such as cooperation, the pursuit of common goals, well-organized and planned lessons, developmentally appropriate activities, explicit learning objectives). (5) classroom instruction (student understands goals, direct

instruction vs. indirect instruction). Other influences that were significant to a

high degree were (1) peer group involvement and the level of peers' academic

aspirations, and (2) home environment/parental support. Of the 28 categories

examined, state-level and school-level policies (such as guidelines for

development and selection of curriculums and textbooks, and school wide

assertive discipline plan) and school demographics (students per class, number

of teachers and aides, etc.) were the least influential in student learning. This

research suggests the need for direct intervention and practices in the

psychological determinants of learning (perception, thinking, motivation, etc.),

rather than top-down policy making and reform agendas that may not change

practices in the classrooms (Wang, Haertel, & Walberg, 1994). What this review

of 50 years of research on student learning is telling us is that what the teacher

does, the activities she facilitates, the motivation she cultivates, the

atmosphere she produces, the goals she sets, the classroom climate she

demands, the collaboration she inspires, the connection on contexts she allows,

all will surely influence student learning inside and outside of school, and

perhaps technology can help with these roles.

The literature points to a wealth of possibilities for positive contributions

that technology might make to facilitate thinking and learning. According to

Geisert and Futrell (1995) in their book Teachers, Computers, and Curriculum,

a meta-analysis of the major research on student learning and computers

shows that computer-mediated instruction effectively improved achievement at

all levels of schooling, especially at the elementary level, and that "it has had

positive effects on student attitudes toward subject matter, toward instruction, and toward computer technology". A ten year study of the evaluation literature (twelve separate meta-analyses) on computer-based instruction conducted by Kulik (1994) and his colleagues found that (1) students usually learn more in classes in which they receive computer-based instruction, (2) students learn their lessons in less time with computer-based instruction, (3) students like their classes more when they receive computer help in them, (4) students develop more positive attitudes toward computers when they receive help from them in school, and (5) computers did not have positive affects in every area (p.11-13). A review of these findings shows that, of these meta-analyses, adding computers to a particular curriculum, on an average, made it more effective, albeit often in low-order thinking skills.

Studies on computer-mediated drill and practice type activities, higher-order thinking activities, self discovery learning, and cooperative learning provide important insights into how technology might be incorporated into classrooms to enhance student learning.

Drill and Practice Activities (including Computer Assisted Instruction)

Drill and practice, and CAI programs, are primarily developed with preset objectives where learners can read, practice, and then be tested on the information given. Drill-and-practice activities are considered by most to require low-order thinking skills, or "learned behavior" or "reproductive thinking" as it is sometimes referred (Lewis & Smith, 1993). Studies conducted over the past few years have indicated that drill-and-practice computer activities for

elementary age children produce little or no gains in problem-solving and higher order learning skills (Haugland, cited in Shade, 1994; Schaudt, 1990; Shade, 1994), although, interestingly, these activities did increase social interactions and cooperation between students (Shade, 1994; Strommen, 1993). This literature further suggests that computer drill-and-practice activities best promote learning when coupled with activities that involve higher order thinking (Doyle, 1983; Geisert & Futrell, 1995; Resnick cited in Lewis & Smith, 1993; Scott et al., 1992). Based on this literature it seems reasonable to suggest that computers can be used effectively to present drill and practice activities to students, but the effectiveness of these types of learning activities alone is debatable if the focus of learning in the classroom is based on a goal of promoting higher order thinking.

Higher Order Thinking Activities (reasoning, problem solving, critical thinking)

Lewis and Smith (1993) define higher order thinking as "thinking that occurs when a person takes new information and information stored in memory and interrelates and or rearranges and extends this information to achieve a purpose or find possible answers in perplexing situations" (p. 136). Higher order thinking can be facilitated by using computer-mediated activities and programs that require the learner to analyze, reason, problem solve, judge, reflect, and then evaluate, as suggested in recent literature related to the use of technology for situated learning (Collins 1991; Mendelsohn, 1996), cooperative learning (Kanselaar & Gijsbert, 1996), cognitive apprenticeships (Collins,

1996), and generative learning (Cognition and Technology Group at Vanderbilt, 1996; Cognition and Technology Group at Vanderbilt, 1993). These studies point to the potential for computers to promote higher order thinking in students.

In a study by Lai (1993), for example, both positive cognitive and affective outcomes were reported when students using computers in a LOGO computer programming learning environment were evaluated on problem solving and metacognitive skills. The learning environment also had positive effects on several other higher-order thinking skills such as self-monitoring and evaluation (Lai, 1993; Nastasi and Clements, 1993). Studies on software usage have shown that software that promotes problem solving also offers affective gains, such as stimulating more cooperation between students as in turn taking, helping each other, and talking (Shade, 1994). Other innovative computer-mediated projects have shown positive gains in students' critical thinking skills, such as the Jasper Series (Cognition and Technology Group at Vanderbilt, 1993), HERON (Reusser, 1996), ICONS (Torney-Purta, 1996), and the International Science Classroom (ISC) (Salomon, 1996).

Self-Discovery Learning

According to child theorist Seymour Papert (1991), children need to create appropriate learning processes for themselves based on their own knowledge structures. Therefore, he advocates the "learning-by-doing" or self-discovery approach to learning, which allows children to discover knowledge for themselves, at their own pace, and in ways suited for them. Papert asserts that through this method, learning will be self-generated which builds upon prior

knowledge (Simon, 1987). The underlying assumption of this perspective is that learners will actively seek out the information they need to form a knowledge base. A study on Papert's Project Headlight (Bass, 1987) found that the discovery-based project helped students develop their own goals and learn through exploration, as well as gain more confidence in their work.

Simon (1987) disagreed with Papert. He cited four studies that showed that this self-discovery of learning did not produce significantly better levels of learning. One of the studies he cited was done on Papert's LOGO computer program for children. Another study by Jacobson et al. (1995) found that students need explicit modeling and scaffolding support (rather than freely exploring the learning environment) in order to perform at a significantly higher level in a hypermedia learning environment.

Other studies reported mixed results related to self-discovery and student learning. Blackstock and Miller (1990), in a study of children using computers at free time, found that children could become active problem-solvers and exploratory learners when their learning was self-directed, but teacher conferencing and mediating increased learning. Two studies that looked at self-discovery methods of learning found different results for students based on their classification as active or passive learners. In one study by Lee and Lehman (1993), the use of instructional cueing was studied on two hypermedia programs. It was found that passive and neutral learners performed better when given instructional cues (hints to view other related information), whereas active learners tended to perform at about the same level regardless of

instructional cueing (Lee & Lehman, 1993). Steinberg (cited in Yacci, 1994) reviewed ten years of learner control research in computer-mediated instruction and found that the self discovery/learner control method of learning seemed to be productive for only higher ability students. An overview of this literature suggests that some children will voluntarily seek out new information using a self-discovery form of learning and that computer-mediated environments can contribute to discovery learning, but it is important to consider the role of the teacher (or other adult or more competent person) in the process and the type (active or passive) of learner that is involved.

Cooperative Learning

Another learning strategy that has been studied extensively is cooperative learning, which has been demonstrated to have a positive affect on a child's learning, motivation, and attitudes about school (Baron, 1991; Crook, 1987; Fisher, Wilmore, & Howell, 1994; Lai, 1993; Nastasi & Clements, 1993). Many researchers, developers, and educators believe that, under the right circumstances, computer usage in the classroom can be a powerful catalyst for collaborative learning (Crook, 1987).

A study by Repman, Weller, and Lan (1993), for example, compared the achievement of eighth grade magnet students working individually or in pairs on a hypermedia-based instructional unit. They found the magnet students scored higher than the other students in any other social context. Another study revealed that even though there was no significant difference in the success of 4th graders of different abilities on computer assisted problem solving, there

were different patterns of verbal interactions between the successful and unsuccessful groups (King, cited in Repman et al., 1993); low-ability students in heterogeneous groups outscored low-ability students in homogeneous groups (Hooper & Hannafin, cited in Repman et al., 1993); and students working in pairs learned more than individuals in all ability groups (Hooper, cited in Repman et al., 1993).

Additional studies indicate that peer tutoring, with mixed and same age, sex, and ability groupings, have positive effects on student learning (Baron, 1991) and engaged learning time (Baron & Abrami, 1992), and indicates that a computer-mediated environment where peers are working collaboratively fosters motivation, exchange of information, conflict resolution, and enjoyment (Nastasi & Clements, 1993; Nicol, 1990; Shade, 1994). These studies indicate that technology can and is a viable option in creating and facilitating cooperative learning in the educational setting.

The Literature on the Internet and Learning

Another potential advantage of computer technology to enhance student learning is the use of the Internet. Studies on the use of the Internet for educational purposes have found that it has the potential to provide authentic tasks that can allow for cognitive apprenticeships (Fisher et al, 1994; Repman et al , 1993), simulations of real world contexts (Jonassen, 1995), and collaborations with peers and adults inside the classroom and throughout the world (Harris, 1994). The literature on the effectiveness of hypermedia in the educational settings (Jacobson, et al, 1995) also has implications for the

Internet, supporting the positive effects of modeling and scaffolding (Jacobson et al., 1995) and instructional cueing (Lee & Lehman, 1993), and the positive effects of exposure to large databases of information presented in a non-linear fashion (Repman, et al., 1993).

Many see the telecommunications function of the Internet to be the most significant advantage to the use of the Internet in the educational setting (Trentin, 1996). It has the potential to be a powerful influence on student collaboration and it gives students an opportunity to communicate in detail about interests and problems. Studies of communication within a telecomputing environment have shown that this type of learning environment can also be useful in language acquisition - organizing thoughts, presenting them clearly, and producing better results (Bottino & Ferrari, 1994). According to Judi Harris (1995), seven "telecomputing activity structures" that can be used to facilitate student learning are: (1) information searches, where students are provided with cues and must use reference sources to solve the problem; (2) electronic process writing, where students share their writings and give feedback to others, (3) sequential creations, where participants progressively create a shared text or project; (4) parallel problem solving, where a similar problem is presented to different groups in different places, and problem-solving strategies shared; (5) virtual gatherings, where people from all over the world get together to talk or participate in a mutual activity in real-time; (6) simulations, where students work collaboratively within their groups and with groups outside their classroom to create on-line simulations; and (7) social

action projects, where students globally participate in a project with a common cause to help our planet (Harris, 1995). Harris (1995) says that focusing on these types of problem-solving activities using the rich resources of the Internet allow students to concentrate on the "process" of curricular integrated learning instead of the technologies they are using or the product to which the process leads.

Over the past two years, countless anecdotal success stories have also emerged on the use of the Internet to enrich the curriculum and promote active learning (Copen, 1995; Harris, 1995; Lynes, 1996; McCarty, 1995; Peha, 1995; U.S. Department of Education, 1994). These anecdotal accounts offer an optimistic look at the possibilities the Internet has to offer school curriculums throughout the country (U.S. Department of Education, 1994). However, as yet, there is scant empirical evidence that one can rely on to justify its positive contributions to helping students learn or helping teachers teach using the Internet. It seems likely, however, to expect that we might see a surge in research devoted to this agenda as we continue to place computers with Internet access into the classrooms throughout our country. Clearly, there is a need for this type of research to avoid the costly mistake of spending billions of dollars on another educational innovation that has little or no impact on what, or how, students learn in schools. But incorporating technology into classrooms, especially the Internet, means that teachers will have to organize learning experiences for students differently than ever before.

<u>Variables that Affect Successful Implementation of Technology into the</u>

<u>Curriculum</u>

In order for the use of technology to promote student learning, teachers must successfully implement the technology into the school curriculum. As Solomon (1996) states, using technology as a means to student learning depends on changes over the whole learning environment, not just in the fact that technology is used as the learning tool.

In a survey on "Computers in Education" conducted by the International Association for Educational Achievement (IEA) in 1991, it was revealed that computers available in schools in the United States increased dramatically between 1985 and 1989, but few teachers used them for instruction, student learning, or "productive work" (De Corte, 1996). A Dutch study reported on the integration of computers within an entire school curriculum (Doornekamp & Carleer, 1993). They found, over a four year period, that integrated use of the computer did not occur frequently. This study points to three major constraints in the process of integrating computers into the curriculum: the availability of courseware, the lack of time, and the motivation of the teacher to successfully facilitate learning via computer-mediated instruction (Doornekamp & Carleer, 1993).

Other studies corroborate the Dutch study. Hickey (1993) found that even though all the classrooms in the 16 schools studied had access to computers and all the teachers had been trained in their implementation, they were seldom and sometimes never used. Teachers who did use the computers reported that

they generally used them for enrichment activities or to "give the students something to do". Some reported that they were used as a "reward" for children who had finished their seatwork.

Davidson & Ritchie (1994), in contrast, reported increased positive attitudes of elementary students, teachers, and parents over one year after an effective implementation of computers into the school. The implementation, including teacher training, included the entire school community (i.e. all teachers, parents, students). Davidson & Ritchie found that at the end of the one year implementation, teachers believed that student performance and motivation to learn had increased, and that the technology enhanced their teaching. They also had developed positive attitudes about computer usage and saw it as a important contributor to the curriculum for the future. These positive attitudes were attributed to the notion of "school community" in the implementation process.

Ritchie & Wiburg (1994) identified four variables that seem to have the most influence on how well teachers incorporate technology into their curriculums. They are: (1) administrative support and leadership, (2) the pedagogical orientation of the teacher (whether she sees "process" or "product" as being the most important), (3) the quality of training in integrating the technology, and (4) having collaborative partnerships with agencies outside the school such as universities, corporations, and local and state departments of education. Other variables that have an impact in technology integration and are more specific to computer usage, are the instructional settings in which the

computers are placed, and the programs available to use that can be correlated with and incorporated into the curriculum.

The *Education Technology Survey* of 1995 found that the three greatest barriers to electronic usage in the school setting that were identified by the 1,000 teachers in the sample were lack of knowledge about the service, lack of workshops or training, and lack of time to learn how to use the technology. Teachers need to gain some mastery of the operational skills of the technology in order for them to use it effectively with their students (Honey and McMillan, 1993; Scott, Cole, Engel, 1992). They also need direction in *how* to integrate its use into their current curriculum, how to facilitate active learning with the computer-mediated environment, and how to provide authentic situations of learning. In addition, teachers also need *time* to learn the skills necessary for using the technology and to gain a feeling of competence in it's use (Honey and McMillan, 1993; Means, Olson, & Singh, 1995).

In a recent review of nine case studies where technology was implemented into the schools, the deciding factor for a successful implementation was a schoolwide approach where the technology was implemented into the core curricula for all students with shared vision (Means, Olson, & Singh, 1995). This scenario included a school of teachers who saw themselves as change agents, who collaborated on a shared vision, who saw the worth of technology in the educational process, who were given substantial resources and administrative and community support, and who focused on process learning for every child. Again, we return to the same adage - it is most

often the decisions of the teachers that are implementing technology into the curriculum that make a difference - not the technologies themselves.

The Interdisciplinary Approach to Education

Teachers need not only to learn how computers work--they also need to be shown how to incorporate technology into the learning experiences they design for their students. Seymour Papert, a noted MIT professor and theorist on children's learning and computer usage, made a number of recommendations to the U.S. House of Representatives in reference to educational reform and technology - one of those being that we strive to create "radically innovative new concepts of intellectually rich curriculum" without the constraints of specific subject areas (i.e. math, science, physical education) (Papert, 1995). Even federal officials have advocated integrative practices in our schools. In "An Agenda for Reform in the U.S.A" (Organisation for Economic Cooperation and Development, 1994), President Clinton and Secretary Riley emphasize integration throughout the curriculum for successful school reform.

Integration of subject-matter content is not a new concept. In the early 1900's, progressives like John Dewey and Alfred North Whithead saw a need for integration in education (Placek, 1996). Again in the 1950's and 60's, influential educators, such as Paul Dressel and Benjamin Bloom, began to again investigate and talk about integrative learning in our educational system, and the need to provide students opportunities to create new systems of learning by connecting past, present, and future experiences, and by making

sense of what they know as it pertains to them and their world (Harter & Gehrke, 1989; Nielsen, 1989).

Schools in the 1990's are still dominated by traditional, discipline-based curriculums. These curriculums typically focus on learning bits and pieces of information that are not related holistically to the child's real-life situations, and the world in which he or she lives. Henry Adams, the great U.S. statesman, once said that "nothing in education seems as astonishing as the amount of ignorance that is accumulated in the form of inert facts" (Harter & Gehrke, 1989, p.13). Although total curriculum integration (Jacobs, 1991,1989; Vars, 1991) is not widely practiced, still many teachers, especially elementary teachers in self-contained classrooms, integrate parts of their curriculums (Placek, 1996).

An integrative curriculum is defined as "one in which the planned learning experiences not only provide the learners with a unified view of commonly held knowledge, but more importantly, motivate and develop the learner's power to perceive new relationships themselves" (Harter & Gehrke, 1989, p.15). (The terms "interdisciplinary" and "integrative" are usually considered synonymous, and will be used interchangeably in this study.) One viable argument for the worth of integrative education is the fact that humans, in general, need "connectedness" - we need to see the connections in our world and be able to understand them as they relate to each of us in our microsystems, our mesosystems, our exosystems, and our macrosystems (Bronfenbrenner, 1979). It is in making these connections that we come to understand them.

Connecting Subject-area Content Integration and Technology

The possibilities for positive effects from connecting the integrative approach to curriculum content and the use of technology are being investigated by some researchers. In a study by Tracy and Williams (1990), a program that combined the teaching of German and Turtle Logo (a computer programming program) was investigated for it's benefits on the achievement and attitudes of 5th or 6th grade students.   Results showed that when the two subjects were combined, students were highly motivated to study both, regardless of their ability group. It also showed that instructional time was maximized by presenting two subjects at once. By using German as a tool or medium through which other skills are learned, positive results were found in all areas. Tracy and Williams (1990) suggest that other researchers investigate these types of "double subject" conditions where knowledge from more that one subject area could simultaneously be learned. Greenman (1991) reported on an interdisciplinary module using computers. The problem solving/geography unit was used with sixth graders over a four week period, and positive results were found in children's knowledge of geography, their attitudes about using the computer as a tool to conduct research, and their peer cooperation. Flake and Sandon (1990) discuss the use of using a "maps" theme and computer-mediated activities in a curriculum to integrate many subject areas. They cite other successful theme oriented approaches to learning such as one's

revolving around transportation and bridges. Obviously one theme that can easily be integrated across a curriculum is the concept of living healthy.

Living Healthy as an Interdisciplinary Theme

Striving to meet the national goals and objectives concerning a healthy and productive lifestyle is certainly a responsibility that should be considered by all those involved in educating children in the school setting, not only health and physical education teachers. It is also a topic that readily lends itself to interdisciplinary learning.

Meeting goals and objectives of the health and physical education curriculums through integrative approaches are advocated throughout the literature in health education (Ames, 1994; Kane, 1994), and physical education (Colvin and Walker, 1996; Faucette and Hillidge, 1989; Gabbard, McBride, & Matejowsky, 1989; Petray, 1989; Placek, 1996; Rasuchenback, 1996). The comprehensive school health curriculums that are in place in many schools reinforce the concept of an integrated curriculum, rather than a limited, fragmented curriculum where topics are addressed singularly and where information does not have relevance to the students' real world situations (Hamburg, 1994). Some educators believe that integrating subjects such as art, music, and physical education with the core subject areas of math, science, social studies, and language arts using a thematic approach on a regular basis is most appropriate (Allen, 1996; Bugan, Finnigan, & Tipton, 1996; Fogarty, 1994; Lynes, 1996; Nielsen, 1989; Placek, 1992). Some authors suggest that students who are normally unenthusiastic about health and physical education

may be motivated by the integrative activities that allow them success in both the cognitive and physical domain, and that they may find an interesting "connection" that motivates them to learn in other subject-specific content (Rauschenbach, 1996). The literature on student learning in health and physical education through integration approaches is limited.

Positive effects have been reported in integrating physical education with language arts (Earle; Pennman Christopher & Wood, in Placek, 1996), science (Werner in Placek, 1996), and music (Brown, Sherril, & Gench in Placek, 1996). Two studies of classroom teachers integrating physical education concepts showed positive effects on measures of fitness (Pissanos & Temple, in Placek, 1996), and gains in student knowledge about fitness, participation in activities, and motivation to exercise (Sander, Harageines, Ratliff, & Pizarro, in Placek, 1996).

From the literature on the interdisciplinary approach to learning, integrating health and physical education concepts into the child's total school curriculum can be considered a viable approach to promoting healthy lifestyles and physical activity that can be actualized and connected in real-life context, and can be practiced throughout a lifetime. Using technology as the context in which to "connect" the curriculum can be an additional asset in this endeavor. But clearly, it is the teachers that will make integration "work". If teachers recognize the contributions each field of study can make to the others, and strive to make "connections" between the subject areas, then student learning can be enhanced in new ways.

The Development of Instruction

In order to develop an integrative unit of instruction that uses technology as the instructional medium, one needs to understand the instructional development process, and apply the principles of instructional development and design to the innovation. This brief literature review on the development of instruction begins with a distinction between "development" and "design". Gentry states:

> *Instructional development emphasizes those activities that deal directly with the systematic design, development, implementation, and evaluation of instructional materials, lessons, courses, or curricula in order to improve student learning or teaching efficiency (Abedor & Sachs, 1984, p. 395, in Gentry, 1994, p. 2)*

Gentry (1994) alludes to the confusion in the professional literature between "instructional development" and "instructional design", saying that some authors use these two terms interchangeably, while others give them separate meanings. Gentry uses "development" to mean the entire system of instruction, including systematically developing the instruction as well as managing the development process. He considers "instructional design" to be one of the subsets of instructional development. Because of the complexity of instruction delivered via the Internet, it seemed most appropriate to adopt Gentry's approach to instructional development and design, and so, therefore, in this study, design will be considered one component in the development process of the Interdisciplinary Internet Module - Healthy Hearts (IIM-HH).

Gentry (1994) views the instructional development as being made up of systems, with a system being a set of components that are arranged so that a needed operation can be performed (p.3). These systems can best be represented by graphic models. Instructional development models are a graphic representation of the interdependent, interactive components that must function to create and facilitate the efficient and effective development of instruction. Gentry's *Instructional Project Development and Management (IPDM) Model* is composed of fourteen components that are interactive, and give the developer a guide in determining what processes need to be completed during the instructional development process. Of those fourteen component, one is *design.* An illustration of Gentry's (1994) IPDM Model can be seen in Figure 2.1.
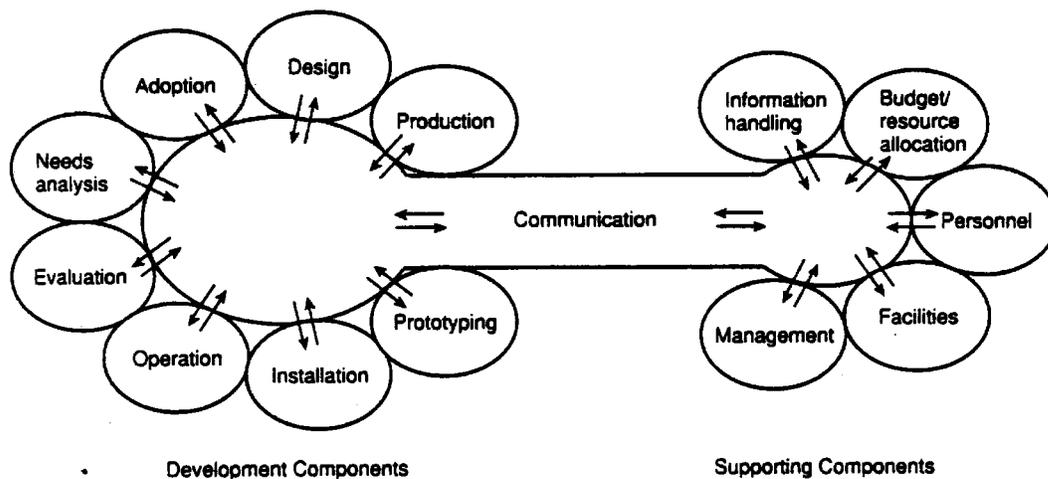
Figure 2.1   Gentry's IPDM Model (from *Introduction to Instructional Development*, Gentry, 1994, p. 4.)

In addition to Gentry's model, there are numerous development and design models that are advocated by various authors, with the differences being mainly in the emphasis that is placed on particular steps in the development/design process (Gentry, 1994). An instructional design model presented by Shambaugh & Magliaro (1997) (Figure 2.2) clearly depicts the instructional development/design process and, combined with Gentry's model (Figure 2.1) provided the foundation for the IIM-HH Development Model which is detailed in Chapter 3. Regardless of the instructional development/design model used, most developers of instruction would agree that to begin the development and/or design of an instructional unit, the need for the instruction must be identified.
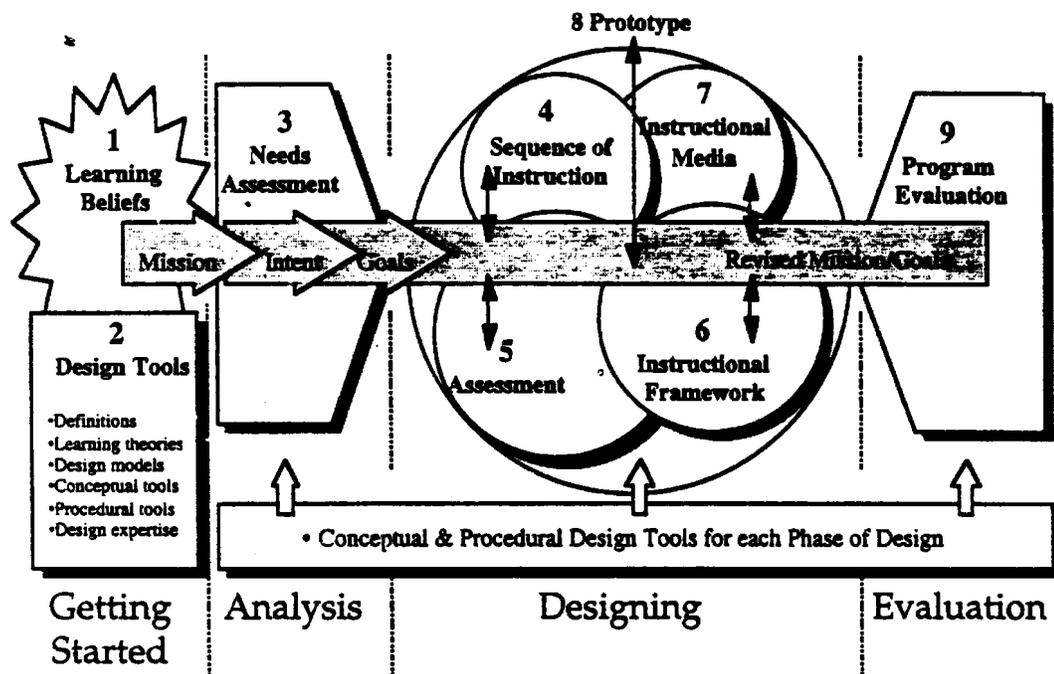
Figure 2.2.   An instructional design model presented by Shambaugh & Magliaro in *Mastering the Possibilities (1997, p. 237).*

Needs Analysis and Goals Development

To begin the development of instruction, developers should first conduct a *needs analysis* to determine if a particular instructional unit is needed, and to gain information that will suggest the course of action to be taken in designing such an instructional unit (Gagne' & Briggs, 1974; Gentry, 1994; Shambaugh & Magliaro, 1997). This process allows the developer to decide on major features of content and/or tasks to help solve a problem. Once that has been decided a list of the major *instructional goals* is generated to help address these problems and to indicate what the developer believes can be accomplished by the new instructional unit (Shambaugh & Magliaro, 1997). Gagne' and Briggs (1974) recommend working from general to specific in writing goals because general goals are better understood when communicating with others, while specific goals are needed for the developer's own use in the development process (p. 218).

Once the need for the instruction is justified, and the instructional goals of the innovation formulated, the next step is to decide a sequence of instruction (Gagne' & Briggs, 1974; Gentry, 1994; Rothwell & Kazanas, 1992; Shambaugh & Magliaro, 1997. The *sequence of instruction* is one of four steps necessary in the actual design of instructional content.

Sequence of Instruction

Sequence is "the order in which learners are introduced, through planned instruction, to information and tasks essential to performance" (Rothwell & Kazanas, 1992). Instructional sequencing ranges from a fixed, or

inflexible, sequence where the sequence never varies regardless of the learner, to a varying, or flexible, sequence where the learners influence the instructional sequencing. The sequence used to present information in a particular instructional environment is dependent upon the performance objectives to be achieved with the instruction then sequenced so that learners are introduced to information in a systematic way that is appropriate to the learning objectives, the learners themselves, and the learning environment (Rothwell & Kazanas, 1992).

There are many approaches to sequencing instruction. They include chronological sequencing, topical sequencing, whole-to-part sequencing, part-to-part sequencing, known-to-unknown sequencing, unknown-to-known sequencing, step-by-step sequencing, part-to-part-to-part sequencing, and general-to-specific sequencing (Rothwell & Kazanas, 1992). Another approach to sequencing instruction is through the use of taxonomies (Gagne'& Briggs, 1974; Gentry, 1994; Shambaugh & Magliaro, 1997). This approach helps develop the sequencing of content by identifying the learning capacities of what students are able to do. Learning taxonomies have been developed to address skills in the cognitive, psychomotor, motor, and affective domain (Gagne' & Briggs, 1974; Gentry, 1994; Shambaugh & Magliaro, 1997). One such taxonomy is Bloom's Cognitive Taxonomy. It is made up of six levels or degrees of complexity of the thinking process, beginning with *knowledge*, and progressing through *comprehension, application, analysis, synthesis, and evaluation* (Shambaugh and Magliaro, 1997). In this taxonomy, these skills are

ordered from simple (*knowledge*) to complex (*evaluation*), and implies that

mastery at one level should be obtained before moving on to the next cognitive

skill (Shambaugh & Magliaro, 1997). Many design experts recommend that

student performance objectives be sequenced to represent Bloom's order of

cognitive skills (Gentry, 1994).

While some advocate student control over instruction where the learners

select instruction, work at their own pace, and make choices based on their

individual learning needs and styles, there is evidence that learners frequently

make poor instructional choices due to lack of needed knowledge to make

metacognitive judgments (Hannafin & Hooper, 1993; Winn, 1993). "Control of

sequence-altering options, such as to quit a lesson, skip instructional segments,

or alter the sequence of instruction, are of substantial potential consequence to

intended learning outcomes" (Hannafin & Hooper, 1993). Winn (1993)

suggests that learners be given specific advice about how to proceed through

instruction, but allow them to have control over the pace of instruction

The Instructional Framework

. Once the sequence of instruction is determined, the next step is to

develop the *instructional framework* of the instructional design defined as the

"means to enact and support your instructional goals and objectives"

(Shambaugh & Magliaro, 1997, p. 151). The framework is based on the

foundational learning principles that the developer has identified, and the

instructional models or *strategies* that the developer will use to incorporate

those principles into the instruction.

Instructional models provide a "theoretical basis" for what "works" in instruction (Shambaugh & Magliaro, 1997). Many instructional designers suggest that instruction may be presented using a variety of models, and the models chosen for a particular project should be based on the learning goals and objectives one hopes to accomplish, and the contextual factors that are present in the particular instructional setting. The *instructional framework* should include the instructional models used in the instruction design, a rationale for these models, and how they will be carried out in the design of instruction.

Assessment of Student Performance

In order to know if instruction is effective, assessment of learner performance has three main purposes - (1) to inform the teacher when/if the learner has mastered an objective and to detect when more instruction is needed in a unit of study, (2) to inform the student of the strengths and weaknesses of his/her performance, and (3) to inform the developer where revisions should be made in instruction, and to contribute to the evaluation of the instructional unit as a whole (Gagne' & Briggs, 1974).

According to Shambaugh and Magliaro (1997), there are two types of assessment possibilities - selected response and constructed response assessments. For selected response assessments, students make a choices from a predetermined set of answers, e.g. multiple choice and true-false questioning. Constructed response assessments require the student to construct an answer, such as in short answer tests or essays. Other constructed

response assessments include portfolios, projects, interviews, and self-assessments (e.g. logs, reflection papers, journals) (Shambaugh & Magliaro, 1997).

Instructional Media Considerations

Given the surge of instructional media into the school curriculums, it is important to consider the possibilities that media materials may have on the instructional design of a unit of study. A developer of instruction must first determine if a medium is suitable for the content of the instruction, if it has the potential to help the design of the instruction meet the specified instructional goals, if it is appropriate for the students for whom the instruction is being designed, and if the use of the medium is realistic within the contextual setting (Shambaugh & Magliaro, 1997). As noted earlier in this chapter, technology-based instructional media is being implemented throughout school settings everywhere. Developers of instruction should consider the potential use of new technological interventions as they design instruction for schools in the 21st century (President Clinton's Call to Action...1997; Boyer, 1992; Papert, 1995).

Overall Evaluation of the Instructional Unit

Each of the components described above combine into the overall instructional unit which must then be evaluated. Evaluation of an instructional unit is imperative, both during phases of development and at the completion of the unit. It is through evaluation that a developer/designer has assurance that his/her instructional unit is valuable for learning in the educational setting

(Gagne' & Briggs, 1974). Systematically gathered evidence will indicate how well the unit "works" (Bogdan & Biklen, 1992; Patton, 1990; Tessmer, 1993).

There are two major roles of evaluation - formative evaluation and summative evaluation (Bogdan & Biklen, 1992; Gagne' & Briggs, 1974; Patton, 1990; Tessmer, 1993). A complete program evaluation should include both formative and summative evaluations. A formative evaluation is "a judgment of the strengths and weaknesses of instruction in its developing stages, for purposes of revising the instruction to improve its effectiveness and appeal" (Tessmer, 1993, p. 11). Summative evaluations are used to determine if instruction is effective after it has been completed, rather than during the on-going development process. This process determines if the program has met the goals established in the instructional development process, and to draw conclusions about the overall effectiveness of the instructional system (Gagne' & Briggs, 1974; Patton, 1990). Typically, formative evaluation begins after an instructional unit or program has been developed into a rough draft. It also occurs before any summative measures are taken. However, formative evaluation should not be seen as an isolated step in the development process, but as an interactive one that can be applied to each step of the design process (Gentry, 1994; Tessmer, 1993). Even after a program or instructional unit has successfully met summative-evaluation criteria, some instructional developers maintain that formative evaluation of an instructional unit should be ongoing as long as the unit is in operation (Gentry, 1994).

The focus of formative evaluation research is to determine strengths and weaknesses of a specific program being studied, and to make recommendations for improvements (Patton, 1990). According to Patton, the standard for judging the innovation is its usability and usefulness by the targeted audience in the intended setting. Bogdan and Biklen (1992) suggest that to increase the credibility and validity of the development of instruction, the target audience's behavior, description, and assessments should contribute to practical changes.

Tessmer (1993) offers four types of formative evaluation that should be considered when examining the effectiveness of an instructional innovation. First, experts, such as technical, content, and pedagogy experts, should review the instruction for content and technical quality. Also, one-on-one evaluations by the reviewer with those representative of the target population should be considered. Once revisions are made based on the findings of this formative evaluation, small group evaluations should take place, where the evaluator tries out the instruction with a small group of learners and records their performance and comments, and modifies the unit based on the findings. Finally, a field test of the instructional unit or program in a realistic situation with a group of learners should be conducted, and again, changes made to the unit based on the results of the evaluation (Tessmer, 1993) Within these four types, there are many acceptable variations according to the number of people used, the situation, and the role of the investigator (Tessmer, 1993).

A variety of tools might be used to collect data during a formative evaluation. They include tests (both selected and constructed response), logs, field notes, databases, audio recordings, student records, observations, video recordings, and questionnaires (Tessmer, 1993). The tools used will depend on the research questions that are to be answered from the evaluation. Formative evaluations should involve the triangulation of a number of different types of data collection methods in order to collect different types of information from different sources (Bogdan & Biklen, 1992; Patton, 1990; Tessmer, 1993).

<u>Theoretical Foundations</u>

This study was undertaken to design, pilot, and evaluate an instructional unit that promotes active learning in children through an interdisciplinary approach, using the Internet as both a tool and a context in which to learn. The theoretical foundation which was reflected in the development of this instructional module was Bronfenbrenner's (1979) Systems Theory of child development. The following section will describe the theory in detail, and discuss the relationships between the principles of the theory and this study. A subsequent section will briefly review other theories that are related to the Systems Theory, and that have relevance to the study. This section of the chapter will also provide a literature review on learning theories' influences on instructional design.

The Systems Theory of Human Development

Urie Bronfenbrenner's (1979) Ecological Systems Theory of human development focuses on the context surrounding a child's development, and how these contexts influence the child's perceptions of society and his/her opportunities to acquire various skills. The basic tenet of his theory is that behavior evolves as a function of the interplay between a person and his environment. His theory looks at the evolving processes of interaction through which the behavior of participants in the system is instigated, developed, and sustained and asserts that each child has different interests and natural tendencies. Development happens because of these unique interactions with his environment. The Internet has the potential to provide an environment where differences in interests and genetic potential can be actualized as a child interacts within the context of the Internet environment.

Bronfenbrenner (1979) defines human development as "the process through which the growing person acquires a more extended, differentiated, and valid conception of the ecological environment, and becomes motivated and able to engage in activities that reveal the properties of, sustain, or restructure that environment at levels of similar or greater complexity in form and content" (p. 27). From the Systems Theory perspective, development takes place concurrently in the perception and the action domains. In the perceptual sphere, developmental change takes place from the nature and influence of the external context, and to what extent the child's view of the world extends beyond the immediate situation to include a picture of other settings in which he

can actively participate. In the action sphere, development occurs as the child uses the Internet to reorganize his existing knowledge and create new knowledge of comparable or higher order that may be more in accord with his desires and interests. The child is seen both as a product and a producer of developmental change. The change takes place through mutual accommodation between the active, growing human being and the changing properties of the immediate settings in which the person lives. The developmental process is not only affected by these immediate settings but also by the larger contexts in which the settings are contained (Bronfenbrenner, 1979, p.21).

From this description of human development, three points should be made. First, the developing person is seen as a growing, dynamic being that progressively moves into and restructures the environment in which he resides. Secondly, the interaction between person and environment is viewed as bi-directional, requiring a process of reciprocity. Thirdly, the environment is not limited to a single, immediate setting, but incorporates interconnections between settings and external influences from larger surroundings (Bronfenbrenner, 1979).

Bronfenbrenner (1979) sees the process of human development covering the life span, and influenced by four overlapping ecological contexts: (1) the microsystem, (2) the mesosystem, (3) the exosystem, and (4) the macrosystem. These contexts can be imagined as a set of "nested structures" (p.3), each inside the next.

Microsystem

The microsystem is the innermost level. It is where the developing person is found in his immediate setting, such as home, school, etc. In the microsystem, the material and physical characteristics of a person's activities, roles, and interpersonal relationships, and how they have meaning to the person, all contribute to his development. One important contributor to development in the microsystem is the interpersonal structures therein. In studying dyads, when two persons pay attention to or participate in one another's activities, data has shown that if one member of the pair undergoes a process of development, then the other person does as well. Findings also indicate that extending beyond the dyad to triads, tetrads, and larger interpersonal structures have equal developmental significance (Bronfenbrenner, 1979). "Active engagement in, or even mere exposure to, what others are doing often inspires the person to undertake similar activities on her own" (Bronfenbrenner, 1979, p.6).

Through participating in Internet activities as a part of the child's microsystem of school or home, these molar activities give the child an opportunity to work in interpersonal structures constantly. Working cooperatively with others, exploring the activities of others, corresponding one-on-one with other students and with experts in particular areas of interest, and participating in projects of interests with other students all over the world are all examples of how interpersonal structures are facilitated and encouraged by Internet activities. Additionally, the Internet can be seen as a "context" or setting

itself, as it is a representation or simulation of the real-world context of another microsystem.

Mesosystem

This level is the interaction between the single settings (the microsystems) of a person. For example, a child's mesosystem may consist of his home, school, church, and circle of friends. As children develop new needs and interests, they are brought to new contexts that influence their development, and the number of settings in which they are a part gradually increases. This evolving participation in multiple settings is both a cause and a result of development.

The principle of interpersonal structures discussed previously can also apply to relationships between settings (between microsystems). In order for settings to function effectively in development, social interconnections between the settings must occur. The capabilities of the Internet allow individuals in different settings to communicate, participate jointly, and share information about each setting with the others.

Exosystem

The third level of the ecological environment is that which influences the child's development, but in which the child may not participate directly. In a school setting the exosystem plays a major role in technological advantages that a school has to offer its students. Technological opportunities in schools can depend on the school's economic status, demographic location, and size.

As the National Center for Education Statistics 1996 report indicated, the

schools with the most Internet access were those that had 1,000 or more

students, were located in suburban areas, and had less than 11 percent of

students eligible for free or reduced-price school lunch ("Advanced

Telecommunications...", 1997). Students and their parents within these settings

are also less likely to have exposure to computer technology outside of the

school setting.

The educational support from outside agencies in the communities, state,

and in the nation can also affect students' exosystem influences in

development. As President Clinton reiterated in his "Call for Action" (1997), the

goal of providing technological opportunities for all students cannot be

achieved unless the exosystem components work together - including

communities, businesses, governments, teachers, parents, and students.

Macrosystem

This level encompasses the "blueprint" of the ecological environment as

we see it through the lower-order systems (micro-, meso-, exo-). This "blueprint"

exists according to the belief systems or ideology of the subculture or the culture

as a whole in which it is found (Bronfenbrenner, 1979). Our "blueprint" is

formed by our social organization, our belief system, and our lifestyles in every

setting in our culture. The infusion of the Internet into every setting within our

environment is forcing our societal "blueprint" to change. This change could

contribute to our macrosystem by our communication with those outside our

mesosystem, by accessing information in other settings that are common to and

different from our culture, and through other global education opportunities that the Internet affords us.

Systems Theory and the Internet

According to Bronfenbrenner (1979), a person

...gradually becomes capable of adapting his imagination to the constraints of objective reality and even of refashioning the environment so that it is more compatible with his abilities, needs, and desires. It is this growing capacity to remold reality in accordance with human requirements and aspirations that, from an ecological perspective, represents the highest expression of development (p.10).

 The Internet may be an avenue in which a child can "refashion" his environment to his interests and abilities. Through the information available on the Internet, a child's ideas of "reality" can broaden, expanding his thoughts of the possibilities his life affords him. (Mikropoulos, Kossivaki, Katsikis, & Savranides, 1994). Two assumptions made by Bronfenbrenner as he elaborates on the Systems Theory have particular relevance to Internet usage. First, he believes that if a child is involved in a number of activities in a range of settings, he will be better able to adapt to a variety of people, tasks, and situations . This will increase the scope and flexibility of his cognitive competence, and will allow for generalizations across situations. Second, he believes that, to maximize their development, children need more exposure to different activities and roles of people, as well as culturally diverse

environments. The Internet has the potential to provide these opportunities for children.

The theoretical underpinnings of Bronfenbrenner's Systems Theory also supports the constructs of an integrative curriculum perspective, seeing each subject as only a "microsystem" that needs to be explored through it's interaction with all other "microsystems", and in light of their interactions within the entire "macrosystem". Simply speaking, the integrative curriculum promotes learning by allowing specific subject matter knowledge to be applied within other contexts of learning, requiring the learner to connect concepts, and find relevance with his real-world context. The learning environment, therefore, fosters an interconnectiveness of the knowledge gained, influenced by all areas of the curriculum, and the world in which the learner is a part.

Social Context Learning Theory

The Systems Theory suggests a "social context" perspective of human development, which is also supported by many other current learning theorists, including Vygotsky, who proposes a "zone of proximal development" where students actively collaborate with peers or adults to achieve the next level of development (Miller, 1993). The zone is between a learner's actual level of development and his potential level, and can occur in any situation where some activity is leading the child beyond his current level of functioning. Through the interactions with adults or more competent peers in the zone, learning occurs. (Miller, 1993) This approach to learning is also called *cultural constructivism* by

Scott, Cole, and Engel (1992) where the child is seen as an active learner but the learning is equally influenced by the interaction with an active adult.

Over recent years, much has been written on the influence of the culture and social context on development and learning. (Brown, Collins, & Duguid, 1988; Choi & Hannafin, 1995; Crook, 1987; Fisher, Wilmore, & Howell, 1994; Jonassen, 1995; Jonassen, Wilson, Wang, & Grabinger, 1993; Repman, Weller, & Lan, 1993; Resnick, 1987; Scott, et al., 1992) Mutual guidance, supportive and encouraging atmosphere, conversation, reciprocal learning, and cooperation are all deemed components of such contexts. The value of collaboration and reciprocity is stressed in Brown, et al.'s (1989) theory of cognitive apprenticeship and situated cognition, and reiterated by Resnick (1987) and Choi and Hannafin (1995), to name a few. In these situated learning environments, learners engage in authentic tasks that they find personally interesting and meaningful and that help them progress beyond their current level of development (Fisher, Wilmore, & Howell, 1994; Repman, Weller, & Lan, 1993).

Some suggest that technology can contribute to providing this type of learning environment for students (Bransford, Sherwood, Hasselbring, Kinzer, & Williams, 1990, in Repman, Weller, & Lan, 1993; Jacobson, et al., 1995). A technology-based environment can be used to produce authentic tasks that are exciting to students in which collaboration on the activity will take place between the learner and the technological tool, whether it be software, hypermedia, Internet, etc., as well as between the learner and other learners,

and the learner and teacher. The Internet can simulate real-world contexts, it

can connect learners within a school, within a community, and within a

universe. The determining factor in the kind of learning that a technology-based

learning environment, or any other learning environment, will promote is

influenced by the theoretical approach that guides the design of the instruction.

Learning Theories Influences on Instructional Design

Three theoretical approaches that are most commonly used to guide (or

describe) instructional practice are *behaviorism, cognitive psychology*, and

constructivism. (Shambaugh and Magliaro, 1997). Each one is briefly

described in the following sections.

The Behaviorist Perspective

Emphasis on behaviorism in educational psychology was brought to the

forefront by the well-known contemporary neobehaviorist, B. F. Skinner.

Skinner believed that "nearly all human behavior is a product of either

biological natural selection or psychological operant reinforcement" (Bigge and

Shermis, 1992, p. 96). According to Skinner, people respond directly to extant

reinforcing consequences. Therefore Skinner suggested that we can improve

the efficiency of behavior of learners through operant reinforcement. From a

behavioral perspective, learning is seen as response acquisition--the learner

responds frequently, and his or her appropriate behaviors are immediately

reinforced (Shambaugh and Magliaro, 1997). According to Skinner, we allow

"showing and telling" in education so that the learner can see the acceptable behavior for the first time so that the behavior can then be reinforced, but discovery and creativity activities that teachers allow learners to participate in are used only as a way to interest students, and good reinforcement does that in "a much more profitable way" (Bigge and Shermis, 1992, p. 111). The linear dimension of this view of learning allows a student to progress through a series of steps at his own pace, being reinforced immediately after each correct response. Instructional design that is based on this view of learning will take into consideration the individual learner's needs and interests and will allow for individual pacing and progress. Subject matter is sequenced for the learner, and learning is measured by some behavioral indicator using objective measures (Shambaugh and Magliaro, 1997).

Skinner saw the computer as the "ideal teaching machine..." (Bigge and Shermis, 1992, p. 111. Computer-based instruction developed over the last few years is based upon Skinnerian programming whereby immediate feedback is given in a linear fashion as students find the right answers in a given sequence. The most common use of computers in education, until recently, has been either to teach children how to use computers, or to take them through drill and practice sequences for a specific skill (Bigge & Shermis, 1992). In this role in instruction, computers are viewed as "tutors".

The Cognitive Psychology Perspective

The *cognitive psychology perspective* views learning as knowledge acquisition. With this view of learning, the human memory system is compared

to a computer (information processing theory), where more attention is given to the learner's mental processes, such as problem solving, thinking, and remembering in contrast to the rather linear process posited by Skinner. Memory and recall are seen as dependent on the quality of the processes. Jerome Bruner, equally as influential as Skinner in educational circles, is a cognitive learning psychologist who views "humans as information processors, thinkers, and creators" (Bigge and Shermis, 1992, p. 123) who actively acquire knowledge, transform information, and construct and alter hypotheses based on the evidence " (Bigge and Shermis, 1992). As did Skinner, Bruner also viewed learning as goal-directed, but he suggested learning was driven sometimes by our curiosity, not just our primal needs. He believes that optimal learner motivation comes from establishing that point of motivation halfway between "apathy and wild excitement" (Bigge and Shermis, 1992, p. 12). . For Bruner the role of the teacher is to be a model for students to interact with daily - not just a model to imitate. Through these interactions, the teacher is able to share positive attitudes about learning in general, and about specific subject area content. Instruction that focuses on this type of "explanatory understanding" strives to *give* the learner understandings (Bigge & Shermis, 1992). To do this, the teacher provides the learner with truths that he/she knows and gives cues to aid in the understanding of these truths. The student has completed the learning task when he/she has an understanding of the pre-established truths presented to him/her initially.

Adapting this perspective to instructional design, the ideal knowledge structure is identified, and then instruction is structured to stimulate and promote processing activities that help the learner reach that potential. A student not only learns the information, but also learns it in such a way that he or she can use the new information to solve problems. *Conceptual organizers* are used to help the learner organize his/her understanding of the information. Sequencing of information should begin with rudiments that the learner is familiar with and that can be built upon them by adding more complex information. "Readiness" should be taught - not just expected to happen.

 In regards to rewards, Bruner recognizes the roles of both extrinsic and intrinsic rewards in promoting learning, but believes that extrinsic rewards might get a particular act in progress, and may encourage it's continuation, but as behavior becomes more long-range and competence-oriented, intrinsic motivators are the most important " (Bigge & Shermis, 1992). Bruner says that for a learner to gain intrinsic motivation, the knowledge of his results must be available to him on a regular basis at the time when he is comparing the results of his work with that of some criterion that he wishes to achieve (Bigge & Shermis, 1992).

Computer-mediated Instruction that seeks to promote explanatory understanding goes beyond the mechanistic approach of behaviorism which defines learning in terms of a correct response to a particular stimulus, to include an understanding of humans where consideration is given to problem-solving and application, but only as it applies to previously learned rules, not

developed through exploratory understanding or reflection. This perspective

views the computer as "tutee" - "instead of learning *about* computers or

learning *from* computers, learners *teach* the computer to perform a series of

prearranged steps" (Bigge and Shermis, 1992. p.313). Probably the best

example of this is computer programming. In short, in this environment the

learner's role in solving problems is limited to the "problems" that the computer

program defines and their programmable solutions which require higher order

thinking, planning skills, and interaction capabilities within the context of the

computer program (Bigge and Shermis, 1992).

The Constructivist Perspective

Learning is viewed as knowledge construction from the constructivist

theory perspective. The main focus of constructivism is on *how* we understand

and *what it means* to understand (Duffy, Lowyck, & Jonassen, 1991). In contrast

to the views ascribed to Skinner (behaviorism) and Bruner (cognitive

psychology) , in a constructivist perspective the learner is seen as in control of

his or her own learning. Instruction that focuses on this "exploratory

understanding" of teaching and learning emphasize that "what children and

youth learn along with their learning subject matter is often as significant as the

subject matter itself" (Bigge & Shermis, 1992). Cognition, from this perspective,

is seem as "situated" - that is, it must be understood in the context of the

learning environment (Choi & Hannafin, 1995; Collins 1991; Brown, Collins, &

Duguid, 1988). Learners must be involved in both investigative (discovery -

explanation) and reflective (prediction-verification) processes (Bigge &

Shermis, 1992). Constructivism encompasses many learning principles, three of which are generative learning, situated learning, and cooperative learning.

Generative Learning

Many constructivist theorists emphasize the importance of student engagement in learning activities that are generative rather than passive -- requiring learners to engage in argumentation and reflection to help them refine their current knowledge and to "make sense" of alternate points of view and to solve problems. The learner must call upon the new concepts over and over again in order to "link, interpret, and explain new information" (Cognition and Technology Group at Vanderbilt, 1991, p. 16). Learners are encouraged to actively construct their own solution to the problems.

Situated or Anchored Instruction

Situated instruction allows the learner to seek solutions to problems that assimilate some of the advantages of apprenticeship learning. A major goal of this approach is for both students and teachers to participate in a shared environment where sustained exploration enables them to understand .

According to Collins (1996), educators should be preparing students to perform the complex tasks that occur in life - that can be applied to the real world in which we live. He asserts that the first issue to address in designing any instructional environment is *authenticity.* The two questions associated with *authenticity* are: 1) What are the potential uses for the knowledge? and 2) How can a learning environment be created that reflects those possible uses?

Cooperative Learning

In addition to solving problems in authentic situations, another tenet of constructivism is cooperative learning. As the Vygotskian theory asserts, cooperation with others in our social environment allows us to advance through the social interactions and through the social construction of knowledge (Brown, Collins, & Duguid, 1989). Collaboration with others allows learners to collectively problem solve, where others' views give new insights and solutions that may not be recognized individually. Working with others also is effective in identifying misconceptions or non-optimal ideas of individuals (Kanselaar and Erkens, 1996).

In instructional design, the constructivist view puts the learner at the center of the activity, and the curriculum emerges during the course of the inquiry as the learner faces problems and seeks answers to those problems. The role of the teacher becomes that of a facilitator, as he or she provides learning experiences designed to help learners seek new knowledge. Situated learning, reciprocal teaching, and cooperative learning are all instructional techniques that reflect the constructivist perspective. Learning is assessed by how well learners can solve problems in real-life situations, and how they reflect on their own knowledge.

Summary

Computer technology in K-12 education is, indeed, at the forefront of educational reform in the 1990's, and recent studies are finding that new technological interventions are contributing to student learning in a number of ways. The literature is finding, too, that the Internet, being one of the latest technological innovations in the schools, has the potential to promote active learning and to provide students with a new ecological and social context in which to learn. Additionally, integrative curriculums are proving to be a viable means of "connecting" learners with the real world in which they live. Clearly, in order to develop effective instruction using computer technology as the medium, one must first understand the instructional development process, particularly the design of the instruction, and the evaluation methods used to determine its effectiveness.

The intent of this study was to design, pilot, and evaluate an integrative instructional unit delivered via the internet to promote active learning related to cardiovascular health for children in the upper elementary grades. This review of literature provided a foundation from which to begin.

CHAPTER 3

THE INSTRUCTIONAL DEVELOPMENT OF THE

INTERDISCIPLINARY INTERNET MODULE - HEALTHY HEARTS

(IIM-HH)

The basic reason for designing instruction is to make possible the attainment of a set of educational goals. The society in which we live has certain functions to perform in serving the needs of its people. Many of these functions - in fact, most of them - require human activities which must be learned. Accordingly, one of the functions of a society is to insure that such learning takes place. Every society, in one way or another, makes provision for the education of people in order that the variety of functions necessary for its survival can be carried out (Gagne' and Briggs, 1974).

Within our society, there is a perceived need to educate our young children on the importance of making wise health and wellness decisions that can affect mortality, morbidity, and their overall quality of life (Allensworth, 1996; Hansen, Landsmann & Monismith, 1996; President Clinton..., 1996; Taubert, Moller, & Washington, 1996; Torabi & Nakornkhet, 1996; U.S. Department of Health and Human Services, 1996; U.S. Department of Health and Human Services, 1991). There is also concern for our children's acquisition of technology "know how", particularly the use of the Internet, to enable them to function adequately in our world in the 21st century ("President Clinton Call to Action...", 1997; Boyer, 1992). Based on these perceived educational needs in

our society, and embracing the ecological perspective of Bronfenbrenner, the constructivist learning principles of situated learning and social interaction and collaboration, and the model of integrated curriculum, the vision of the Interdisciplinary Internet Module - Healthy Hearts (IIM-HH) was created.

This chapter begins with an overview of the IIM-HH, and then follows with a description of each of the seven sections of the instructional unit. This discussion is included first in this chapter so that the reader will better understand the basic tenets of the IIM-HH as they relate to the subsequent discussion of the components of development. The IIM-HH Development Model is then presented, followed by a discussion of each component as it relates to the IIM-HH development process. This chapter concludes with an illustrated description of the three development components that make up this study, and their relationship to each other.

A Description of The Interdisciplinary Internet Module - Healthy Hearts (IIM-HH)

The Interdisciplinary Internet Module - Healthy Hearts (IIM-HH) is a four week theme-based module for intermediate grade students delivered via the Internet that focuses on cardiovascular health. It encourages children to participate in physical activity regularly, eat a proper diet, and avoid the use of tobacco products. It encourages youngsters to read, write, problem solve, estimate, and develop an understanding of the heart and the impact of exercise, diet and tobacco use on its efficient functioning (science). Additionally, the IIM-

HH has been designed to help children make wiser decisions about participating in physical activity, eating properly, and avoiding tobacco product usage throughout their lifetimes. It has been developed for use by classroom teachers of upper elementary students, and encourages them to work collaboratively with physical education teachers to integrate the IIM-HH instructional unit into a number of subject areas within the school curriculum. The instructional unit is comprised of seven main sections that deliver instructional content to the student.

Components of the IIM-HH

The IIM-HH is divided into seven sections: *Get Smart, Do You Know?, Write On, Ask Experts, Movin' and Groovin', Log It, and Go for the Gold.* In addition, a overall user's guide for teachers (*Guidelines for Teachers*) is available within the module, as well as additional recommended activities and resources for the teachers' use with their students. The learning experiences that comprise each part of HEALTHY HEARTS change weekly as they relate to the weekly themes. Weekly themes are:

Week 1 - About the Heart: What it is and how it works

Week 2 -Being Active for a Healthy Heart

Week 3 - Eating Right for a Healthy Heart

Week 4 - Living Tobacco-free for a Healthy Heart

GET SMART

     Get Smart was designed to help youngsters understand how their heart works and how exercise, proper dietary habits, and tobacco use affects their heart. This section supplies the student with textbook-type information and accompanying graphics. The developer (the investigator) of *Get Smart* relied heavily on materials produced by the American Heart Association in selecting appropriate content for this section. The information in *Get Smart* is then used in other sections of the IIM-HH as students are encouraged to apply the content to their own lives . The content *of Get Smart* provides the foundational information for most other sections of the module, and changes each week according to the weekly theme. Figure 3.1 shows the main page of the *Get Smart* section of the IIM-HH.

DO YOU KNOW?

     Do You Know? is the part of the module that encourages children to complete self-tests about the content in Get Smart. This interactive feature allows children to quiz themselves anytime, in a risk-free environment. A wrong answer does not elicit a reprimand, but will trigger the program to help the student find the correct answer, and the reason for it (Gates, 1996). The quiz questions were formulated in accordance with Gentry's (1994) Multiple-Choice Test Item Construction recommendations. The quiz can help the student have a better sense of what he knows, and where he needs to gain a better understanding. The four weekly quizzes correspond to the information

Figure 3.1: *Get Smart* main page in the IIM-HH.

presented each week in *Get Smart*. An example of the main page of *Do You Know?* can be seen in Figure 3.2.

WRITE ON

Write On encourages problem solving and critical thinking as students are challenged to complete weekly writing activities that provide meaningful applications to their daily lives. Developmental approaches to literacy for children, such as collaborative writing and sharing, freedom to write about authentic experiences, and cognitive stimulation were considered in developing this section (Kelly and O'Kelly, 1993). The telecommunications feature of the Internet is conducive to students sharing their writing with others outside their immediate environment. Recent literature suggests that reluctant writers are encouraged and motivated to write by sharing with peers and by seeing their own writing on-line (Schweitzer, 1990; Seawel et al., 1994). Other studies on the development of literacy skills in children through the use of computers have shown that the interaction of the students with the medium itself can facilitate writing by allowing for easy editing, and, when working with a partner at the computer, interaction is made easier by the sharing of the screen and discussions facilitated by jointly formulating solutions and responses (Pontecorvo, 1991). The problem solving writing activities in *Write On* change each week, according to the weekly theme and the content introduced in *Get Smart* for that week. The students may choose from three types of writing activities each week, called "Dear Gabby", "Your Opinion Counts" and

Figure 3.2: *Do You Know?* main page in the IIM-HH

Figure 3.3: *Write On* main page in the IIM-HH

Figure 3.4: "Dear Gabby" activity in *Write On* - Week 4.

"Extra Extra, Read All About It". Figure 3.3 shows an example of the main page of *Write On*, and Figure 3.4 contains the "Dear Gabby" writing activity for Week 4.

MOVIN' AND GROOVIN'

Movin' and Groovin' gives the children a guide in selecting physical activities. It allows them to make choices that are appropriate for them, and that they feel they will enjoy (Pangrazi, Corbin, & Welk, 1996; Stein et al, 1991). The menu of activities helps the children see that many routine chores and tasks require physical activity, such as walking the dog, riding a bike to a friend's house, or helping Mom or Dad with the gardening. This section emphasizes that there are many ways to be physically active beyond "gym" class or playing on organized sports teams. Children are encouraged weekly to "try out" new physical activities recommended by the physical activity specialists, "Movin" and "Groovin", and to submit their own activities to the IIM-HH to be included on-line in the menu of physical activities. *Movin' and Groovin"* main page on the IIM-HH can be seen in Figure 3.5.

LOG IT

The validity and reliability of children's self-reports of physical activity have been studied in recent years (Sallis, Strikmiller, Harsha, Feldman, Ehlinger, Stone, Williston, and Woods, 1996; Sallis, Condon, Goggin, Roby, Kolody, and Alcaraz, 1993; Sallis, 1991). The approach to reporting physical

Figure 3.5: *Movin' and Groovin'* main page in the IIM-HH

activity that is shown to have the greatest validity when administered to intermediate grade children is a self-report instrument that uses one-day recalls (Sallis, Strikmiler, Harsha, Feldman, Ehlinger, Stone, Williston, & Woods, 1996; Sallis et. al, 1993). *Log It* uses a 24 hour recall approach adapted from the Self-Administered Physical Activity Checklist (SAPAC) developed and validated for use with the Child and Adolescent Trial for Cardiovascular Health (CATCH) (McKenzie, Nader, Strikmiller, Yang, Stone, Perry, Taylor, Epping, Feldman, Luepker, and Kelder, 1996). This instrument asks the children to check the activities they participated in the day before, identifying their subjective rating of the intensity of each activity they checked and the number of minutes they participated in each activity. In addition to providing the researcher with important information to better understand the physical activity patterns of the students, this section encourages the children to think about the type and amount of physical activity they do every day, and to account for it by identifying the activities on a daily basis. Figure 3.6 shows the out-of-school portion of the "Yesterday's Activity Log" that each child can complete in the IIM-HH.

ASK AN EXPERT

Interactiveness is a significant feature of many of the most popular websites on the Internet, and the IIM-HH takes advantage of that capability by providing a section that encourages youngsters to ask experts from various cultures questions about cardiovascular health. The opportunity to see

Figure 3.6: Out-of-school portion of the Yesterday's Activity Log in the IIM-HH's *Log It.*

questions and answers from experts encourages youngsters to seek out new

information and learn from others. Recent studies have shown that in typical

school environments, most of the interaction between the teacher and the

students is teacher-dominated and directed (Harris, 1994). *Ask an Expert* is

student-directed, giving students the opportunity to generate their own

question, and to also read questions from other children and the experts'

responses to those questions. Figure 3.7 shows the main page of the *Ask an*

Expert section of the IIM-HH.

GO FOR THE GOLD

One recommendation for the success of an Internet site, based on a

review of successful websites, is to offer rewards and prizes (Berber, 1996).

This section of the module describes how participation in the weekly activities

can earn students points, leading to awards such as caps, balls, and

jumpropes, as well as participation in drawings for larger prizes such as

autographed footballs and rollerblades. Extrinsic motivators encourage

children initially to participate in a given activity. Hopefully, the extrinsic

motivation of HH will eventually lead to an intrinsic motivation as the

participants discover the importance of making wise health choices (Chance,

1992). Figure 3.8 shows a page in the *Go for the Gold* section of the IIM-HH

that explains how a student can earn points.
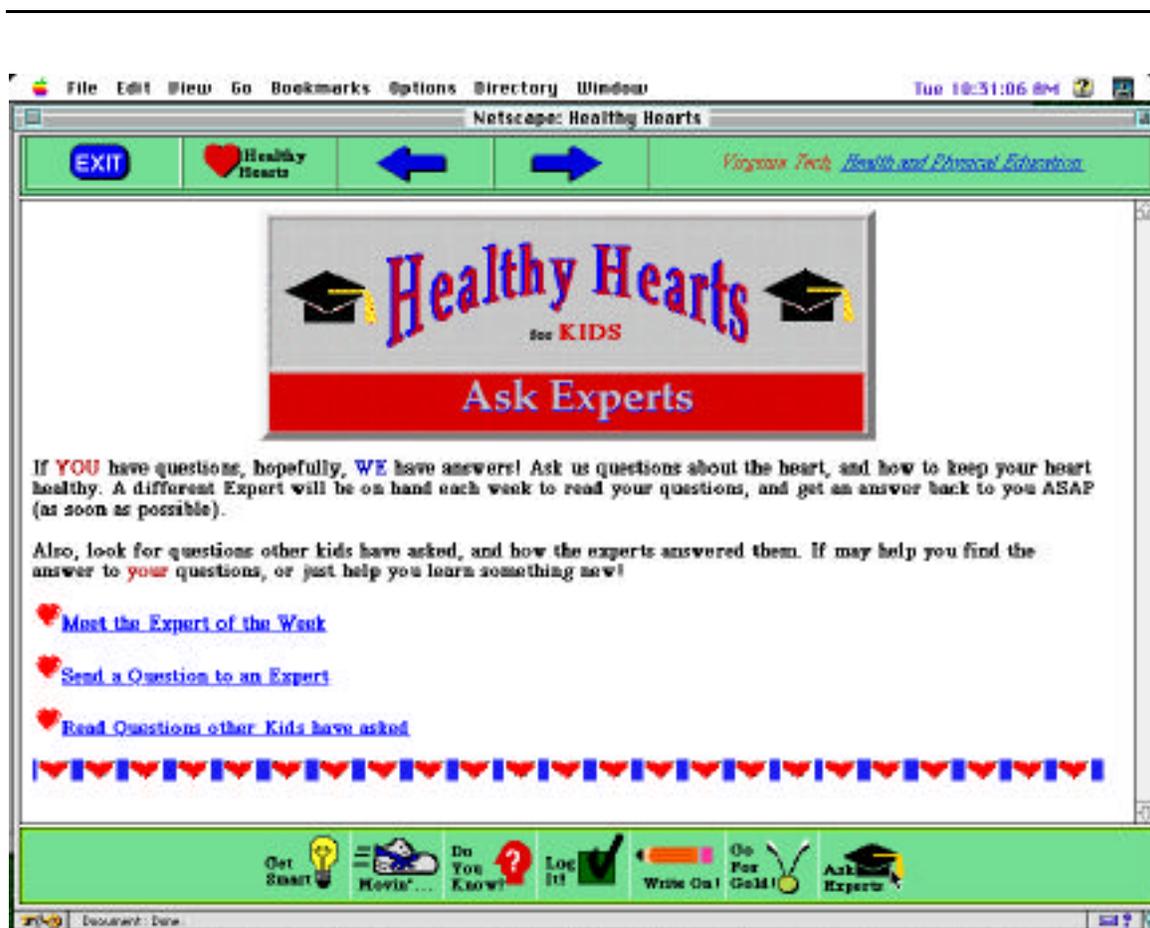
Figure 3.7: *Ask an Expert* main page in the IIM-HH

Figure 3.8: "How to Earn Points" page in *Go for the Gold*

FOR TEACHERS

The IIM-HH provides an on-line *Guidelines for Teachers* which orientates the teacher with the entire program, and provides step-by-step instructions in how to prepare students for participation in the module. Healthy Hearts content provides a variety of experiences that can allow a wide variety of "teachable moments" to arise during the students' participation in the module. Another important aspect of the model for teachers is the resource information that is provided weekly. The information provides "links" to other websites on the Internet where teachers can find relevant information, as well as suggestions for additional learning activities that they can carry out outside the computer-mediated environment. The "school-to-work" concept is also emphasized by giving teachers information about related occupations that may be of interest to students (School to Work, 1997). The telecommunications feature of the module also affords teachers the opportunity to discuss problems and concerns with the program technical and content personnel. An example of the Teacher Resources page in Week 1 of *Get Smart* can be seen in Figure 3.9.

As described above, the IIM-HH has been developed to offer an information-rich learning environment that promotes learning through a variety of instructional strategies. The effectiveness of the IIM-HH, or any similar instructional environment, can most efficiently be determined through a systematic process that considers a number of variables that play a role in the

Figure 3.9: "Teacher Resources and Activities" that accompany Week 1 activities

development of the instruction . To better understand the development process, the following section of the chapter will present the IIM-HH Instructional Development Model. In order to facilitate this study, an in-depth look at the content design, pilot, and evaluation components will be presented in Chapters 4, 5, and 6, respectively.

<center>The IIM-HH Instructional Development Model</center>

"Instructional development emphasizes those activities that deal directly with the systematic design, development, implementation, and evaluation of instructional materials, lessons, and courses or curricula in order to improve student learning or teaching efficiency" (Abedor & Sachs, 1984, p. 395, in Gentry, 1994, p.2). A model of instructional development for the IIM-HH was created, based on the Instructional Project Development and Management Model (IPDM) (Gentry, 1994), and Shambaugh and Magliaro's Model of Instructional Design (Shambaugh & Magliaro, 1997). The IIM-HH Instructional Development Model is made up of the following components: needs and goals, design, production, prototyping, evaluation, and support considerations (see Figure 3.10). The module is dynamic, and interactive, where changes within each component can influence the other components within the model. The components represent the essential processes for carrying out the instructional development of the IIM-HH. The arrows indicate that, through communication, each component generates and receives essential information that can impact the development process of the other components. One justification for this type

of model is the non-linear, dynamic process that it represents. In developing

instruction, the process is very seldom linear, as some models suggest. It is not

uncommon for the components to be revisited and to change over the course of

the development, therefore, this model represents that dynamic process.

Secondly, this model indicates the importance of the support components in the

development of instruction, which is often neglected in design/development

models (Gentry, 1994).

The following sections of this chapter will discuss each of the

components of the IIM-HH Instructional Development Model, as identified

above. Since this study focuses specifically on the instructional design, piloting,

and evaluation components of the module's development, each will be

discussed in length in subsequent chapters. Chapter 4 provides an in-depth

look at the design of the instructional unit, piloting the IIM-HH will be further

discussed in Chapter 5, and Chapter 6 contains a discussion of the methods,

analysis, and results of the formative evaluation of the IIM-HH's content and

technical functionalities.

Needs and Goals

The development of instruction results from some perceived need

(Gagne' & Briggs, 1974) (Figure 3.10).   The development of the IIM-HH unit of

instruction was a result of the perceived needs of school curricula to (a) more

efficiently and effectively offer instruction to intermediate age children on the

health risks associated with sedentary lifestyles, improper eating habits, and the

use of tobacco products, and (b) have access to appropriate resources on the

Internet that supports the existing curricula. These needs are justified in the

literature on children's physical activity and health (Allensworth, 1996; Kane,

1994; President Clinton..., 1996; U.S Department of Health and Human

Services, 1996), and the literature on incorporating the Internet into current

schooling practices (President Clinton's Call to Action..., 1997; Statement by

U.S. Secretary of Education..., 1997; Trentin, 1996).

The intent of the module was to provide for these identified needs

through a four-week theme-based instructional unit, delivered via the Internet.

The instructional unit would be limited to those intermediate grade students and

teachers who have access to on-line computers. Prerequisite skills and

knowledge in the use of computers and the Internet would not be necessary.

The content would be organized into seven (7) sections, described previously in

this chapter, beginning with more direct instruction of factual information (*Get

Smart)*, to opportunities for learners to problem-solve in real-life situations that

would encourage wise decision making and application of information to their

personal lives (*Write On, Ask an Expert)*. The module would be intended to

function efficiently and effectively to deliver instruction to learners with little

teacher preparation and limited prior computer knowledge.

The instructional goals of this instructional unit were then identified. The

general goals of the IIM-HH would be to:

- encourage participation in, and positive attitudes about, physical
  activity
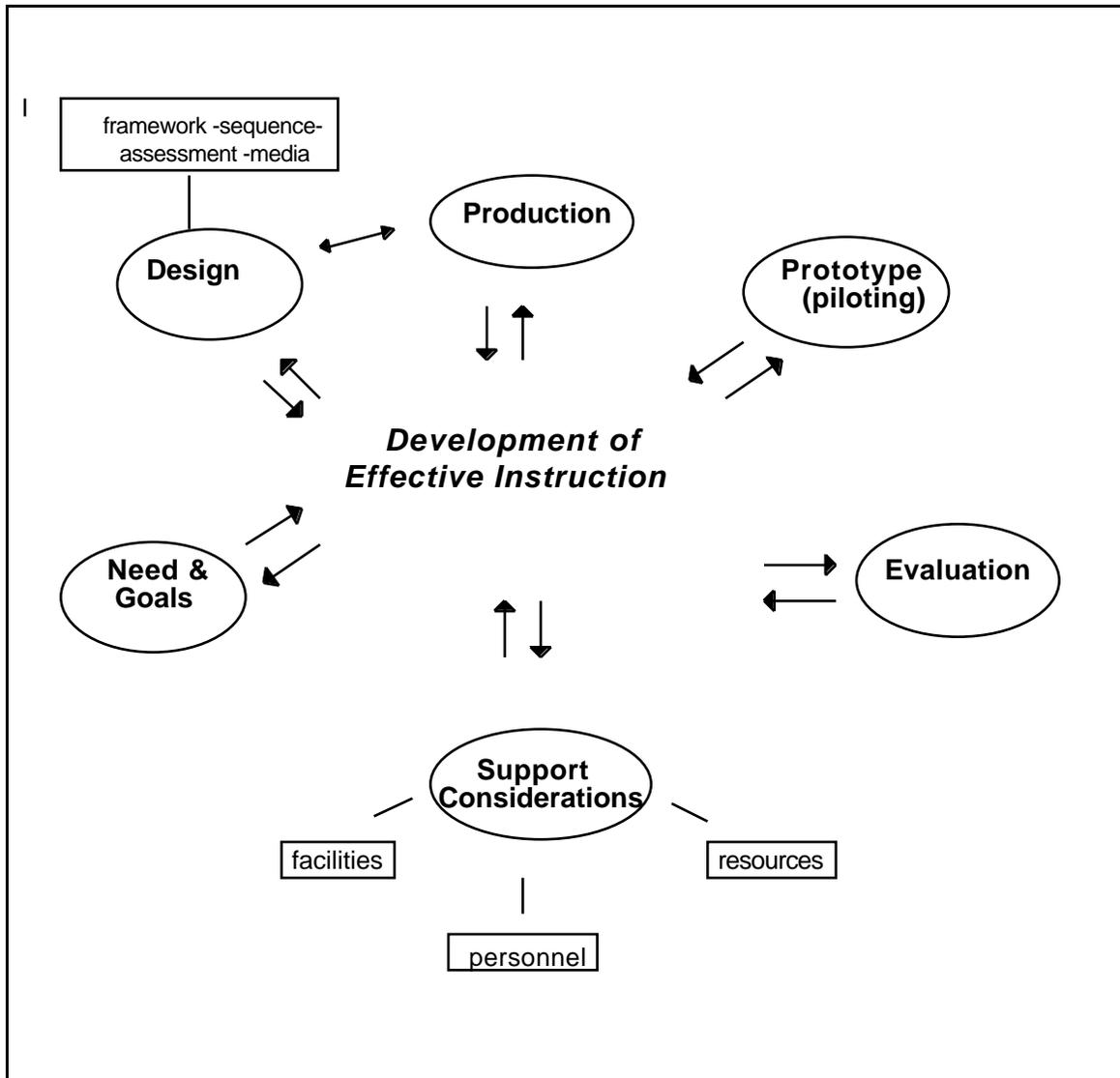
Figure 3.10: The IIM-HH Instructional Development Model [adapted from the IPDM Model (Gentry, 1994) and the Shambaugh and Magliaro's Instructional Design Model (Shambaugh & Magliaro, 1997)]

- offer content specific knowledge on cardiovascular health via the Internet that is developmentally appropriate for children

- integrate subjects within the curriculum

- benefit children living in different locations and cultures

- serve as a unit of instruction that could be implemented by both classroom teachers and physical education teachers

- encourage participation in computer-based learning delivered via the Internet

After the formulation of the instructional goals of the IIM-HH, educational goals to be accomplished by the learner at the conclusion of module usage were initially identified. These student goals were reconsidered and modified during the development process. The learning implications of the educational goals, listed below, are based on Bloom's Taxonomy (Shambaugh & Magliaro, 1997; Gentry, 1994) and are included in parenthesis after each goal.

When the piloting phase of the IIM-HH began, it was intended that at the completion of the module, each learner would be able to:

- identify and state the cardiovascular risks associated with the lack of physical activity, improper eating habits, and the use of tobacco products (knowledge and comprehension)

- practice making wise health decisions (application)

- transfer factual information into authentic situations (application)

- analyze the importance of making wise health choices pertaining to exercise, diet, and tobacco use, and practice making wise decisions (analysis)

- analyze personal choices concerning physical activity, eating patterns, and tobacco use (analysis)

- explain the importance of the cardiovascular risks associated with sedentary lifestyles, improper dietary habits, and tobacco usage (synthesis)

- recognize personal physical activity patterns and eating habits and how to improve them (evaluate)

- consider others responses to solutions to real-life problems (evaluate)

- consider others opinions (evaluate)

- acquire skills in using the Internet to deliver instruction (knowledge)

Once the need for the module was established, and the instructional goals and initial educational goals were identified, the actual design of the instructional unit began.

Design

"Design is a disciplined inquiry engaged in for the purpose of creating some new thing of practical utility" (Rowland, 1993, in Shambaugh & Magliaro, 1997, p. 23). Based on the goals intended to be accomplished, and the limitations and capabilities of the medium chosen to be used (i.e. the Internet),

the design of the IIM-HH began by matching the learning principles of the

instruction with the overall goals, and critically analyzing the means (i.e. the

instructional models) for accomplishing these principles (Shambaugh &

Magliaro, 1997). Subject-specific factual information was collected for use in

the content of the design, and the sequence of instruction was planned.

Specific instructional tasks were devised, with consideration given to

assessment of student performance. Throughout the design process, many

decisions were based on the capabilities of the Internet, since the instructional

unit would be delivered almost exclusively via this telecomputing medium. (A

more thorough discussion of the design process of the content of the IIM-HH is

found in Chapter 4.)

The design of the module was originated in hardcopy format, and then it

was transcribed into HTML (HyperText Markup Language) web pages, and

placed on a server. The design was modified throughout the production process

to accommodate the capacities of website materials, as discussed below.

Production

The production component of instructional development is the part where

the skeletal frames provided by the design specifications are turned into

functional products (Gentry, 1994). Often times in developing an instructional

unit, the design and production components can be considered one because

the two processes are done simultaneously and, therefore, each process is

dependent on the other. The process of production is always dynamic because

many adjustments must be made during production as one element of the

product may influence modifications in another. Although the IIM-HH was initially designed on paper, once the production of the module began, the design was constantly modified, even recreated.   Due to the dynamic capacity of the Internet site, the module will continue to be redesigned and modifications in production made throughout its lifespan, based on the continuous formative evaluations of its effectiveness.

The design and production of the IIM-HH has been an ongoing collaboratively process between an interested team of professors and graduate students from the Health and Physical Education Program and Instructional Technology Program in the College of Human Resources and Education at Virginia Polytechnic Institute and State University (see Appendix A).   As the prototype elements were assembled into a testable instructional unit, revisions were made on a regular basis from the recommendations of experts (Appendix H), and from stated discrepancies from the design team (both content and technological personnel) during the process of producing the prototype. Designing and producing the IIM-HH prototype was a year long process, that used formative evaluations to make recommendations for change in the content and technical functionality and overall design of the module (see Chapter 5). Input was gathered from experts throughout the design/production process in subject-area content (health and physical education), pedagogy, student learning, website development, hypermedia design, graphic design, interface design, CGI programming, and database design. As Gentry (1994) points out, clear communication among designers and producers is essential in the

development of an effective instructional unit. The lead technical designer and

producer, David Carter-Tod, worked closely with the investigator throughout the

development of the IIM-HH, and monitored the technical functionality of the

module throughout the piloting phases. He met with the investigator regularly

throughout the development process, and e-mail was used to communicate

frequently to discuss problems, modifications, refinements, and overall

design/production issues.

Prototyping (Piloting) and Evaluation

As illustrated in Figure 3.10, two other components of an instructional

development module, in addition to needs and goal, design, and production,

are prototyping and evaluation. Prototyping is the "process of assembling, pilot

testing, re-specifying, validating, and finalizing an instructional unit" (Gentry,

1994). A prototype is a functional version of an instructional unit whose

effectiveness and efficiency can be tested (Gentry, 1994). The function of the

prototype is to guide the instructional developers to make revisions until the

product have been brought up to specifications and/or expectations. Piloting the

prototype with the intended audience in an authentic setting allows the

developer to determine if it "works". Does the design and production of the

instruction produce the intended results (instructional goals, educational

goals)? What changes should be made in the design and production of the

instruction to increase its effectiveness and efficiency? These questions can be

answered through an ongoing formative evaluation of the instruction unit or of

its individual components. After revisions are made to the instructional unit from

an analysis of the formative evaluation results, the developer may choose to continue the formative evaluation with a larger population or in a different contextual setting. If the developer believes the instructional unit is ready for finalization, a summative evaluation is in order to provide evidence to prospective adopters about its value to teach what it is supposed to teach. Once the summative evaluation is completed and modifications made, the instructional unit has the potential to be made available to a large population of students and teachers.

As illustrated in Figure 3.11 in the concluding section of this chapter, this study is a formative evaluation of the design and production of the IIM-HH prototype and analyzes its instructional effectiveness and efficiency. From the results of this study, the IIM-HH may be summatively evaluated, or may undergo significant changes that will require continued formative evaluation before the module is ready for finalization. Chapter 5 is devoted solely to describing the piloting phases of the Healthy Hearts module, and the formative evaluation results of the module is discussed in detail in Chapter 6.   Recommendations for the next step in evaluating the IIM-HH will be presented in the final chapter, Chapter 7.

Support Considerations

In addition to the six components of the IIM-HH Development Model that are discussed above, there is also the Support Considerations component (see Figure 3.10) which includes elements that are not directly a part of the learner instructional unit but that have an impact on its functionality and effectiveness.

These elements - facilities and equipment, personnel, and funding resources - all are important considerations in order for an instructional unit such as the IIM-HH to become a reality for a large population of learners across cultures, and so, therefore, are included in the IIM-HH Development Model.

Facilities and Equipment

Facilities include both the project facilities and the facilities that will house the instructional unit upon its completion. The project facilities must house a high speed on-line computer system and server (e.g. Macintosh 9650/233 Workgroup Server) , with the necessary equipment (e.g. videodisc cameras, scanner) and software (e.g. Adobe Photoshop, Filemaker Pro) to produce quality, state-of-the-art websites. Schools should be equipped with at least one computer for every two students that is on-line, and that can run an Internet browser that supports Javascript.

The prototype of the IIM-HH was produced on home computers and computers in the Teaching and Learning Technology Lab at the university. Various PowerMacs and a Macintosh Quadra 650 computer were used in the production process, as well as various high resolution scanners (i.e. Artec ViewStation scanner). At the start of the project, a 8100 / 80Mhz. server was used, but the module was later moved to a Workgroup server 8550 / 200Mhz . A number of software applications were used to complete the module, including BBedit and Claris Home Page to produce HTML-formatted text, Filemaker Pro for database design and maintenance, Adobe Photoshop, JPEGView, and GraphicConverter for graphics, and Userland Frontier for CGI programming.

<u>Personnel</u>

Personnel includes the persons needed to successfully complete the design, production, and operation of the project (as outlined earlier in this chapter). Once a list is generated of the tasks that must be performed for the project's completion, then personnel needed for the project can be identified. For the IIM-HH or other IIMs similar in nature, personnel would include a full-time developer who would manage the entire development process, a content designer, a technology designer and producer, a server manager, and an information handling processor during operation. Technical production personnel would need expertise in hypermedia design and production, CGI programming, HTML, graphic design, WWW site design, Interface design, and database management and design. In the design, production, and implementation of the IIM-HH prototype, the technical designer/producer, David Carter-Tod, and the investigator performed the majority of the functions outlined above (see other personnel listed in Appendix A).

<u>Funding Resources</u>

Once developers have determined that a project is worth doing, then they must determine the resource needs of the project. A trial budget should be generated, which would include the costs of materials, equipment, facility use, and personnel time. In order to estimate costs, the developer must first list the tasks necessary for project completion and then estimate the cost for performing each individual task. One of the most efficient methods of identifying project tasks and their costs to a project is through the *Program Evaluation and Review*

Technique (PERT) (Gentry, 1994). After creating a workable budget, the task of

locating funding sources from internal or external sources, restructuring the

proposal to fit the source, and allocating resources once received are all

resource considerations that must be addressed in the development process,

particularly for a new technological innovation. For implementation of the IIM-

HH in a large population, a functional budget must be created and funding

resources procured.

Role of the Investigator in the IIM-HH Development

The overall development plan of the IM-HH was conceptualized by the

investigator, including the initial design of the instructional unit. The investigator

was the primary designer of instruction and content producer throughout the

project. She also collaborated with other production experts in designing and

producing HTML-formatted text, graphics, and the overall WWW site

development. Additionally, the investigator conducted formative evaluations

during the pre-piloting and piloting phases of the development process.

Summary of the IIM-HH Development Model

The IIM-HH Development Model, based on instructional development

and design models presented by Gentry (1994) and Shambaugh and Magliaro

(1997), is a visual description of the components that the investigator believes

are necessary for effective development of the IIM-HH instructional unit (see

Figure 3.10). These components, as they have been discussed in the

preceding section, are needs and goals, instructional design, production,

prototyping (piloting), evaluation, and support considerations. The dynamic nature of this module illustrates the interactiveness of the components, and the influences of communication between those components. As previously stated, the focus of this study was on three of the components of this development model - content design, piloting, and evaluation.

<u>The Development Components Under Investigation in this Study</u>

The purpose of this study was to design, pilot, and evaluate an Interdisciplinary Internet Module - Healthy Hearts (IIM-HH) for intermediate grade children. To assist the reader in gaining a better understanding of how these three components of the IIM-HH Development Module will be studied, Figure 3.11 provides an illustration of the process of the study.

As this figure illustrates, once the IIM-HH prototype was designed and produced, a pre-pilot was conducted and results of the formative evaluation used for modifications to the module. Then, the IIM-HH was implemented into a regular school curriculum with the targeted audience for the intended timeline of the instructional unit. From the results of the formative evaluation of this pilot, there was evidence that modifications to the design and production should continue, and further formative evaluation is needed, before the IIM-HH is ready to be finalized and summatively evaluated (Gagne' & Briggs, 1974). Chapter 3 will describe the instructional design process of the IIM-HH, whereas, Chapters 4 and 5 will discuss the piloting of the module and the results of the formative evaluation.

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┌──────────────┐        ┌──────────────┐          ╭──────────────────╮
│  Step 1      │   ──→  │  Step 2      │    ──→   │    Step 3         │
│  Design/     │        │  Pre-Pilot   │          │ Formative Eval    │
│  Produce     │        │              │          │ Recomm. for Change│
└──────────────┘        └──────────────┘          ╰──────────────────╯

┌──────────────┐        ┌──────────────┐          ╭──────────────────╮
│  Step 4      │   ──→  │  Step 5      │    ──→   │    Step 6         │
│ Modify Design│        │  Pilot  of   │          │ Formative Eval    │
│ / Production │        │Entire Module │          │ Recomm. for Change│
└──────────────┘        └──────────────┘          ╰──────────────────╯
```

Step 1 — Design/ Produce → Step 2 — Pre-Pilot → Step 3 — Formative Eval Recomm. for Change

Step 4 — Modify Design / Production → Step 5 — Pilot of Entire Module → Step 6 — Formative Eval Recomm. for Change

Step 7 — Modify Design / Production →

Step 8
Summative Eval &
Ongoing Form. Eval

OR

Step 8
Continue Formative
Eval

Figure 3.11: The relationship between design and production, the piloting phases of the study, and the evaluation of the IIM-HH. (adapted from Mauldin, 1996)

Chapter Summary

This chapter began by presenting a description of the IIM-HH, its seven sections of instructional content, and illustrations of content examples. This provided the reader with a general understanding of the module, in order to relate the module components to subsequent discussions of the IIM-HH throughout the remainder of this study. Next, the chapter described the development process of the IIM-HH, and presented the IIM-HH Development Model, a model created by the investigator to better explain the components that are necessary for the successful development of the instructional unit, IIM-HH. Three of the components of development - design, piloting, and evaluation - were the focus of this investigation, and, therefore, an illustration and description of how these three components were studied was presented in the final section of this chapter. The next chapter, Chapter 4, will be an in-depth discussion of the design of the content of the IIM-HH.

CHAPTER 4

DESIGNING THE INTERDISCIPLINARY INTERNET MODULE -

HEALTHY HEARTS (IIM-HH)

As described in Chapter 3, the IIM-HH Development Model included seven components that were used interactively in the development of the instructional unit of the IIM-HH. One of the most significant of these seven components was *design.* It included both content design and technical design techniques. This chapter offers an indepth look at the content instructional design process of the IIM-HH.

The content design of the IIM-HH is grounded in Bronfenbrenner's (1979) ecological systems theory and framed around the Vygotskian theory characterized by extensive and dominant use of interaction to facilitate learning (Miller, 1993). Interaction within this instructional unit includes that of peer interaction, interaction with others outside the immediate environment, and interaction between the student and the medium itself. The instructional design models of Shambaugh and Magliaro (1997) and Gentry (1994) were used as guides to design the IIM-HH instructional unit.

Designing instruction is a creative process when one idea may stimulate another, causing changes to occur frequently in the designing process, as alluded to by Gentry (1994). In the content design of the IIM-HH, a flexible format was used, and modifications and changes were made regularly. The designer (and investigator) relied heavily on her creativeness in applying basic

design techniques and her knowledge of children and how they learn in an attempt to create an effective instructional unit.

As identified in the previous chapter which described the overall development of the IIM-HH, the needs and goals of the instructional innovation were determined at the onset of development (Chapter 3). Once these needs and goals were established, considerations commenced on the content of the IIM-HH, and how it might be designed. This chapter describes in detail this design process. It starts by describing the delivery medium that was used (i.e. the Internet), and the review of related materials that would help the investigator write appropriate and accurate content for the website module. Next, the chapter describes how the various parts of the module were instructionally sequenced, with a list of student performance objectives presented. The next step was the development of the instructional framework which included identifying the learning principles that would guide the content, and then describing how these principles would guide the actual presentation of the information through instructional strategies. The chapter concludes by describing the means by which student performance can be assessed during the use of the IIM-HH.

Considering the Instructional Medium

From the initial conception of the module, the Internet was identified as the primary instructional medium that would deliver the content of the IIM-HH to students. In fact, the medium, itself, produced a "need" for this type of instructional unit. As indicated throughout Chapters 1 and 2, the Internet is now

considered by many to be an acceptable, albeit emerging, medium for providing instructional materials to learners in school settings. Although this medium imposes some limitations on the quality of instruction, such as limiting the amount of graphics, and reducing the flexibility in presentation format of text and graphics, it also provides some unique interactive features that are exclusive to this mode of delivery. According to Trentin (1996), the greatest advantage of the Internet as a delivery media is the interactiveness of its telecommunication features. Although one of the main goals in the development of the IIM-HH was to provide an effective instructional unit on the Internet, the medium itself was not the main focus of the design. Rather, the developer focused primarily on the sound pedagogical framework for the learning environment, with consideration given to the medium in determining the feasibility of its functionality as a website.

Reviewing Related Materials

During the beginning phase of the IIM-HH design process, the investigator reviewed a number of related instructional materials for students, particularly those with health-related content. Fourth, fifth, and sixth grade textbooks were reviewed (Olsen, St. Pierre, & Ozias, 1994), as well as other supplemental instructional units appropriate for intermediate grade children (i.e. *HeartPower* by the American Heart Association). Also, the Internet was searched for children's sites that contained factual information on particular topics, and for interactive activities in which the children could engage. Although those sites were sparse, one example that was used as a reference in

designing the IIM-HH content was *Kidscom* (Kidscom, 1997) . This site

provided good examples of how children could use individual passwords to

gain access, complete quizzes and questionnaires, participate in games and

activities, and communicate with experts. Other websites and materials were

used as resources throughout the design process, and a partial listing of those

resources can be found in Appendix B. From these resources, a few provided

instructional materials that were modified for use in the IIM-HH, although most

of the instructional materials and learning tasks were designed exclusively for

the IIM-HH instructional unit.

Sequencing of Instruction

The next step in the design process was to write performance objectives

that the students might accomplish at the completion of the IIM-HH instructional

unit. Based on the educational goals established at the onset of development,

the following learner objectives were written and sequenced according to

Bloom's Cognitive Taxonomy (Shambaugh & Magliaro, 1997).

At the completion of each week's instructional content, the student will:

• acquire factual information on the cardiovascular risks associated with the

lack of physical activity, improper eating habits, and the use of tobacco

products (knowledge)

• identify the correct answer to 5 questions about the factual information for

each week (knowledge)

- state the answer to a question about the factual information for each week (comprehension)

- choose to participate in physical activities at least 5 days a week (application)

- transfer factual information in *Get Smart* to authentic situations in *Write On and Ask an Expert* (application)

- transfer factual information in *Movin' and Groovin"* to authentic situations in *Log It* (application)

- categorize the intensity and time of his/her daily physical activity (analyze)

- generate questions for experts from the weekly content (synthesis)

- generate responses to opinion questions about the content as it applies to authentic environment (synthesis)

- originate a solution to a real-life problem that stems from peer pressure or lack of knowledge (synthesis)

- self-assess his responses to writing activities by reading responses of others and by communication with peers during the writing process (evaluate)

- self-assess his personal physical activity level by completing daily physical activity logs (evaluate)

As noted by Hanafin & Hooper (1993), giving the learner complete control of the sequencing of instruction does not necessarily result in good instructional choices, and/or the best use of instructional materials. However, if

the instructional unit has an inflexible sequence where the sequence of instruction is pre-determined (e.g., in this case, controlled by the medium), the learner has no control over the content, and cannot actualize his natural tendencies and interests (Bronfenbrenner, 1979).

The sequence of instruction in the IIM-HH was organized so to be neither completely learner nor lesson controlled. The intent of the sequencing was to maintain the independence of the learner while simultaneously providing information to guide the learner in making effective decisions that meet the learner objectives systematically. The nature of the Internet allows for flexible structuring of information, as defined by Rothwell and Kazanas (1992). Therefore, the flexible format of the IIM-HH's instructional materials did not adhere to any rigid hierarchical or procedural requirements, except for the importance of reading the factual information in *Get Smart* at the beginning of each week of instruction. This provided the knowledge necessary to complete the other cognitive skills needed to accomplish the objectives of the weekly instruction. Additionally, within *Get Smart,* the information organizers are listed in chronological order to indicate to the learner the recommended sequence of the information, although the learner can choose to select the information in any sequence. If the learner attempts to complete the quiz (*Do You Know?)* without reading the factual information in *Get Smart,* he/she is allowed to do so, but if two questions are answered incorrectly, the learner is automatically returned to *Get Smart* and cued to read that section of the module first. For each week of the four week module, the sections and sequence of information remains the

same, although the emphasis of the content changes. The *Guidelines for Teachers* recommends that the teacher encourage learners to complete *Get Smart* first, before proceeding on with the other tasks in the module. The point system of *Go for the Gold* can, perhaps, provide a sequencing effect as well, through identifying only certain activities that earn the extrinsic reinforcement.

Once the needs, goals, and sequence of instruction had been determined, the developer then proceeded in developing the instructional framework that would be the foundation for the instructional design.

Developing the Instructional Framework

As outlined by Shambaugh and Magliaro (1997), the instructional framework is based on the learning principles that the developer has identified, and on the instructional models that the developer will use to incorporate those principles into the instruction.

The designer decided on the learning principles that would serve as the foundation for the instructional unit based on the related literature (Chapter 2) and her education beliefs and experiences. Once done, instructional models or strategies were identified as the means by which these learning principles might be accomplished. As Shambaugh and Magliaro (1997) suggested , these models were chosen based on the goals and objectives of the IIM-HH, and the contextual factors of the Internet that influence the delivery of instruction.

<u>Identifying the Guiding Learning Principles</u>

Learning principles are the foundations on which the design of instruction are built (Shambaugh & Magliaro, 1997). In designing the content of the IIM-HH, eight guiding principles were selected from the literature in an attempt to accomplish the goals of the module. Although each is identified separately, they mutually influence each other in actual practice.

1. The Internet can be used as a tool and a communications device to support and promote active learning (Technology and Education Reform..., 1997).

2. Integration of curriculum content in health, physical education, science/technology and language arts can assist students in connecting the curriculum and seeing relevance to subject-specific information throughout other curricula areas (Organisation for Economic Cooperation and Development, 1994; Papert, 1995; Placek, 1996).

3. Situated learning in meaningful contexts contributes to social interaction and collaboration in learning, and invites critical thinking in an authentic and meaningful context (Collins, 1996; Goldman, Pellegrino, & Bransford, 1994).

4. Cooperative learning environments extend instruction from the individual to cooperative contexts of learning (Baron, 1991; Brown, Collins, & Duguid, 1989; Crook, 1987; Fisher Wilmore & Howell, 1994; Harris, 1994; Lai, 1993; Nastasi & Clements, 1993; Repman, Weller, and Lan, 1993;).

5. A generative, rather than passive, learning format (Cognition and Technology Group at Vanderbilt, 1991) encourages active involvement of the learner, (Goldman, Pellegrino, & Bransford, 1994), learner reflection (Jonassen, 1995), and the use of critical thinking and problem solving skills. (Harris, 1994)

6. There are appropriate uses of a range of learning strategies that reflect behaviorist, cognitive phychology, and constructivist views of learning. (Geisert & Futrell, 1995; Reusser, 1996; Shambaugh & Magliaro, 1997).

7. Students learn (develop) not only because of their interests and natural tendencies, but also because of the ecological contexts in which they live. (Bronfenbrenner, 1979)

In addition, consideration was given throughout the design process to what recent literature has identified as important guidelines to follow when creating and maintaining effective instructional websites. These guidelines are:

1. Organize information in a easily comprehensible format that invites investigation (use short paragraphs, bulleted lists, link only main ideas) (Shotsberger, 1996).

2. Display student work prominently (Shotsberger, 1996).

3. Connect communities of learners with communities of practitioners (Jonassen, 1995).

4. Connect communities within schools (Jonassen, 1995).

5. Simulate the real-world contexts (Jonassen, 1995).

6. Give learners the opportunity to serve "cognitive apprenticeships" by

    a. providing instruction in real-life, useful contexts.

    b. presenting information in multiple contexts and generalize

        ideas across those contexts.

    c. modeling processes and explain reasons why, helping the

        learner to know when and where to apply information.

    d. monitoring students' progress by providing hints and support to

        encourage staying on track, reflecting on their own and

        others performance and identifying misconceptions.

    e. including reflection and analysis of students' performance.

(Jonassen, 1995)

Using the principles of learning and the general guidelines of webpage development identified above, five main instructional models were used for the content framework of the IIM-HH. The next section of this chapter describes these instructional strategies and identifies how they were each used in the design of the IIM-HH.

<u>Selecting and Implementing Instructional Models</u>

As defined by Shambaugh and Magliaro (1997), instructional models or strategies are, in a broad sense, the terms given to ways that instruction is presented to students, and that have a theoretical basis for what "works" in instructional settings. Based on the guiding principles listed above, the instructional strategies that were used for the content framework of IIM-HH included (a) direct instruction, (b) generative and situated learning, (c)

cooperative learning, (d) integrative environment, and (e)contingency

management.

Direct Instruction

The first instructional model to be discussed is that of direct instruction.

Direct instruction is suitable for teaching basic skills that are necessary before

learners can move on to other levels of thinking and learning (Shambaugh &

Magliaro, 1997). It is best broken into chunks, and feedback given to the

learner until mastery is achieved. This model is most effective when coupled

with activities that involve higher order thinking (Geisert & Futrell, 1995;

Resnick cited in Lewis & Smith, 1993; Scott et al., 1992). The constructivist

perspective could overlook the essential role that direct and indirect guidance of

good teachers and good instructional and cognitive tools can play for learners

in most school contexts. Reusser (1996) suggests that we "provide as much

learner control as possible and as much control of the learner as needed" (p.

91). He also points out that discovery learning can be very slow and that

school learning in a mass society is often times an accelerated act .

Shambaugh and Magliaro (1997) also allude to the role of direct instruction

when time is limited. A combination of direct instruction approaches with other

higher order thinking strategies of constructivism can provide both needed

direction and independent, active learning.

In the IIM-HH, direct instruction is used to present the weekly information

that is to be learned in the section *Get Smart*. This section is followed *by Do

You Know?* which asks the learner factual questions about the information in

Get Smart, and which automatically refers the learner back to the content of *Get Smart* if more than one incorrect response is given to a question.

Generative, Situated Learning Context

Generative learning and situated learning are two more instructional models used in the instructional framework of the IIM-HH design. Most recent literature in children's learning emphasize the importance of helping learners engage in generative rather than passive learning experiences (Cognition and Technology Group at Vanderbilt, 1993). This body of literature suggests that there are important benefits from having students generate information (Cognition and Technology Group at Vanderbilt, 1993; Goldman, Pellegrino, & Bransford, 1994). Providing situated learning environments where information is provided in a meaningful, real world, problem-solving context can contribute to generative learning. Students can be given opportunities to articulate and reflect on cognitive processes as they think and problem solve in these real world contexts (Collins, 1996**).** Through articulating their thoughts and knowledge in learning tasks, students may be better able to formulate their ideas on other occasions and within other contexts (Collins, 1996). Reflection involves having learners assess their own knowledge and performance on a task, and to compare it to others performance on similar tasks (Collins, 1996). These constructivist approaches require the learner to actively generate solutions to problems in real-life situations, instead of giving them already solved solutions to passively accept, and to express and reflect on their solutions.

Students should be given many opportunities to revisit new information, and to link, interpret, and explain it in different contexts [Resnick and Resnick (in press), in Cognition and Technology Group at Vanderbilt, 1993]. They should have opportunities to express their own opinions, and to explore new ideas and different opinions of others (Cognition and Technology Group at Vanderbilt, 1993). In a motivating and realistic context, students should be able to pose problems, to solve problems, and to reason (Cognition and Technology Group at Vanderbilt, 1993).

In the IIM-HH, real world contexts are found in *Movin' and Groovin', Log It, Ask Experts,* and *Write On* where learners can connect the content *in Get Smart* to how it might be useful in their lives and other real-life situations. Learners are asked to articulate their actions to particular real world situations and problems in *Write On.* They must make decisions and justify their decisions as they generate responses to "Dear Gabby", "Your Opinion Counts", and "Extra, Extra, Read all About It". *Ask Experts* also gives learners opportunities to articulate as they formulate relevant questions and read experts' answers to their questions and to questions others have asked. By working cooperatively in pairs and by reading others' responses on the module, learners are allowed to see what others think and how others will solve the same problem. Reflection is encouraged in the Healthy Hearts module in *Write On* and *Log It.*

Cooperative learning

Another instructional model used in the IIM-HH instructional framework, and probably the one of most significance to the module, was that of

cooperative learning. The cooperative learning approach is characterized by the use of social interaction to facilitate learning. Jonassen (1995) states that to promote learning to its fullest extent, cooperation and collaboration should be promoted by learners working in a "communities of learners" atmosphere where they observe and share ideas and skills, and where support is given. Other theories and researchers expound on the benefits of peer cooperation (Baron, 1991; Crook, 1987; Fisher, Wilmore, & Howell, 1994; Kanselaar & Erkens, 1996; Lai, 1993; Nastasi & Clements, 1993), of cooperation with others more capable (Harris, 1994; Miller, 1993), and of cooperation through computer usage (Crook, 1987; Kansellar & Erkens, 1996; Nicol, 1990).

Cooperative learning opportunities are made available to the learner in the IIM-HH through the interaction of the learner with the module, with peers, with others more capable, and with others outside of the immediate environment. Writing activities in *Write On* encourage peer collaboration in solving the real-life problem and provide opportunities to share with others outside the school environment. Learners generate questions for experts and receive responses to them in *Ask Experts* through the telecommunication feature of the Internet. Learners work in pairs in the computer labs throughout the use of the module and therefore, collaborate and cooperative with a peer on most features of the module.

Integrative Environment

An integrative environment model was also used in the design of the IIM-HH, and provided what could be considered the "overarching design" of the

instructional module. *Integration* is defined by Placek (1996) as the "unity between forms of knowledge and their respective disciplines" (p. 288). Learning in an integrative curriculum will help learners understand new relationships between information and realize that subject-specific disciplines provide only one way of organizing knowledge and making sense of it (Placek, 1996). It becomes obvious in an integrative learning environment that knowledge can be structured around themes, ideas, problems, and so on, and learners can then make better sense of that "connected" knowledge as it applies to them and their world (Nielsen, 1989).

The design structure of the IIM-HH is that of subject integration. Structured around the theme of cardiovascular health, students have an opportunity to connect health and physical education concepts and skills with language arts, science/technology, and math concepts.

Contingency management

The final instructional model to be discussed as part of the IIM-HH instructional framework is that of contingency management. Contingency management analyzes the learning environment for reinforcers that effect learner behavior (Shambaugh and Magliaro, 1997). This behaviorist model is used throughout the module through the material reinforcers of the *Go for the Gold* point delivery system which allows the learner to earn points for completing identified activities and to gain prizes at the completion of the module. Social reinforcers are also used through computer programming by praising individual learners upon their completion of specific tasks, and, in

some instances, through recognition and special attention given to selected individuals.

Once the framework for the content design of the IIM-HH was formulated in the design process of development guided by the five instructional strategies noted above, assessment of student performance required consideration before the design of the instructional unit could be completed. The means through which students' performance could be assessed in the IIM-HH are discussed below.

Identifying Means of Student Performance Assessment

When designing an instructional unit, consideration must be given to how the design lends itself to assessment of the performance objectives of the instruction. In the design of the IIM-HH, both *selected response* assessments where the learner selects from a choice of answers, and *constructed response* assessments, where the learner constructs an answer, are used to assess student performance. *Do You Know?* is a selected response assessment with one constructed response component that indicates to the learner and the teacher if the student knows the information and can demonstrate comprehension. Self assessments which give learners an opportunity to assess themselves make up the other assessment activities within the module. Learners assess their own problem solving solutions to the *Write On* activities by working with peers to construct the responses, and by reading others' responses via the telecommunications of the Internet. Learners also self assess their physical activity levels by completing *Log It* up to five days a week.

Teachers assess the students' progress through observation, social interaction with the students, and through the points earned weekly by each participant. The assessment results will aid the investigator in realizing the strengths and weaknesses of the instruction, and make changes based on those findings.

Chapter Summary

Since designing the IIM-HH was part of the purpose of this study, the preceding section has taken the reader through the initial content design component of the IIM-HH Instructional Development Model (Figure 3.10) to provide a better understanding of the considerations the investigator made in the design process. As stated throughout this document, the design of content of the IIM-HH, particularly the specific techniques used to deliver the content, was modified throughout this study, as is depicted in Figure 3.11. Once the design and production of the instructional unit were initially completed on the IIM-HH prototype, the module was then ready to be piloted with the targeted audience. Chapter 5 describes the IIM-HH piloting phases of this study.

CHAPTER 5

PILOTING THE INTERDISCIPLINARY INTERNET MODULE -

HEALTHY HEARTS (IIM-HH)

The purpose of this study was to design, pilot, and evaluate the

Interdisciplinary Internet Module - Healthy Hearts (IIM-HH) for intermediate

grade children. The preceding chapter, Chapter 4, discussed the content

design process of the IIM-HH development. This chapter describes the piloting

phase of the study, including a description of the participants, setting, and

procedures in both the pre-pilot and the pilot. In addition, the role of the

investigator in the pilot was discussed, as well as a brief overview of the data

collection methods and the use of the computer/server database throughout this

phase of the IIM-HH.

As discussed in Chapter 3, and illustrated in the IIM-HH Development

Model (Figure 3.10), piloting the prototype of an instructional unit is a necessary

step in its development. It is imperative that a unit of instruction be tested for

effectiveness and efficiency before it is made available for use by a large

population. Piloting should be done using participants from the intended

audience, and later, in the authentic setting in which the instructional unit is

intended to be used.

Once the first workable prototype of the IIM-HH was produced, the

investigator (and designer) began a formative evaluation of the prototype by

pre-piloting it with a small group of children and teachers from the intended

target audience (intermediate grades), and with content, technical, and pedagogy experts.   From this initial formative evaluation of the module, the prototype was again revised, based on the findings of the pre-pilot test. Elements of the unit were not tested individually upon their completion because the module was designed to function as a whole and one section's functionality is often dependent upon that of another. After revisions were made in production, the IIM-HH prototype was piloted with two intact classes of intermediate grade students and their teachers. Revisions were again made in the design and production based on the finding of the data collected from this phase of the formative evaluation (see Figure 3.11). A complete report of the analysis of the data collected during the piloting phase of the study will be reported in Chapter 6, *Evaluation of the IIM-HH*.

<div align="center">Pre-Pilot</div>

To begin the formative evaluation of the IIM-HH, the module was tested with a small group of students and teachers, and reviewed by experts while still in the development stage to determine if the right procedures were being followed, and how functional the instructional materials and medium were at that point (Gentry, 1994, Tessmer, 1993). This pre-pilot of the IIM-HH checked specifically for technical and content functionality. The results of the data analysis were used to modify the module in the ongoing instructional development processes.

<u>Participants</u>

Five students participated in the pre-piloting phase of the IIM-HH development. The five children selected for this piloting phase were fifth grade students, all from the same school. They were selected by the investigator via a personal contact with their teacher who was willing to participate and whose school setting was believed to provide the necessary on-line technology for the project. The teacher designated which five children would participate in the pilot, and which children would work together in pairs. Informed consents were obtained from each student and each student's parent who participated in this phase of the study.

Two teachers from the targeted audience also participated in the pre-pilot testing. One teacher was a sixth grade classroom teacher, and one was a health and physical education specialist for intermediate grade / middle school children. A number of content, technical, and pedagogy experts also reviewed the IIM-HH. The teachers and other experts were selected by the investigator via personal contacts, and according to their desire to participate, and their access to the necessary technology (i.e. on-line computer with a Java-supported web browser).

<u>Setting</u>

The five children who pre-piloted the IIM-HH were students in a small rural K-8 school in the southeastern region of the United States. The computer lab in which the students worked had three computers on-line. The computers

had 486 processors with Internet access via a school server. The children primarily worked in pairs, although two students worked alone on one occasion. The school's technology teacher assisted the investigator in the computer lab while the students participated in the module during the three days of pre-piloting activities.

The two teachers and other experts worked in their individual settings and communicated with the investigator via e-mail, telephone, and informal meetings.

Procedure

The investigator met with the principal, the technology teacher and the classroom teacher at the school attended by the students who would participate in the study. The investigator familiarized herself with the school and computer facilities before beginning the piloting phase with the five children. After these preliminary steps, the investigator met with the children each day for three consecutive days for approximately one and a half hours each day. Throughout this phase of the study, the investigator assumed the role of moderate participant observer (Spradley, 1980). Each day, the investigator asked the students to complete various segments of the module, and asked the children questions throughout their participation. Through observation and informal interviewing, the investigator was able to gain insights into the content and technical functionality of the IIM-HH. Results of this pre- pilot, including implementation problems, new developments that resulted from the evaluation, and changes that were made to the IIM-HH are presented in Chapter 6.

The investigator explained the IIM-HH to each participating teacher and expert, and the intent of this phase of the study. Each teacher was then asked to review the entire module via the Internet, and complete a questionnaire that reflected his/her opinions of the strengths and weaknesses of each section of the module and the module as a whole, and their recommendations for change. Experts were asked to review the area of the IIM-HH in which they had expertise, and to make recommendations for change in writing to the investigator. The teachers and experts recommendations were considered, and appropriate changes made to the IIM-HH before beginning the second piloting phase which was a field test of the complete module (Figure 3.11).

The Pilot Study

Once the design and production of the IIM-HH prototype were modified and strengthened, based in part by the pre-pilot, a field test of the revised module was conducted. This field test was a 'situated test' where the instructional unit was evaluated in its entirety in the same environment in which it will be used when it is finished (Tessmer, 1993). The major advantage of field tests is to help the developer determine if the instructional unit really "works" with the intended users in a learning environment similar to ones in which they will actually be used (Tessmer, 1993).

In the following section, a description of the participants, the setting, and the procedures for the pilot will be presented. Additionally, the role of the

investigator, the data collection procedures, and the use of the server database in this pilot phase will briefly be discussed.

<u>Participants</u>

Forty-one (41) fifth grade students and their classroom teachers (2) participated in the pilot of the complete IIM-HH. All students in the two intact classrooms obtained parental permission to participate except one (1). Two other students chose to withdraw from the study, one after Week 1 and one after Week 2. These students were present in the IIM-HH instructional environment but participated in non-computer health-related activities assigned by the teachers.

The teachers will be referred to as Ms. Jones and Ms. Smith (pseudonyms) for the purposes of this study. Ms. Jones had been teaching for eight years, and this was Ms. Smith's second year of teaching. Both expressed a desire to expose their students to new and innovative instructional strategies, particularly those that involve computer usage, and both expressed enthusiasm for using the IIM-HH in their curriculums.

The children had limited to moderate computer experience. All had used the computers at school, but, according to the teachers, they were primarily used to "play games". The teachers also had limited to moderate computer experience. They both had school e-mail addresses that they used occasionally. Both had computers with on-line access at home, although Ms. Smith's home computer was not on-line until the last week of the field study.

<u>Setting</u>

   <u>The Physical Environment</u>

Rowland Elementary School (pseudonym) was an elementary school with approximately 350 students in grades K-5, located in a rural, predominately middle-class region of the southeastern United States. There were three fifth grade classrooms in the school, and all were located outside in the main school building in small portable units.

The school had three computer labs, all with Internet access. Two of the labs had ten to fifteen older computers (386 processors and a few 486 processors) each. The newest lab was housed in a fifth grade classroom - the fifth grade classroom that did not participate in the study. This classroom lab was equipped with twelve (12) high speed Pentium processor computers. The lab was arranged so that each table had one computer and two keyboards, therefore, children working in pairs did not have to share keyboards. The children had workspace on the table around the computer upon which to write. The computers were equipped with Netscape Navigator 3.0, but the browser that was primarily used by the students to access the Internet was Microsoft Internet Explorer 3.0. Each computer had two sets of earphones available to the students. All computers were connected to one printer in the classroom. This lab was made available to all the fifth grade students at the school, although access was restricted since the lab was housed in a regular classroom.

The two fifth grade classrooms in the study each were equipped with two on-line computers. Three of the computers were PCs (two with Pentium processors), and one was a Macintosh (PowerMac).

The Social / Ecological Environment

The social / ecological environment appeared to be one of cooperation and communication. The principal of the school was friendly, and displayed a desire to provide the best opportunities and resources for the teachers and the students in the school. He visited each classroom daily during instruction, and communicated regularly with the teachers. He was very cooperative with the investigator in ensuring that the computer labs would accommodate the IIM-HH. He e-mailed the investigator to discuss IIM-HH issues, and he used his office computer to access the IIM-HH for review.

The whole school had a cooperative atmosphere. The teachers appeared to collaborate well with each other and with their students. There were adults throughout in the school setting helping students (i.e. aids, parents, university students, student teachers).

All three computer labs were available to the students in this pilot, although one lab was housed in a 2nd grade classroom, and one in a 5th grade classroom. The teachers and students in these classes where computer labs were situated were not distracted by others in their classrooms, and many teachers offered their assistance, again, displaying the cooperative nature of the setting.   The technology teacher assisted the investigator throughout the project whenever asked. She made herself available to the teachers

participating in the study when needed. The third 5th grade teacher, whose

classroom housed the computer lab worked cooperatively with Ms. Jones and

Ms. Smith to see that the IIM-HH was accessible to their students each week -

even if a snow day or unexpected school event caused a change in scheduling.

The school was highly concerned with the technological literacy of their

students and staff. Fifth grade students could work in a computer lab before and

after school with a computer teacher. Some teachers communicated with

parents via e-mail, and one class had a homework hotline for students and

parents. The school had a website that informed parents and others of special

projects and instruction in each classroom.

Procedure

The IIM-HH was implemented in its entirety with the two classes selected

for the study. Two weeks prior to the implementation of the instructional module,

orientation activities took place. The actual IIM-HH instruction was designed to

be delivered in four weeks, although, during piloting, the teachers asked that

two additional weeks (Week 7& 8 in Figure 5.1) be allowed for participation in

the module activities. Overall, the children ended up having access to the IIM-

HH for a total of eight (8) weeks. Table 5.1 shows a brief outline of the weekly

activities. A more detailed outline of each week of the pilot can be found in

Appendix C. Procedures of the entire implementation will be discussed in the

following sections: (1) gaining access, (2) preliminary procedures, (3)

orientation, (4) implementation of the instructional unit into the curriculum, and

(5) leaving the field.

Table 5.1 Outline of weekly events in the IIM-HH Pilot

<u>Orientation to the Module</u>

Week 1: Gained access; obtained participant permission to participate; met with principal and teachers; planned schedule of IIM-HH implementation; teachers reviewed module; distributed *Guidelines for Teachers* in hardcopy

Week 2: Prepared the available computers to use the IIM-HH (i.e. bookmarked the site, made Netscape 3.0 accessible); teachers gave students e-mail addresses; teachers conducted orientation activities with students

<u>Completing the Module</u>

Week 3: First week of the IIM-HH implementation into the curriculum; Week 1: *About the Heart*

Week 4: Second week of the IIM-HH implementation into the curriculum; Week 2: *Being Active for a Healthy Heart*

Week 5: Third week of the IIM-HH implementation into the curriculum; Week 3*: Eating Right for a Healthy Heart*

Week 6: Fourth week of the IIM-HH implementation into the curriculum; Week 4: *Living Tobacco-free for a Healthy Heart*

Week 7: Fifth (final) week of the IIM-HH implementation; most students were completing activities for Week 4 of the module

<u>Conclusion of the IIM-HH Implementation</u>

Week 8: Students returned to the module to view their writings and those of others, and to read student questions and Expert responses in *Ask an Expert* ; students requested earned prizes

Gaining Access

Rowland Elementary School was selected because it had the necessary technology. Once the investigator had talked with the principal by phone, the principal selected the two fifth grade classrooms who were not a part of a computer grant project in the school. The grant project provided a computer in the classroom for every two children and was being piloted with the "third" 5th grade classroom, the one not participating in this pilot study. The principal looked upon this as an opportunity to appease the children, the teachers, and the parents who had not been selected earlier in the year to be in the "computer grant classroom". After talking with the principal, the investigator then scheduled a formal meeting with the teachers and principal. During the meeting, the investigator discussed the IIM-HH, its purpose, requirements to use the module, and the research study. Once the two teachers agreed to use the IIM-HH in their curriculum and to participate in the study, the investigator and the teachers corresponded via e-mail and telephone for the following weeks, as well as by meeting informally. All students in the two fifth grade classes had parental permission statements already on file in the principal's office, authorizing the use of the Internet for educational purposes. Informed consents to participate in this study were distributed by the teachers to the students and their parents.

The principal and teachers all expressed enthusiasm for starting the IIM-HH in their school (classrooms), and were particularly excited about the possibility of the children winning prizes for their participation.

Preliminary Procedures

Based on the availability of the computers with on-line access, the teachers decided on a tentative schedule for implementing the IIM-HH into their curriculum. Originally, the students were scheduled to work in the HH module two days a week for approximately one hour each. Additionally, the students were to be able to work independently on the computers in the classroom. Due to problems that were quickly identified during these preliminary weeks (discussed in Chapter 6), it was determined that the students' participation in the IIM-HH would be limited to the availability of the 5th grade computer lab (in the classroom not participating in the study). Therefore, lab use was restricted to Friday mornings for one hour per classroom.

Once the number of participants were identified, prizes for the *Go for the Gold* section of the IIM-HH were then procured. The athletic department of Virginia Tech agreed to provide caps, keychains, pictures, and an autographed ball for prizes. The investigator purchased additional prize items, including 4-square balls, and rollerblades. The awards structure was then identified and added to the module.

Orientation to the IIM-HH

Teacher Orientation

Ms. Smith and Ms. Jones met with the investigator and were introduced to the study and the procedures necessary for its implementation. The investigator informed the teachers of the *Guidelines for Teachers* portion of the

module, which would act as their instructional guide and included the module objectives, a detailed description of the module components and activities, pre-requisites for starting the IIM-HH in the curriculum, orientation activities for the students before beginning the unit, a suggested HH weekly schedule, other pointers for successful integration, how to contact help when using the module, and concluding activities at the end of the four week module. The investigator stressed the importance of reading the *Guide,* and completing all the orientation activities with the students prior to beginning the module.

The teachers decided on the format of the IIM-HH delivery, with Ms. Jones being responsible for the lesson and facilitator of the IIM-HH for weeks 2 and 4, while Ms. Smith would teach weeks 1 and 3, and would also be responsible for the Orientation Activities with the students during the week prior to the beginning of the instructional unit. On their designated weeks, the teacher would teach both classes of students in two consecutive one-hour lessons in the 5th grade computer lab.

During this period of orientation, the IIM-HH URL (e.g. Internet address) was bookmarked on all computers that the children would be using by the investigator with assistance from the technology teacher. Both Ms. Smith and Ms. Jones practiced accessing the module from the 5th grade computer lab and also from their classroom computers. Both teachers could only access the IIM-HH from one of the two on-line computers in their classrooms.

Meeting with the teachers during these beginning two weeks resulted in several significant changes. One was the development of the *Guideline for*

Teachers in a hardcopy version. The teachers indicated that there was not

enough time in the busy school day to review and study the *Guidelines for*

Teachers which was available to them only on-line. Neither could, or wanted

to, access the module on-line at home. But, they wanted to use the *Guide* at

home as they prepared their lessons. It became clear that the *Guidelines for*

Teachers needed to be available to the teachers in hardcopy. This was done.

Additions to the hardcopy *Guide* included a worksheet to aid in the

understanding of the navigational bar, a hardcopy of Log It, a password record

sheet, and overhead transparencies of Log It directions, the Front page of the

module, the Menu page, and Go for the Gold to aid the teacher in the orientation

activities. The need for these additional resources became obvious as the

teachers learned more about the module, and the teachers and the investigator

decided how best to implement it with the children.

Student Orientation

Ms. Smith introduced the IIM-HH to the students in the classroom, using

the overheads provided with the *Guidelines for Teachers* manual.   She

distributed password forms so that students could record their passwords once

they were obtained. She gave the students in her homeroom her school e-mail

address to use, and Ms. Jones' students used Ms. Jones' school e-mail

address. She discussed the procedure for obtaining passwords, and how to

access the module once passwords were obtained. Ms. Smith introduced each

section of the module using the Main Menu overhead, and then discussed the

point system and prizes in Go for the Gold. She used the Log It directions on

the overhead to explain how to complete and submit physical activity logs. To complete the orientation activities in the classroom, Ms. Smith discussed the Write On activities in detail, giving examples of tasks and acceptable responses.

After orientation in the classroom, the students went to the computer lab to complete the orientation activities on the computers. The students had to first learn the steps necessary to access the IIM-HH - finding Netscape Navigator 3.0 to access the Internet, then finding the bookmarked Healthy Hearts module. To begin their initial visit to the module, each child had to individually complete a questionnaire in order to obtain a password that would allow them to access the module throughout the four week period (see Appendix D for questionnaire). Once the questionnaire was completed and submitted to the IIM-HH, the program assigned the student a personal password that would allow him/her access throughout the module instruction.

Implementation of the Instructional Unit into the Curriculum

The actual implementation of the four week instructional unit of the IIM-HH began one day after the orientation activities in the lab for one group of students, and on the same day as the orientation activities in the lab for the other group. The children were grouped according to their language arts classes, not by their homerooms. The students chose their own partners. For Group 1, some students worked alone, but for Group 2, every student worked in pairs. Throughout the four weeks, all students worked in pairs sometimes, but not necessarily with the same partner as the previous week. Throughout the actual implementation phase, the students met with the designated teacher in

the computer lab one hour a week (see Appendix C). On Weeks 1 and 3, the children met on Friday mornings, and on the remaining weeks they met on Thursday mornings.

On Week 1, Ms. Smith used direct instruction to guide the students through *Get Smart, Do You Know?,* and *Write On.* Once directions were given, the students were allowed to work at their own pace. As the weeks progressed, the teacher assumed more of a "facilitator" role, and the students worked more independently. The teachers required the students to first read *Get Smart,* and then compete the activities in the module that awarded points (i.e. *Do You Know?, Log It, Write On*). They encouraged the students to complete the other activities in the module if time permitted.

Since the students had access to the IIM-HH only once a week, the teachers required the students to keep a written account of the Log It activities so that they could complete all the logs for the previous week at the beginning of their weekly IIM-HH lab time. The teachers also required the students to turn in to them a written copy of their responses to the Write On activities each week.

As new information became available to the students each week in the IIM-HH, the students followed the same procedures in completing the module tasks - first completing the activities from the previous week that they had not finished, then continuing with the current week's activities that awarded points. By the end of Week 4, most of the students had gotten so far behind that they were just completing Week 3 activities. It became obvious to the teachers and the investigator that in order for the students to participate in Week 4 activities,

an additional week of implementation was needed. In addition, another week was allowed for students to access the module to read responses from others that had been added as the module progressed. Final points were identified and prizes requests were made on this final week, as well. Therefore, the children completed activities in the IIM-HH for six (6) weeks (see Table 5.1).

New Developments during the IIM-HH Implementation

During the weeks that the students completed activities in the IIM-HH, two significant developments occurred. One was the addition of *Headline News* to the Main Menu page. This page gave the students brief "headlines" of what they should look for in the module that particular week, and recognized individual children for exceptional writing submissions from the week before. This was added to the main menu page at the beginning of Week 3, in hopes of encouraging students to participate in parts of the module other than those that received points.

Another development was the need for teachers to have access to their students' passwords, and weekly information concerning what activities the individual students had completed and submitted to the IIM-HH, and the number of points they had accumulated. That information was retrieved from the server database, and a data sheet formatted in Microsoft Excel was sent to each teacher the last two weeks of the instructional unit.

<u>Leaving the Field</u>

After the completion of the instructional unit, students were asked to complete a questionnaire, and formal interviews were conducted by the investigator with both teachers and small groups of students. The IIM-HH remained accessible to the participants for two weeks after the Week 4 lesson activities were completed, so that they could read others responses that had been posted in the various sections of the module (i.e. *Write On, Ask Experts,* and *Movin' & Groovin'*). At the conclusion of the IIM-HH, the students indicated their choice of prizes and a drawing was conducted to choose the two winners for the "grand prizes". The prizes were distributed to the students at school by the investigator.

<u>Role of Investigator</u>

The investigator assumed the role of active participant in preparing the teachers and the physical environment for implementation of the IIM-HH. During actual implementation of the instructional unit in the curriculum, the investigator assumed the role of passive participant observer (Spradley, 1980) when observing each of the weekly sessions in the 5th grade computer lab.

As discussed in Chapter 3, the investigator continued the role of designer / producer outside of the school setting. During this piloting phase, she updated the IIM-HH weekly with new information submitted by the participants, responded to e-mails from the participants, corresponded weekly with the IIM-HH experts for Ask the Expert, and retrieved database files weekly.

Data Collection

Data was collected throughout the field test to aid the investigator in determining the effectiveness and efficiency of the IIM-HH prototype. Multiple sources of evidence were used to help the investigator better address a number of issues, and to develop triangulation of the data to substantiate her findings (Yin, 1989). The multiple data-collection methods used included observations and field notes, informal and formal interviews, questionnaires, subject-produced written documents (i.e. student exit slips and teacher logs), and electronic data. These data collection methods will be discussed in detail and the results of the analysis of the data presented in Chapter 6, *Evaluating the IIM-HH*.

Database Usage

The IIM-HH server database was developed by the technical producer to keep track of the participants' individual points and to gather all information that each participant submitted. The investigator met with the technical producer immediately following the students' entry of information through the questionnaire to discuss the procedures to access and retrieve the information submitted by the participants. To review the information submitted by the participants, the data was exported from the database into Word Excel files. The files were then saved in the IIM-HH folder on the server which made it accessible to the investigator whenever needed.

At the end of each week, a summary of information was retrieved from the database on each task that required user submissions. Files were created of

exported data from *Write On* activities, physical activity logs in *Log It*, as well as a summary file containing the number of points for each user, and the tasks completed that resulted in the total points. Questions for the experts and submissions of new physical activities for *Movin' and Groovin'* were not recorded in the individual's database record, but were sent to the IIM-HH e-mail address which was monitored by the investigator.

Due to a programming problem in assigning points for given tasks, the technical producer and the investigator checked individual user points from time to time and made corrections to individual database records in an effort to correct any point inconsistencies that had arisen.

Chapter Summary

This chapter discussed the piloting phases of the study, both a pre-pilot with a small group of students, teachers, and experts, and the pilot study of the entire IIM-HH with two 5th grade classrooms and their teachers. The participants, settings, and procedures of the piloting phases were described, with particular attention given to the procedure of the main pilot of this study. Additionally, a brief description of the role of the investigator, the collection of data, and the use of the server database in the pilot were included. The description of the piloting phases found in this chapter is necessary to the understanding of the formative evaluation of the IIM-HH, which will be discussed in detail in Chapter 6.

CHAPTER 6

EVALUATING THE INTERDISCIPLINARY INTERNET MODULE - HEALTHY HEARTS (IIM-HH)

As part of the development process of any instructional unit, evaluation must take place to determine its success in the environment in which it is intended for use (; Gagne' & Briggs, 1974; Gentry, 1994; Shambaugh & Magliaro, 1997). Once the IIM-HH had been designed (Chapter 4), and piloted (Chapter 5), the next step in the process was to evaluate the module (see Figure 3.11). The evaluation conducted in this study was a formative evaluation (Patton, 1990) to determine how well the instructional unit "worked" during the development process of the module, and to make changes in the IIM-HH in order for it to become an effective means of instruction in cardiovascular health for intermediate grade students.

In formative evaluations, qualitative methods are commonly used. Qualitative methods were employed throughout the formative evaluation of this study to describe, document, and assess behavior in context which better enabled the investigator to see and understand outcomes upon which to base recommendations for change (Bogdan, and Biklen, 1992). These methods of analysis do not constrain data collection by predetermined categories, therefore, allowing the evaluation researcher to study selected issues in more depth and breadth (Patton, 1990). The investigator, using the naturalistic inquiry approach that qualitative designs require, attempted to understand and

document the actual happenings of the setting under study, and to use the data that emerged to change the actual operations of the intervention to better meet the needs of the users (Patton, 1990). As Bogdan and Biklen (1992) suggest, this naturalistic inquiry approach allows the targeted audience's behavior and assessments to contribute to changes.

Although learner outcomes are a primary consideration in the overall effectiveness of any instructional environment (Chapter 2), this formative evaluation of the IIM-HH does not include an evaluation of learner outcomes. It is what Patton (1990) refers to as "implementation evaluation" which allows the developer of the instructional unit to determine if the instruction "works" the way it was designed, and to test its feasibility. Until one knows how the unit is operating in its intended environment, there is little reason to bother with evaluating outcomes (Patton, 1990). Learner outcomes will be evaluated in a subsequent step of the evaluation process of IIM-HH development based on the results of this study. (see Figure 3.11 to illustrate the evaluation process)

This chapter begins by discussing the data collection methods used in the study, with a brief description of how each of the multiple sources of evidence were used. Then, the methods for data analysis are described, including a description of the overarching categories by which the data was analyzed. An overview of the results of the pre-pilot is then presented. The remainder of the chapter focuses on the results of the pilot test, categorized by the overarching categories, and then by the themes that emerged from the data.

Data Collection

The use of multiple sources of evidence and multiple methods of collecting evidence in an evaluation study provides for consistency and plausibility of results (Cronbach, 1982; Patton, 1990). By using the process of triangulation, data are substantiated and findings are strengthened (Yin, 1989; Patton, 1990; Scriven, 1981). Informal and formal interviews, observation and field notes, questionnaires, other subject-produced written documents, and electronic data were used to determine if the IIM-HH was or was not "working". Each technique is described in the following section.

Informal and Formal Interviews

Both formal and informal interview approaches were used in the study to help the investigator better understand the teachers' and students' opinions and recommendations for change. Formal interviews were conducted at the conclusion of the field test with both teachers and three small groups of students. The formal interview protocol was semi-structured and included both open-ended and closed-ended questions (Bailey, 1982). This approach allowed for contingency questioning (Seda and Pearson, 1991) and probing (Bailey, 1982) by the investigator. The general interview guide for the formal interviews of both teachers and students is in Appendix E. The formal interviews were audiotaped and transcribed.

Informal conversational interviews allowed the investigator to better understand the actions and reactions of the participants that were being

observed by asking questions that pertained to what was happening in the immediate context (Patton, 1990). Interviews in an informal setting took place each week in the pilot with both teachers and students before, during, and/or after the students participated in the IIM-HH. In the pre-pilot, the students were informally interviewed throughout the process. The results of the informal interviews were reflected in the investigator's fieldnotes.

Observation

"The value of observational data in evaluation research is that evaluation users can come to understand program activities and impacts through detailed descriptive information about what has occurred in a program and how the people in the program have reacted to what has occurred" (Patton, 1990, p. 203). Through observation the investigator was able to become aware of nonverbal behavior that contributed to the findings that could not be detected through any other means of data collection (Bailey, 1982). Students were observed using the IIM-HH by the investigator who recorded all fieldnotes on a laptop computer, which allowed for a thorough description of happenings in the setting, as well as the investigator's personal impressions and thoughts.

Questionnaires

Questionnaires are the paper-and-pencil alternative to interviews, allowing the investigator to gain important information but in a less time consuming and less demanding way (Pedhazur & Schmelkin, 1991). In this study, questionnaires were administered to all student participants at the conclusion of the pilot study (see Appendix J). The questionnaire results were

used in conjunction with the other data collection approaches as a way to triangulate the data for the study.

Other subject-produced documents

During the field test, students completed weekly exit slips and the teachers completed weekly logs. These forms of open-ended questioning helped the investigator gain in-depth insights into the feelings of the participants as they participated in the module, and informed the investigator of happenings that occurred while using the module, other than those observed by the investigator. The exit slips were given to the teacher each week by the investigator, and they were distributed and collected at the discretion of the teacher. Both the exit slips and weekly logs were given to the investigator on each weekly visit. Examples of these data collection methods can be found in Appendix G.

Electronic data

The participant responses to *Write On, Do You Know? , Log It, Ask Experts*, and the registration questionnaire were also used to gain additional insights into the functionality of the IIM-HH. Also, the content of e-mail messages from the teachers were used to substantiate the data in fieldnotes and weekly logs.

Data Analysis

From the pilot study, the raw data was initially organized by the five research questions guiding the study, and then inductively analyzed by finding

general coding categories as they emerged from the data (Bogdan and Biklen, 1992; Patton, 1990). As the data was formatively and repeatedly reviewed, other categories and subcodes were derived. Once categorized, the data was again searched for emerging themes, and confirming and disconfirming support of each theme was identified (Patton, 1990). The themes were verified using the "cut-up-and-put-in-folders approach" (Bogdan and Biklen, 1992) to organize the data, and then the "sketch pad method" (Graham, Hopple, Manross, & Sitzman, 1993) was used to clearly identify evidence in the data that confirmed or disconfirmed each theme.

Description of the Overarching Categories of Data Analysis

The overarching categories of data analysis, guided by the five research questions were (a) technical functionality, (b)content functionality, (c) contextual influences, (4) the students' overall views and recommendations for change, and (5) the teachers' overall views and recommendations for change.

Because the design of the IIM-HH was guided, to a large degree, by the medium chosen to deliver the instruction (i.e. the Internet) , it was imperative that the evaluation of this instructional unit be concerned with the *technical functionality* of this complex, interactive technology. *Technical functionality* refers to the way in which the technological medium "works" in delivering the instruction. For the purposes of this study, the *technical functionality* category included data describing the effectiveness of the functions of the technological medium (i.e. Internet website), usability of the functions provided by the

technological medium, and efficiency, strengths, and weaknesses of the medium in an instructional setting.

How well the content "worked" (*content functionality*) in the instructional design and production was also a main consideration of the evaluation of the IIM-HH. This category included the appropriateness of the content, how appealing and motivational it was to the students, its completeness, and its usability.

The *contextual influences* considered those variables specific to the setting in which the IIM-HH was implemented that had an impact on the technical and/or content functionalities. For example, if the teachers in the particular school setting *required* the students to complete certain sections of the IIM-HH, then the content did not function as intended by the developer (i.e. supporting active learning, making choices, opportunities to participate in all the IIM-HH tasks, etc.).

When teachers and students are given the opportunity to voice their likes and dislikes, and their opinions about the strengths and weaknesses of an instructional unit during a formative evaluation, developers allow the users of the instruction to help design the content and the curriculum itself (Tessmer, 1993). The *teachers' and students' overall views and recommendations for change* were important pieces of evidence in evaluating the functionality of the module.

Results of the Pre-pilot

The findings from the pre-pilot resulted in both technical and content changes to the IIM-HH. Through observation, informal interviews, and questionnaires, strengths and weaknesses of the module at that stage in the design/production process were identified, and recommendations for change were made by the students, teachers, and the investigator. Appendix H contains the results of the pre-piloting phase, according to technical functionality, content functionality, and both teachers and students overall views of the IIM-HH. Also, the changes made to the technical functions and to the content as a result of the pre-pilot are identified. This appendix also includes an overview of the recommendations for change made by experts during this phase of the development process.

Results of the Pilot Evaluation

From the inductive analysis of the data, themes emerged in each of the broad categories of technical functionality (six) and content functionality (four). Additionally, there were three main themes that emerged from the data that identified contextual factors that were important in the ability of students to successfully work on the module. The participants' views of the IIM-HH and their recommendations for change were considered a major contributor in each theme, and a discussion of their overall perceptions and recommendations is also included as part of this chapter.

In each of the following sections, the themes that emerged in each of the broad categories are identified and discussed, citing the strengths and weaknesses of the IIM-HH related to each theme, and the users' recommendations for change.

Technical Functionality

Six technical functionality themes were identified. They were: (1) Usability and efficiency of accessing and exiting the module, (2) Navigating the module, (3) Usability - Overall technological requirements to implement module, (4) Effectiveness of the Points System, (5) Effectiveness and usability of the Database, and (6) Effectiveness and usability of E-mail.

Accessing and Exiting the Module

One theme identified that was related to technical functionality was that of accessing and exiting the IIM-HH. To begin the access process, the teacher was given an access code to type in a small box that appeared when the Internet browser made the connection to the IIM-HH website. When the code was entered, the first page of the module appeared which contained a box for the individual participant to enter his/her e-mail address and a box to enter his/her "secret password". Each student was assigned a "secret password" by the program after the registration requirements (i.e. completing a questionnaire) were completed by the individual. It took each student approximately fifteen (15) minutes to complete the questionnaire. The password that each individual

received was 7-9 characters in length, and included both digits and letters. In addition, each student needed an e-mail address to gain access to the module. Both classes of students in the study used their homeroom teacher's school e-mail addresses. Once the student entered both his/her e-mail address and his/her password on the front page of the module, he/she was then given access to the main menu of the module. To exit the module, the user could click on the "exit" icon on the navigational frame to go to the exit page. Only one student could log on at a time, so since most students were working with partners, they would take turns logging in their individual passwords, submitting their work, and then exiting the module, to allow the other student in the pair to do the same.

Strengths

Two strengths of this process were:

(1) The individual password system allowed for a thorough collection of all data submitted by each student

(2) The e-mail address allows the IIM-HH personnel to correspond with each participant individually.

Weaknesses

Five weaknesses were identified in accessing and exiting the module. They are described below.

If the students made a mistake in typing in their e-mail address when completing the questionnaire for the initial registration, when they typed in the

correct e-mail address to access the module, access was denied. The only way to remedy this problem was for the students to re-enter the registration information, and receive a new password.

The IIM-HH will only allow one student to log on at a time, therefore, even though the students work cooperatively to solve a problem and submit a response, only one child is given credit (points) for the response. That child must then exit the module, and the other student in the pair must go through the process of typing in his/her password and e-mail address. This appeared to stifle their cooperation and create boredom in the partner not typing. When two of the children were asked if they thought it would be better if partners could both enter their passwords, one child responded:

> Yeah...and then just go. Or you could like everytime you came back to the main screen it would show you a name...you and whoever your partner was..and just click on whoever was going....

The passwords were not easy for the students to remember, and the IIM-HH only gave the password to the students one time. If they copied it down on paper incorrectly, then they were denied access, and had to complete the registration questionnaire again. During the first week of the students participation in the module, at least 5 students had to re-submit the registration information, and receive a new password.

The main access code that was given the teacher to log the class on at the start of the program was given to every child so that he/she could log on

without assistance from the teacher. This voids the purpose of the main access code, which is to give students access only at school through their classroom teacher, and gives them the knowledge to access the module anywhere. Therefore, a child can show anyone how to log onto the program from any location.

The teacher cannot get an individual password so that they can access the module without completing the same registration questionnaire that the students must complete. The technical personnel of the IIM-HH manually assigned the two teachers in the study an individual password.

Recommendations for Change

The teachers and students made the following recommendations related to accessing and exiting the IIM-HH.

Teachers

- Mrs. Smith recommended that the main access box that required the main access code be changed in some way because it was confusing to the children. She said that they wanted to type their password in the main access box instead of the class access code.

- Mrs. Jones recommended that something be done to expedite the "logging on" process, because important time was used when students could not get into the module because of password problems.

Students

- Some students thought that the method of logging on was too hard and took too long. Two recommendations were made to remedy these problems. One student recommended that the access process be changed so that a list of schools that are participating in the IIM-HH are given in a pop-up menu on the first page. The student selects his school, and from another pop-up menu that appears, selects his class (teacher) in that school. From there, the child selects his own name or password from the last pop-up menu, and then are given access without having to spend time typing in the complicated e-mail addresses and passwords. This would also remedy the problems of students not copying down the correct password, or making a mistake in typing.

- Another suggestion from a student was to allow each student to select his/her own password instead of it being assigned by the program. He believes that by selecting his own password, student would choose a simpler password that they could easily remember.

Navigating the module

The IIM-HH had a standard frame on each page with a navigational bar that included icons for the seven sections of the module at the bottom, and a forward, backward, main menu, and exit icon at the top (can be seen in Figure 3.1). There were also "links" back to the main page of each of the subsections so that the user could get back to the menu of the subsection without using the

navigational bar to return to the main section page. On the students' first visit to the module, the teacher instructed them to click on the different icons on the navigational bar to see where it would take them. She also reminded them that the "back" button would take them immediately back to the place they had previously been.

Strengths

The students had no problems using the navigational tools, and seldom asked questions pertaining to how to get to a specific section of the module. Ms. Smith's comments about navigating the IIM-HH were:

> It's very user-friendly. You don't have to be a computer scientist to use it. And the kids can't get lost. I told them that. "You cannot get lost. You cannot do anything wrong. No matter where you go you're always going to come back". And I think that helped them. I think that helped them a lot. No matter where they went, they could always go back to where they were, and figure out where they needed to go next. And they picked up on that right away.

In the final student questionnaire, of forty responses, nineteen (19) students said they found the icons on the navigational frame that represented the seven main sections to be most helpful in finding their way around the module, ten (10) said they most frequently used the back and forward arrows for navigation, and three (3) said they always went back to the main menu from the navigational bar, and then chose a section from the main menu. One (1) student said she needed more help from another person to find her way around,

and one (1) said "it was difficult". Overall, it seems that most of the students

agreed with this student's comment:

It was very easy - you had everything, all you had to do was click!

Weaknesses

Some children had problems finding specific information or activities that

were in the module but that were not identified by icons that represented the

general topics of the sections. For instance, by the end of Week 3, students

were still asking "How do I find other kids' opinions from last week?", and "How

do I find the answer to my question from the expert?"

A weakness observed that is indirectly related to the technical

functionality of the navigational design of the IIM-HH was the introduction of the

navigation tools to the students. Ms. Smith did not introduce the navigational

frame to the students in the orientation activities because she did not have an

overhead transparency of the frame and orientation activities were not done at a

computer. A navigational bar worksheet was included in the Teacher's Manual

to assess the students' understanding of the navigational procedures, but Ms.

Smith did not use the worksheet with the students. When the students saw the

navigational frame in the module for the first time, they did not readily

understand the "point and click" method of navigation, which created a plethora

of questions for the teacher.

Recommendations for Change

Neither the teachers nor the students had recommendations for change related to navigation of the IIM-HH.

<u>Usability - Overall technological requirements to implement module</u>

The IIM-HH required the use of computers that had Internet connection, and which had a Web browser installed that could support Javascript language. Javascript is a scripting language for controlling the behavior of select browsers, and allows for more complex interactions (D. Carter-Tod, personal communication, May 24, 1997). During this field test, the most commonly known Web browser that supported Javascript was Netscape 2.0 or higher. Because of the Javascript language used in the IIM-HH, the only browser that supported all of the interactive features of the module was Netscape 3.0 or higher.

Strengths

Because of the use of Javascript language in the technical design of the IIM-HH, users were able to effectively and efficiently complete an in-depth daily log of their physical activities by selecting times and intensity levels from pop up menus, and then automatically view a record of how many minutes on a given day they had participated in physical activities, both during school and outside of school. They could also take a quiz, getting feedback after each answer selection, and which sent them back to Get Smart after two wrong answers.

Weaknesses

Many computers currently in use in elementary schools that have Internet access still do not have the capacity to support a web browser that can utilize Javascript language. Therefore, the IIM-HH will only run on those computers that have large enough processors to support such a browser, and, ideally, a browser that has the capabilities of Netscape 3.0 or higher. In this study, because there were three computer labs that all had Internet access on every computer, it was assumed by the principal and the technology teacher at the beginning of the study that Netscape 3.0 could be installed on all computers and the IIM-HH could be accessed from all three labs. During the orientation weeks, it was discovered that the 386 and 486 computers did not have the capacity to use any Netscape browser beyond the 1.22 version. Therefore, the students were restricted to the use of one lab for the IIM-HH implementation.

Recommendations for Change

The teachers and students did not have recommendations for change related to the technological requirements of the IIM-HH. However, the principal, another administrator, and two technology specialists from the school district made the following recommendations:

School Administrators and Technology Specialists

- The principal of Rowland Elementary School, the two computer specialists for the elementary schools in that county, and a school administrator in technology from that county, all recommended that the IIM-HH be

redesigned to accommodate the computers with 386 and 486 processors that could not run any browser higher than Netscape 1.22. They believed that this particular county had "one of the best situations you will find anywhere" and they will be using the slower computers in the labs for a few more years. The technology supervisor recommended that to successfully develop materials for children and to reach the most children, materials on the Internet should be accessible through Netscape 1.0 or 1.22 - nothing higher.

Effectiveness of the Points System

A fourth theme of technical functionality to be described is the effectiveness of the points system of the IIM-HH. It is programmed to award users points for participation in three areas of the module - *Log It, Do You Know?,* and *Write On.* Each week a student could earn up to 25 points, for a total of 100 points at the end of the four week module. Each time a user exited the module, the program would tell the individual how many points he/she had accumulated to that point. Prizes awarded at the conclusion of the module were contingent upon the total amount of points accumulated at the conclusion of the instructional unit.

Strengths

When beginning the module, both the teachers and students were excited about the "points system" of the IIM-HH. The children appeared to be more excited about seeing their points add up than they were about the actual

prizes that they could select at the end of the module. They always seemed

anxious to read the program's response to their submissions because a

statement would appear on the screen telling them the number of points they

had accumulated. At the end of the second week of the module, five (5)

students reported that "the points" were "what they liked best about Healthy

Hearts". At the end of the module, on the final questionnaire four (4) students

listed "the points" as what they considered the best part of the entire module.

Ms. Jones commented in the final interview that what she thought the children

liked the most about Healthy Hearts was "Getting points....getting points!" (More

discussion can be found in a succeeding section about the content functionality

of the points.)

Weaknesses

Each week as the module progressed, a new glitch was found in the

programming of the point system for the module. The glitches resulted in users

receiving the wrong points or no points at all, or in the program reporting less

points for an individual that he/she had previously earned. The children were

very discouraged when they did not receive the right points, and immediately

reported the problems to the teachers, who, in turn, reported the problems to the

investigator. During the final interview with Ms. Smith, when asked what she

thought the biggest problems were with the module over the four week period,

she stated "The points! Just the points!" Ms. Jones' comments were similar

when she stated:

Yes, they got more stuck on that (the points not working) than anything

else. It's like "we're doing our part, why isn't this doing it's part".

Although many problems were corrected in the programming during the

field test, at the conclusion of the module, all the glitches had not been found in

the programming, and therefore, have not been corrected. During Weeks 3 and

4 of the module, the investigator and the technical programmer used the

contents of the database to manually correct the students points in the

database, so that they would be reported correctly to the student from the

module.

In many of the cases where the students did not receive as many points

as they should have, it appeared to affect their feelings about the module

overall. One child stated in the final interview:

The reason I didn't like Healthy Hearts that much is because of the

points. I had like 90. Then it went back down to 80. Then I had to earn

back up to 90.

Another child asked to be taken out of the study after Week 2 because he didn't

"want to participate in Healthy Hearts anymore". When his teacher asked for a

reason before allowing him to withdraw, he said that he took the quiz the week

before, and he did not receive any points for it, so he did not want to do it again.

Recommendations for Change

Neither the students nor the teachers had specific recommendations for changes in the technical functionality of the point system. However, one student made the following recommendation:

>   I would recommend that they (the designers of Healthy Hearts) keep the points straight. Because you get mad when you didn't get what you earned!

   Effectiveness and usability of the Server Database

A fifth theme of technical functionality refers to the use and effectiveness of the database used in the IIM-HH. The database for the IIM-HH was created by the FileMaker Pro software and was the mechanism through which data submitted from individual users were organized and stored. As writing activities and physical activity logs were submitted, the content of these submissions was appropriately stored in individual files according to users' names and passwords. The database also kept track of the number of successful quizzes each user submitted, the users' e-mail addresses, and all registration information submitted.   The technical producer wrote scripts for each area of data submitted so that the investigator could access the data from the database via the server and the web browser according to the specific activities and the week the data was submitted.   (An example of database information can be seen in Appendix I).

Strengths

The database allowed the IIM-HH to collect and organize data submitted by the user. The investigator was able to access the information by designating the specific information needed, and then import it into Microsoft Excel documents for easy interpretation of the data.

Weaknesses

The database did not collect all data from the writing activities that the students submitted. The data for the writing activities for Week 2 and Week 3 were incomplete answers, therefore, the database was unable to collect the user's entire responses .

Recommendations for Change

The teachers made the following recommendations related to the server database:

- Both teachers expressed a need for the information in the database to help them assess what their students were submitting to the module. They both recommended that the module provide a mechanism to allow them to access all the activities submitted by their students, and a "data sheet" that allowed them to see what every individual student had submitted and total number of points that they had earned.

- Ms. Smith suggested that it would be helpful it she could know how many times an individual student had taken the quiz before he/she had a successful completion. She also recommended that the bonus question on

each quiz be programmed so that the answer had to include key words.

Presently, a student can type in nonsense, and the program will accept it.

Effectiveness and Usability of E-Mail

The sixth theme of technical functionality is the effectiveness and

usability of e-mail in the IIM-HH. Electronic mail (e-mail) was used to retrieve

questions that the students submitted to the experts in *Ask Experts*, and to send

responses back to the students. E-mail was also used for the submission of

new ideas from the students for the physical activity lists in *Movin' and Groovin'*.

An electronic e-mail form was located in both these areas of the module for

easy accessibility.   In addition, teachers were encouraged to use e-mail to

communicate any problems to the investigator, or ask any questions about the

module that arose during the field test. Although an e-mail form was also

available for the teachers in the module, the teachers in this study used their

school e-mail to communicate with the investigator. The IIM-HH had its own e-

mail address (hheart@vt.edu) and was monitored by the investigator.

Strengths

The teachers used e-mail to communicate with the investigator on a

regular basis about such topics as problems with points and changes in

scheduling. The efficiency of e-mail allowed for timely communication.

Once the students submitted questions for the experts to answer, the

investigator could expeditiously forward the questions to the appropriate expert,

who, in turn, forwarded his/her response immediately back to the investigator.

The investigator then sent the response to the individual who asked the question, and also converted it to the HTML document that was placed in the module for all participants to view. This process was usually done in two days or less. In a weekly log submitted by Ms. Smith, she stated that a strength of *Ask Experts* was "the responses were sent back (to the students) right away". This was made possible through the capabilities of e-mail.

Weaknesses

If the browser on the computer in which the student was working did not have a SMTP host specified in Main and Nes Preferences (which is part of standard configuration), then the e-mail form that is provided by the IIM-HH could not be sent. Since this is a contextual variable that influences the technical functionality of the e-mail form, it will vary from location to location.

The teachers in the study did not allow the students to check their e-mail messages, but instead, copied them to share with the class. Ms. Smith said that the problem with allowing students to use her school e-mail address was that she must then give them her personal password to check the individual e-mail messages for the IIM-HH, which she did not feel was appropriate. The student, therefore, did not receive the full benefit of the direct communication with others outside his/her classroom that is made possible with the use of e-mail.

Recommendations for Change

Neither the teachers nor the students had recommendations for change related to the use of e-mail in the IIM-HH.

<u>Content Functionality</u>

The second broad category of data analysis was that of content functionality. Content functionality themes were (1) Efficiency and Acceptability of the timelines of the IIM-HH, (2) Means of student performance assessment, (3) Effectiveness of the extrinsic motivators of the IIM-HH, and (4) Evaluating specific module components.

<u>Timelines of the IIM-HH</u>

The first theme related to content functionality was the efficiency and acceptability of the timelines of the IIM-HH. The IIM-HH was designed as a four week module, with a different content emphasis each week. On Week 1, a user could only access Week 1's information. On Week 2, a user could access both Week 1 and Week 2's information, and so on. By Week 4, all information on the module was available to the user, and he/she could submit information from any week's activities. By the end of Week 4, no new information was introduced. It was suggested in the *Guidelines for Teachers* that the students needed approximately one to one and a half (1 to 1 1/2) hours a week to complete the weekly activities in the module. In the field test, students participated in the IIM-HH one hour a week, most students working with a partner, in a computer lab setting.

Strengths

The scheduled introduction of new information each week encouraged all participants to focus on the same topic of information and work cooperatively on that topic with partners, with the module, and with others outside of their immediate environment. Giving a timeline to the entire module allowed the two teachers to plan how it might best "fit" in their curriculums.

If a student got behind, he/she could "catch up" at his/her convenience by returning to a previous week's activities. In some instances where a student was absent on the day that the class went to the computer lab, he/she did not have another opportunity to work in the module on that week. Allowing a user to access all the content that had previously been introduced gave him/her the opportunity to complete the activities during the following week.

Weaknesses

At the conclusion of Week 3's lesson in the lab, in one class seven (7) out of 17 students had not even started on the activities for Week 3 - they were still finishing activities from Week 2. By the end of Week 4, most all of the students were just completing the activities for Week 3. As each week passed, most children were progressively getting farther behind, and therefore, would spend more time each week doing activities from the week before. This would indicate that either the students needed less "requirements" to successfully complete a week's lesson, or more time at the computer to do so.

The students had very little time to search the module for new information and activities, They only did the "required" activities (i.e. the ones that gave them points and that their teachers required them to complete) in the amount of

time they had in the computer lab, and they struggled to get those completed in

the time allotted. This suggests that the overall quality of the instructional unit

was reduced because it stifled the student's active learning and their use of

some of the module features that the delivery medium made possible, such as

reading others responses, submitting other activities that could be seen on the

module, and e-mailing experts.

The time needed to successfully complete the activities in a weekly

lesson appeared to be partially contingent upon whether the students worked in

pairs or alone at the computer. The students who worked alone had completed

more activities at the conclusion of the one hour lab time than those who

worked with a partner. This problem could possibility be resolved if the

technical functionality allowed for partners to log on to the program together.

User Recommendations for Change

Both teachers and students made the following recommendations for

change related to the timelines of the IIM-HH:

Teachers

- Both teachers recommended that the module be longer than four weeks.

  They did not believe that any of the content should be taken out, but that

  more time was needed for the students to complete the activities in the IIM-

  HH content.

- Both teachers believed that the content would be more effective if the

  students had more access to computer usage, and therefore, recommended

that teachers be made aware of the need for more than one hour a week

computer time per student, particularly if students must work with partners.

Students

- When interviewing two of the students at the conclusion of the module, both

   Jared and BJ (pseudonyms) recommended that the module be extended

   past four weeks. Interestingly, both of these students were students who

   completed all of the "required" activities and BJ completed quite a few

   additional activities on his own.

   Jared: We didn't have enough time. I think instead of like four weeks, I

   think it should be a little longer. We should get five weeks to do it, I think.

   ..because you do get behind.

   BJ: You might have like an 8 week thing where you come in one week

   and do it, and if you don't get done, catch up the next week. Or if it was 8

   weeks, your partner could have a week, then you could go in, and you'd

   have a week.

BJ also recommended that it would also be helpful to work on the IIM-HH in the

lab twice a week instead of once. Another student suggested that students

needed at least two hours a week to work on the module. All nine students who

participated in the final interview agreed that they did not have enough time to

do everything they wanted to do each week in the IIM-HH.

<u>Means of Assessment</u>

Another theme of content functionality is the means of assessment provided by the IIM-HH. The IIM-HH was designed so that students could self assess their performance through the selected response method of the quiz in *Do You Know?,* through reading the constructed responses of others to the problem solving activities in *Write On*, and by completing the daily physical activity logs and receiving feedback from the module giving them the total amount of time they were physically active in *Log It*. There was no technical mechanism to provide the teachers a record of the students' responses. The primary ways for the teachers to assess student performance were through observation, social interaction during participation, and through the points earned weekly by the students.

Strengths

The students received immediate feedback on their responses to each question in the quiz, allowing them to recognize the correctness or incorrectness of their response. The feedback included an explanation why a particular selection was right or wrong. If the student submitted more than one wrong response, he/she was immediately returned to the content in Get Smart. During an informal interview with Ms. Smith after she had reviewed the module content for the first time, she commented that she was particularly impressed with the way the design of the quiz allowed for immediate feedback and included an explanation of the correct response. One student in the final interview talked about the quiz format and said:

Yeah, it gives us the (right) answer, but if you look at the answer and see

what you done wrong, then maybe it will help you learn. ...sometimes I

would click on the wrong one and I would have to go back to Get Smart

and make sure of the two questions I missed, and I would go back to the

quiz.

A few of the student comments on the final questionnaire indicated that

the activity logs helped them recognize their activity levels. One student wrote

that she liked Log It because "you could go in and print what you did, and it was

a good way to keep track of what you did". Another child said that it helped him

remember the physical activities that he had done during the week. During the

final interviews, the students were asked if completing the daily activity logs had

made them think more about being physically active. All the students reported

that it did make them think more about their personal level of physical

activeness.

Weaknesses

Because of limited computer access, the students had to complete their

activity logs all on one day each week, rather than daily. Although the teacher

required them to keep track of their daily activities on a piece of paper, this did

not provide the same type of self-assessment opportunity as if the student had

logged his/her activities daily, reflected on the time and intensity of that day, and

thought about how to improve/maintain the next day's physical activity.

Additionally, the logs probably did not as accurately represent the true physical

activity levels of the individuals as they would have if they had been completed daily.

The students could not see the "big picture" of their physical activity patterns, based on the information submitted on the physical activity log weekly. Once the log was submitted and the student was given the total number of minutes they were physically active on a given day, the student never dealt with that information again. To better assess their overall physical activity patterns, the students need to see a summary of their logs on perhaps a weekly basis.

Because of time constrains as discussed above, the students did not read others' responses to the Write On activities on a regular basis, and therefore, this mechanism of self-assessment was not adequately used by the students.

In addition, teachers did not know what the students were submitting, and were unable to hold them accountable for their work, something they preferred to do. Ms. Smith said that she didn't feel like she could "grade" them on what they were doing in the IIM-HH, because she didn't have a copy of their work, or any way of accessing what they were submitting.

It would be nice to see what it is that they ARE writing, so that I can hold

them accountable. Because, if not, who knows what they are going to

write, and type, if they don't know that you can actually see it.

Both teachers indicated that they would like to give their students a grade on their responses in the Write On activities, but they needed access to what they were actually submitting to the module.

User Recommendations for Change

Teachers and students made the following recommendations for change related to means of assessment of the IIM-HH:

Teachers

- Ms. Jones recommended that a form be included in the *Guidelines for Teachers* that listed all of the Write On activities so that it could be printed out and distributed to the students to give them an opportunity to think about their responses before they are asked to respond in the IIM-HH program. She also indicated that this was necessary so that she could require the students to write their responses on the forms before typing, which would then allow her to collect and grade the responses before the children submitted them on-line.

- Both teachers recommended that a test that reviewed all the information covered in the instructional unit be provided either on-line or in the teacher's manual. Ms. Smith said:

    It would be neat to have an overall, end of the unit type of quiz/test, but have it assessable where they (the students) don't have to get everything right like they do when they submit the quizzes...just to see what they do...what they know...

- Both teachers recommended that the module include a mechanism so that they could retrieve the information that their students were submitting to the IIM-HH, including the quizzes and logs they had submitted, and the number

of points that they had accumulated at any given point in the four week module.

Students

- Two of the nine students recommended in the final interviews that the quizzes should be changed so that the user is not told the right answer if they select the wrong one. They believed that this made it too easy for the partners waiting to take the quiz.

Four students out of 41 on the final questionnaire (Appendix J) recommended that the quizzes be changed or omitted completely. Three indicated that the questions were too hard and took too long to read, and one simply said, "I would recommend not having the tests, because almost everyone hates tests!".

The Extrinsic motivators of the IIM-HH

The third theme of content functionality related to the extrinsic motivators of the IIM-HH. As discussed in the technical functionality section of this chapter, the students received points for participating in designated sections of the module - 25 points per week for a total of 100 points. They could earn five (5) points each for submitting two writing activities (Dear Gabby and Your Opinion Counts), five (5) points for successfully completing the quiz, and 2 points each for submitting physical activity logs (maximum of 10 points a week). At the conclusion of the module, the children could select a prize according to the number of points that they had accumulated over the four week period. In addition, if the student had at least 90 points accumulated, his/her name was

also placed in a drawing for the "grand prize". (See Appendix ?? for the

point/prize structure in the IIM-HH).   The points and prizes appeared to be a

motivating factor, both positively and negatively, throughout the module. A few

examples of how the points positively and negatively affected students overall

attitude about the IIM-HH were reported in a preceding section of this chapter

on the technical functionality of the point system. Due to the malfunction of the

technical programming of the point system, it is more difficult to evaluate the

strengths and weaknesses of the points as an extrinsic motivator in the content

of the IIM-HH. However, some obvious issues surfaced in the data analysis and

are discussed below.

Strengths

When introduced to the IIM-HH in the orientation activities, the teacher

introduced the point system of the module to the children and they were excited

at the thought of earning points for their work and selecting a prize based on the

points earned. They asked many questions about the prizes and how to earn

points, and wanted to talk extensively about it. When the program would tell the

students they had received points for a particular activity, most of them told their

friends or the teacher, and seemed eager to continue so that they could receive

more points.

Weaknesses

The students and teachers both felt that the activities that received points

were the most important, and had to be done first. The teachers announced to

the students at the beginning of the one hour lab time each week that they were "requiring" them to complete the activities that received points. Therefore, some of the activities that the students neglected were due to the fact that they did not have points attached to their completion, and the students felt that the activities that received points were their priority.

While the children were excited about receiving points, they did not seem to worry about the prizes until the last week of the module. Then they became very concerned about the number of points they had, and a few students even asked to quit the IIM-HH. Ms. Smith believes that they wanted to quit because they realized they were not going to receive enough points to be in the top prize group. When talking about the activities in the lab on the last day of the module, Ms. Smith reported that most of the students "were rather frantic about points".

User Recommendations for Change

The teachers and students made the following recommendations for change related to extrinsic motivators of the IIM-HH:

Teachers

- Award prizes weekly instead of only at the conclusion of the four week module was the recommendation of Ms. Smith. She noted that if students were rewarded weekly they could more easily see what they were missing, and be motivated to try harder the next week. It would also eliminate the end-of-the-unit-panic over points.

• She also recommended that a condensed version of the point system and prize structure be included on the exit page of the module. This page reported the children's points each time they exited, and she suggested that this would be a good location to remind the students of the requirements to receive certain points and prizes.

Students

• Some students recommended that more points be given for Log It submissions and the quizzes. One student said they should be worth more points because they were "harder".

• One student's response to the IIM-HH points structure was:

> I wouldn't change it (the points)...I mean, it's like if you're the one....you've got to earn the money, and they give you the right amount of money, and if you don't come to work about 5 days in one week, then you won't get paid that much.

Evaluating Specific Module Components

The final theme of content functionality was the evaluation of the content of specific components of the IIM-HH -- the components of *Get Smart, Do You Know?, Write On, Ask Experts,* and *Log It.*

Get Smart

Get Smart was the section of the module that provided the text-like factual information that would guide the weekly activities in the module.

Strengths

Both teachers commented on the appropriateness of the content of *Get Smart* for their fifth grade curriculum. Ms. Jones also liked the way the information was organized, easily accessible, and clearly presented. Ms. Smith commented on the amount of information, and felt that it was appropriate and provided enough "extra" information for students who were eager to learn more.

The students liked the *Get Smart* section of the module. On the final questionnaire, seventy-seven percent (77%) said that the *Get Smart* section of the module was "good" or "awesome" (Appendix J).   The features of this section that they commented on the most were the "pictures", particularly of the inside and outside of the heart, the smoker's lungs and heart, and the posters about smoking. Some also commented on other graphics, including the "beating" heart.

Weaknesses

Some of the information in *Get Smart* was displayed as questions for the students to answer, but the student could not actually type the answer in this section of the module. This created concern for both the teachers and the students.

In Week 3, Ms. Jones noted that children were asked to answer questions about food labels but in order to see the questions on the screen, they could no longer see the labels, so they had to scroll back and forth. She also noted that in instances where the students found it difficult to complete a task, they seemed to just skim that section and move on.

Some of the students felt that there was too much information in this section of the module. With their limited time to work on the IIM-HH, they could not read all of the information.

Recommendations for Change

Teachers and students made the following recommendations for change for *Get Smart:*

Teachers

• Change the sections in Get Smart that appear to be interactive but are not.

• Include a printout of the labels in the Teachers Manual so that they can be distributed to the students for use with Week 3 information in Get Smart.

Students

• Add additional phonetic pronunciations for the harder words in the content.

• Shorten the length of the content in Get Smart.

• Add more interactive features, animation, and video and sound clips.

Do You Know?

Do You Know? was the section of the IIM-HH that allowed students to complete self-tests about the content in *Get Smart.*

Strengths

Most of the students liked doing the quizzes each week. When the students were asked on the final questionnaire how they felt about this section

of the module, 75% of them said it was "good" or "awesome" (Appendix J). The

teachers also liked the quiz, and felt that it was a good representation of the

content in Get Smart.

Weaknesses

Although seventy-five percent (75%) of the students gave this section a

good (or above) rating, eight students specifically identified this section as the

part of the module that they "liked the least" (Appendix J). Reasons for these

responses were mostly based on the difficulty of the task, with such comments

as "I have to study too much" and " they were a little hard".

As mentioned in the technical functionality section of this chapter,

students could type any combination of letters/numbers for the bonus question

response, and the program would accept it. There is no mechanism to monitor

whether students attempt to answer the questions correctly.

Recommendations for Change

Teachers and students made the following recommendations for *Do You*

Know?:

Teachers

- Teachers recommended that the bonus questions either require a specific

    response that can be detected by the program or be deleted from the

    quizzes.

Students

- Some students recommended that *Do You Know?* be eliminated completely from the module.

Write On

    Write On is the component of the module which encourages students to apply the factual information to their own lives through writing activities that require problem-solving and thinking skills. *Write On* included three writing activities each week - "Dear Gabby", "Your Opinion Counts", and "Extra, Extra, Read All About It".

    Strengths

    Overall, *Write On* was the students' favorite section of the module. On the final questionnaire, eighty-five percent (85%) rated it "good" or "awesome", the highest rating of any section in the module (Appendix J). Eleven (11) students gave reasons why the writing activities were their favorite parts of the module, and only one student reportedly did not like *Write On.* The students said it was "fun", and it gave them opportunities to give their own opinion. One student said he liked the way it "made me feel like I was helping other people", and one mentioned that he liked it because "you can tell your opinion on things that can really happen". (Examples of the student's written submissions are included in Appendix K).

    Weaknesses

The students only participated in "Dear Gabby" and "Your Opinion Counts" because those sections received points in *Go for the Gold*. "Extra Extra, Read All About It" was only submitted a few times throughout the four week period.

As discussed in the previous section of this chapter on assessment means, the teachers had no way of evaluating the students' submissions. They saw this as a weakness.

Recommendations for Change

The following recommendations were made by the teachers and students for *Write On*:

Teachers

- "Extra Extra" submissions should receive points.

- The teachers need a way to access the students' submissions, ideally, before they submit them to the IIM-HH.

Students

- Include more writing activities in the module.

Ask Experts

Ask Experts section of the IIM-HH allows students to ask experts questions about the weekly topics and receive responses via e-mail and also through a posting on the module.

Strengths

The children who participated in this section of the module said that they really liked receiving responses from the experts. The questions seemed appropriate, and the experts' responses seemed comprehensible for intermediate grade students. The teachers reported that the students enjoyed this section of the module, even if they did not ask a question, because of their responses to the group discussions that the teachers conducted when an expert response was received via e-mail and read to the class (see Appendix F for the students' questions and experts' responses).

Weaknesses

Most of the children did not see the questions and responses that were posted on the module each week. Both teachers and students attributed this to lack of time at the computers.

The children were unable to retrieve their own e-mail, therefore, they were dependent upon the teacher to copy the expert's response and give it to them. Some students reported in the interviews that they had not seen a response to their question(s), and thought the expert had not responded.

Recommendations for Change

Neither the teachers nor the students had recommendations for changes to *Ask Experts*.

Log It

The *Log It* section of the IIM-HH allowed the students to complete and submit a daily physical activity log that identified physical activities in which they participated, the time of participation both during and outside of school, and the perceived intensity level of each physical activity.

Strengths

Most of the students liked completing the daily physical activity logs in *Log It*. On the final questionnaire, seventy-five percent (75%) of the students said that they thought that Log It was "good" or "awesome", and ten (10) students cited *Log It* as what they "liked most" about the IIM-HH (Appendix L). The reasons they particularly liked *Log It* ranged from the way it functioned technically (i.e. choose from pop-up menus), to the opportunity it gave them to think about the physical activity they had done the day before. Once the children learned how to complete a log, most were able to do it in less that five (5) minutes.

Weaknesses

Due to limited computer access, the children were unable to complete activity logs on-line each day, and therefore, were dependent upon their memory or a record of their activities on paper to recall activities they had done up to five days before. Some students were completing logs up to two weeks after the actual activities occurred, which essentially voids the validity of the data submitted.

Eight (8) students named *Log It* as what they "liked the least" about the module. Most of these students disliked completing the activity logs because they said it "took too much time" , "it was boring", "couldn't get on the computer every day", and because they had to write it down on paper.

Two students commented on the complexity of completing the "in school" portion of the activity log. One student said that she had never thought about the difference between "recess" and "PE", and that, even at the end of the four weeks, it was still difficult for her to complete that section of the log correctly.

During the orientation activities, Ms. Smith gave two different explanations for determining recess and PE times each day. Therefore, the students' responses to physical activity time during school were inconsistent.

As mentioned in the "Means of Assessment" section of this chapter, the students could not see the "big picture" of their level of physical activeness, because they could not review a summary of the information that they had submitted on a daily basis.

Recommendations for Change

The teachers made the following recommendations for change to *Log It*:

- Include a condensed calendar in the *Teacher's Manual* that can be copied and distributed to the students so that they can keep track of their daily physical activities when they are unable to access the module.

- Add more minutes from which the students can select in the pop-up menu that designates time spend in a specific activity.

- Change the minutes categories to ten minute increments instead of five

  minute increments.

<u>Contextual Influences</u>

It became apparent through the data analysis that, although the inquiry focused on the technical and content functionalities of the IIM-HH, a number of contextual factors had a significant influence on the extent to which the technology and content designs could function. Some of the technical variables specific to the context that were significant in this study included the computer hardware in the school, the Internet web browser that the computers accommodated, and the functionality of the server. Other contextual factors that influenced the quality of instruction of the IIM-HH were the computer setting in the school, and the teachers' decisions in using the IIM-HH with their students. Although reference is made to contextual influences throughout the preceding two sections, it is important to discuss these contextual issues and their influence on the functionalities of the IIM-HH in order to better understand the limitations of implementation in various contexts, and to take measures, whenever possible, to reduce the negative influences that contexts may cause. The contextual themes were (1) the consideration of the technological variables of the computer hardware, the choice of Internet browser, the functioning of the server, and the browser settings, (2) the computer setting in the school in which the students could work, and (3) the way in which the users chose to use the IIM-HH.

Technological variables that affected functionality

Computer Hardware and Internet Browser

The school had three computer labs, all connected to the Internet. Two labs contained mostly 386 PCs, and a few 486 PCs. The newest of the labs was equipped with Pentium processor computers. Although the principal and technology teacher believed that all computers in every lab were equipped with Netscape 2.0 or higher, the computers in the two older labs had only Netscape 1.0 or 1.22 installed. Once discovered, the principal had Netscape 2.0 and 3.0 installed on the school's file server, with the assumption that this would give all computers in the school access. Due to the limited capacity of the computers, these versions of Netscape could not be accessed. Therefore, the students could not participate in the IIM-HH from these computers. This was significant because the participants believed that all computers in the school were adequately equipped to use the IIM-HH, and had planned to use the two older labs two days a week, and the newer lab (the fifth grade classroom) one day a week for participation in the IIM-HH.   Consequently computer usage for the IIM-HH was limited to one day a week for one hour. As indicated in the previous section, this drastically reduced the time the children spent working on the module and necessitated extending the project beyond the proposed four weeks.

Another contextual consideration was the browser application selected for use. The computers in the fifth grade lab had both the Microsoft Internet

Explorer (MIE) 3.0 and Netscape Navigator 3.01 applications loaded to access

webpages on the Internet. MIE was displayed prominently on the desktop of the

computers and students used only the MIE browser when accessing the Internet

from this lab. Netscape Navigator was not easily accessible. The principal said

MIE was chosen over Netscape Navigator because of its pleasing appearance

and additional features. During the orientation weeks of the implementation,

the investigator and technology teacher tried to access the IIM-HH using MIE.

The front page of the module appeared, but access to the rest of the module

was denied. It was then determined by the technical producer of the IIM-HH that

Microsoft Internet Explorer 3.0 does not support Javascript, and therefore,

cannot run the IIM-HH.

Server

The functionality of the program server and/or university network also

played a significant role in the effectiveness of the module. A few days during

the field test, the server was not functional for the entire day, so the students

could not access the IIM-HH, and therefore, could not participate in the module

activities as scheduled. The server proved to be problematic for the

investigator, as well, in completing tasks on schedule. A number of times minor

setbacks occurred such as being unable to retrieve e-mail or being unable to

view the IIM-HH at a given time of the day or night to add new information to the

file server.

<u>Browser Preferences Settings</u>

The computers used for the field test had different resolution settings and different font settings in the browser preference settings, causing the content of the module to appear differently on different computers. Consequently the content seemed smaller and somewhat less appealing than on the Macintosh computers where development had taken place. Although this did not directly affect the functionality of the module, it could influence the content appeal and the users' desire to participate.   Also, as indicated earlier, if a SMTP host had not been identified in the preferences settings, e-mail could not be sent to Healthy Hearts using the e-mail form provided in the module.

<u>Instructional Setting of the Computers</u>

Whether the students participated alone or with a partner at the computer, how many days per week they have computer access, and whether they work in a classroom or a lab setting are all determined by the context in which the IIM-HH is implemented. Thus the learning environment for the children, in addition to the actual computer hardware and software, also influenced how the children interacted with the module.

<u>Student Participation Alone or with a Partner</u>

In the field study, students worked primarily with partners. They could have completed the weekly activities much more efficiently if they were working alone.   Of the nine students interviewed at the completion of the study, seven said that they would rather work on the IIM-HH alone. One student commented

"I think if we were by ourselves we would have all done it a lot faster", and the other three children agreed. Since time was limited to one hour a week, getting things done expeditiously was of primary concern for the students. Both teachers commented that if each student could have their own computer to work alone or if there were at least ten computers in each of their classrooms, that "would be ideal".

Lab Setting

The students worked primarily in the 5th grade computer lab for one hour each Friday, but were able to individually access the module via the two computers in their classrooms during the four week module. They seldom did. Some students indicated that lack of time prevented them from completing Healthy Hearts activities in the classroom expressing the concern they would then miss something else they felt was important. Ms. Smith confirmed that the children were given opportunities to complete IIM-HH activities in the classroom, but mostly during break time and physical education class . Ms. Jones said that her lack of experience in integrating computer usage into her curriculum hindered the use of the two computers in the classroom which might have been used for activities such as Log It or Write On. In the future she would plan differently and make better use of the availability of on-line computers in her classroom.

How the Users Chose to Use the IIM-HH

In addition to time and computer functions, how teachers and/or students choose to implement the module will also influence the quality of the learning experience. Even though a Teacher's Manual is provided that includes suggestions for implementation, and directions given throughout the module, there is no guarantee that the module will be used by the teachers and the students as the developers intended.

Teachers

Some of the ways that teachers varied from the intended procedures of module usage have been highlighted within the discussions of the content and technical functionalities of the instructional unit (i.e. the procedure used to access e-mail messages, the time allowed for classroom computer access to the IIM-HH, the choice not to extend the content of the IIM-HH outside the one hour in the computer lab, and the main emphasis of task completion being those activities that received points). Another variation from that intended by the developer that seemed to impact the effectiveness of the module was the teachers' decision to require students to submit their work on paper prior to entering it into the computer.

During the last two weeks of the module the teachers decided to require the students to write down their physical activities each day, and to also write on paper their responses each week to the writing activities, Dear Gabby and Your Opinion Counts. Ms. Jones required them to submit their responses to her each Friday morning of Weeks 3 and 4. The writing activities were assigned as homework, although some of the children were observed writing their

responses on paper during their time in the computer lab. Mrs. Jones said that she felt the children "needed the thought process of writing down their logs and writing responses" even if they could use the computer every day. Both teachers agreed that they needed something in writing from the children to account for the work they had been doing in the IIM-HH. Ms. Jones did say:

> But then again, it does kind of take the fun out of it. I know just as I required things like that, it wasn't as much fun, because it wasn't as spontaneous.

Most of the children interviewed talked about not liking to meet the teacher's requirements of submitting what they had written in the program on paper. One student said:

> It's a lot easier to just put it in the computer. Sometimes the teacher would still make us write it, even if we had already put it in the computer...And if we didn't write it down, we missed recess.

In writing what they liked least about the IIM-HH at the end of the module, some of the children's answers were related to having to write their writing responses and physical activity logs on paper to submit to the teacher.

<u>Students</u>

One variation from the intended usage of the module was the decision made by a number of the students to take the weekly quiz without first reading *Get Smart*. If they were successful in submitting the quiz (i.e. missed no more that one), then they would just skip *Get Smart* altogether. They then wrote

opinions and responses to *Write On* tasks without adequate knowledge about the subject, which was presented in *Get Smart*.

Users' Overall Views and Additional Recommendations for Change

   In addition to those views and recommendations already presented in specific sections of this chapter, teachers and students expressed their overall views about the IIM-HH and general recommendations for changes. A general overview of the users' responses follow.

  Students Overall Views

   On the final questionnaire, 92.5% of the forty students responding indicated that they liked participating in the IIM-HH (Appendix J). Ninety percent (90%) felt that they learned a significant amount of new information from their work in the module. Most of the children indicated on a rating scale of 1-5, that they think more now about being physically active (87.5% rated 4-5) and eating healthy foods (77.5% rated 4-5) than they did prior to the module, and they felt it was very important to encourage friends and family members not to smoke (95% rated 4-5). The sections of the module that received the highest rating from the students were *Write On* and *Go for the Gold*. No section of the module had less than 72% of the respondents rating it "good" or "awesome". (see Appendix J for a list of student responses to the questions concerning what they liked most and least about Healthy Hearts)

When the children were asked in the final interviews if they liked using the Internet to learn, one girl commented:

> Yeah, that was a neat way. It's a lot better than just reading it in a book. I
> think for everybody, the computer made it a lot more fun!

They also agreed that the IIM-HH helped them learn more about the Internet, e-mail, and using computers, in general. When asked to think about what they would tell another student about the IIM-HH who was thinking about participating in it, most responded with words like "cool", "neat", "fun", "interesting". One boy, however, elaborated:

> I would tell them that it was a great program, and that when I got into
> Healthy Hearts I thought it wasn't going to be that fun, but once I really
> got into what it was like, I really loved it!

Students Additional Recommendations for Change

Although the children liked the module, they also had suggestions for improving it. In addition to the ones already cited, they included:

- Add more color to the module. Two students suggested using a different background each week, such as having a heart background for Week 1, a "heartbeat line" background for Week 2, and so on.

- Not surprisingly the children also wanted more choices for prizes.

Teachers' Overall Views

The teachers were also favorably impressed with Healthy Hearts. They agreed it fit well into their health and science/technology curriculums in meeting

the state required Standards of Learning for their students. Ms. Jones

commented on the potential the IIM-HH has in making her job easier and

providing a new and interesting way for students to learn.

They also agreed the module helped to improve the students overall

computer skills and telecommunication skills. Ms. Smith also commented on

the improvements in the students typing skills and their confidence in working

with computers.

When we first started, they (the students) didn't want to do anything

unless I was standing right there watching them, because they were so

afraid that they were going to make a mistake. And then now, they just

pop on, and away they go (Mrs. Smith)

Ms. Smith said that she thought Healthy Hearts encouraged the students

to be more physically active, or at least, to think more about their physical

activity. She added that she thought it encouraged them to "think differently

about what physical activity really is".

When reviewing the final data sheet at the end of the four weeks that

listed the students' points, and the activities each student had completed

weekly, both teachers commented on the children who had the most points.

They said that many of those students were the ones who were either motivated

academically in all areas, or were very competitive children whom they felt were

primarily motivated by the point system. However, a few students who had

earned points in the top point bracket surprised them. They commented that

these few were typically not motivated to participate in many activities in the

classroom, but were obviously motivated by the IIM-HH. They attributed some of that motivation to working with partners who were more motivated.

Both teachers commented on the contribution the IIM-HH made to "independent learning". They both talked in the final interviews about the students becoming more independent in both the use of the computer and the module content as the weeks progressed. They noted that if they had been able to have more access to the computers, they felt that the students would have displayed even more independence and responsibility for their learning. At the end of Week 3, Ms. Smith said, "They are so self-sufficient now I don't know what to do with myself". In the final interview, she stated that the independence that the students have when participating in the module was one of the greatest advantages of the IIM-HH.

Ms. Jones talked about the need for teachers to be better trained to incorporate technology such as the IIM-HH into their curriculum. She said that her lack of computer skills and experience in integrating computer technology, particularly the Internet, into her curriculum was one of the drawbacks to using the module with her students. She believes that in eighteen to twenty-four months teachers will be more "advanced" in this type of technology usage, and can more effectively implement a module such as the IIM-HH.

Ms. Smith said that the orientation activities and the first week of the module were the hardest and "most stressful" for her, as the teacher. After that initial period, the module was easy for the students to use, and the students became self-sufficient in participating in the module. Ms. Jones advised

teachers beginning the program to "become very familiar with it before you start". She noted the importance of reviewing all content in the module, and planning means of student assessment.

In the final interview, both teachers talked about using the Internet in their curriculums, and the need for more organized information that is appropriate for their students and their curriculums. Ms. Smith said she sees the Internet as something she will eventually be required to use, and the problem is **how** to use it.

> For a teacher, you have to have time to sit down and surf, and to search, and to find things that are going to be appropriate for your classroom. And that takes a lot of teaching planning time. I can surf for one thing for half an hour sometimes, and that's just one little topic...and that's when I get discouraged with it...surfing the Internet. Healthy Hearts gets them on the Internet...and they're using the computers....and they're learning content....and it gave them the confidence that they needed to do other things (on the computers/Internet).

Ms. Jones gave this response to a question regarding her opinion of the greatest advantage to using a module such as the IIM-HH in her curriculum:

> ...incorporating computer technology into your curriculum. It makes it very easy. I'm not going to the Internet saying "Let's research this". It's using the Internet...the information's there...it's applying the information...it's all right there. It's a teaching module.

Teachers' Additional Recommendations for Change

As expected, however, the teachers has recommendations for improving the module. They were:

• Include all the content of the module in the *Guidelines for Teachers*, particularly the Teacher Resources and Activities listed each week in the Get Smart section

• Include an individual nutrition log, similar to the physical activity log, that would require the students to enter their daily diet intake, or perhaps, only the foods they ate for snacks. Upon submission, the IIM-HH would give the participant the number of calories or fat grams they consumed on a given day.

• Put the IIM-HH on a longer timeline, perhaps six (6) weeks.

Chapter Summary

This chapter began with a brief discussion of formative and summative evaluation, and the structure of the evaluation process for the IIM-HH. The formative evaluation procedures of this study were then described, including the data collection methods and data analysis techniques. The remainder of the chapter was a presentation of the results of the formative evaluation of the pilot study of the complete IIM-HH instructional unit. A discussion of the findings and the investigator's recommendations for change to the IIM-HH will be discussed in Chapter 7.

CHAPTER 7

SUMMARY, DISCUSSION, AND RECOMMENDATIONS FOR FUTURE IMPLEMENTATION

This chapter summarizes the study, followed by a discussion of the findings. It concludes by presenting the investigator's recommendations for change to the IIM-HH before future implementation should be considered.

Summary

The purpose of this study was to design, pilot, and evaluate the Interdisciplinary Internet Module - Healthy Hearts (IIM-HH) for intermediate grade children. Recent educational reform movements in the United States call for resources to help our students better use the computer technologies made available to them, particularly the use of the Internet (President Clinton's Call to Action...1997).   Reform agendas also call for better education for our children on health-related issues that can affect mortality, morbidity, and overall quality of life (U.S. Department of Health and Human Services, 1991). This study is one attempt to meet these needs by (1) providing an instructional unit on cardiovascular health that is designed not only to give children factual information about the cardiovascular risk factors of sedentary lifestyles, poor dietary habits, and tobacco usage, but to also provide them opportunities to

develop health-promoting skills and to apply those skills to their everyday lives, and by (2) using the Internet to deliver the instruction.

The development of the IIM-HH was grounded in Bronfenbrenner's Systems Theory of human development. It suggests that behavior evolves because of the interplay between a person and his/her environment, and focuses on both the natural tendencies and interests of a person, as well as the contexts in which development takes place (Bronfenbrenner, 1979). Through the interactions provided by the IIM-HH, it was hoped that the student would be encouraged to (1) gain new information that may not be emphasized in their current curriculum, (2) apply the information to their own lives, even if it is not practiced by others in their microsystem (i.e. their parents, friends, family), (3) communicate with others outside their mesosystem, such as other students participating in the IIM-HH, and experts, and (4) realize that they can make personal health choices that can affect their lives, regardless of the choices of people within their immediate environment.

In developing any unit of instruction, many components of the development process must be considered before development can be complete (Gentry, 1994). For the IIM-HH Instructional Development Model (adapted from Gentry's IPDM Model of Instructional Development, and Shambaugh and Magliaro's (1997) Model of Instructional Design), the investigator chose the components of needs and goals, design, production, piloting, evaluation, and support considerations as necessary to the successful development of the IIM-HH (see Figure 3.10).

The design of the IIM-HH was based on six guiding principles that gave a theoretical basis for determining what was important in the instructional unit and how it would be presented. These principles primarily reflected constructivistic views of learning, although some traits of the behaviorist and cognitive psychology theories are obvious, as well (Shambaugh & Magliaro, 1997). Cooperative learning, generative learning, situated learning, integrative environment, direct instruction, and contingency management were the instructional strategies (i.e. models) around which the IIM-HH was modeled.

Once the module was designed it was piloted at an elementary school with intact classes of 5th grade students and their teachers. The students participated in the IIM-HH for a total of eight (8) weeks (Figure 5.1). During each week of actual implementation into the curriculum, the students participated in IIM-HH activities for one hour, one day a week.

The investigator used multiple sources of data collection (i.e. observation, fieldnotes, interviews, questionnaires, subject-produced written documentation, electronic data) to qualitatively evaluate the success of the IIM-HH at this stage in development - its strength, weaknesses, and changes necessary to become an effective instructional unit. This formative evaluation paid particular attention to the technical functionality of the IIM-HH, its content functionality, the contextual factors that influenced the effectiveness of the instructional unit, and the teachers' and students' views and recommendations for change.

From these results, it became obvious that significant changes needed to be made to the IIM-HH before it could be an effective means of instruction for a large population of intermediate grade students and their teachers. Therefore, the design/production of the module should be revised, based on the findings of this study, and then should undergo further formative evaluation before considering a summative evaluation to determine if it has met the overall instructional goals.

Discussion of Results

Results from the formative evaluation of this study provide support for the use of the Interdisciplinary Internet Module - Healthy Hearts (IIM-HH) as a viable unit of instruction for intermediate grade children. However, a number of changes must be made before the development of the instructional unit can be completed and the unit successfully implemented. The following discussion of results is organized according to (a) technological context, (b) time, (c)interactive features, (d) means of performance assessment, (e)extrinsic motivators, (f) content of specific sections, and (g) other influences on instructional effectiveness.

The Technological Context

The evaluation part of the study provided important insights into the technological context of the IIM-HH (i.e. the technology itself without regard to the content). One significant discovery was the limitations caused by the selection of the application software (i.e. browser) that allows access to the

Web pages. Because of the use of JavaScript language in the technical design

of the IIM-HH, a browser that supports such language is required (i.e. Netscape

Navigator 2.12 or higher). Unfortunately, it appears that many school

computers, even though they have Internet access, did not have the capacity to

run browsers that support JavaScript. Therefore, these on-line computers at the

school could not access the IIM-HH, as designed. It also became obvious that

even the latest Microsoft Internet Explorer (MIE), at the time of the study, did not

support JavaScript language so, therefore, could not run the module. According

to the technical producer (David Carter-Tod), it may be necessary to reconsider

JavaScript's role in the IIM-HH, and also to test the IIM-HH using the new

version of MIE, which reportedly has JavaScript capabilities.

Another related important finding is that the school's 386 and 486

computers did not have the capacity to run the newer versions of Netscape

Navigator, and therefore, could not access the IIM-HH. The IIM-HH was only

successful viewed and completely operational on the Pentium PCs.

It also became obvious during the study that an "exosystem"

(Bronfenbrenner, 1979) of website instructional delivery, the program server,

plays a major role in the effectiveness of the module . In the case of the IIM-HH,

both the program server and the university network system were "down" on

occasion, causing the IIM-HH to be unavailable to the users. This caused

significant problems during times when IIM-HH instruction was planned, or

when IIM-HH personnel were adding new information to the file server and

retrieving e-mail. One solution regarding the server might be to deliver the IIM-

HH from a server where personnel can be employed to monitor the IIM-HH throughout its implementation. This is especially important if the module will be used in different time zones or even by children at home before or after school.

The last technological context issue to be discussed here is that of the instructional setting of the computers in the school. In this study, most students participated in a lab setting which required students to work in pairs. Many students expressed a desire to work alone rather than in pairs. They felt that they could complete the activities in the IIM-HH quicker, which was important with the limited time for instruction in this implementation. It appears that the technical functionality of accessing the module played a role in their desire to work alone. Because only one student could "log on" at a time, cooperative learning was stifled. If the technical functions of the IIM-HH could allow for joint access (i.e. where students working together could both receive points or credit for their work) then working together in a cooperative learning atmosphere would be better promoted.

<u>Interactive Features</u>

These technical problems can be overcome in future versions of the IIM-HH which is fortunate because this study found that the interactiveness of the Internet provides many opportunities for learners that may not be typically available to them in the educational setting. For example it was possible for the children to have access to new information and meaningful activities, submit responses to learning tasks, see others' (from outside their environment) responses to the same problem-solving tasks, communicate with experts, and

receive immediate feedback for completing activities (point system, quiz). None of these features were available in their current classroom settings.

Because students are encouraged to work on their own with little or no adult intervention the interactive features within the module are extremely important. Clearly defined navigational tools and means of accessing and exiting the unit allowed the children to became comfortable very quickly with these procedures. The IIM-HH navigational bar, (i.e. frame) appeared to be "user-friendly", and the students, for the most part, could easily find the information they were seeking at a given time. It appeared that displaying the navigational tools as a frame that consistently appeared around each page contributed to the success of the children in navigating the instructional unit. However, accessing the module was quite complicated for the children because it required typing in long e-mail addresses and passwords. As the students recommended, another method of assigning passwords, and of accessing the module needs consideration, such as personal selection of password, and perhaps pop-up menus to access state, school, teacher, and student. It also became obvious that the teachers need access to student passwords in order to assist them if problems arise during the use of the module.

The questionnaire that the students were required to complete in order to acquire a password provided a rich description of each child that could contribute to future research in a number of areas. From the IIM-HH questionnaire, the investigator collected data on students' attitudes about physical activity, their self-rating on physical activities, their school physical

education schedules (i.e. PE teacher, classroom teacher, time, days per week),

favorite physical activities, parental involvement in physical activity, parental

encouragement for participation, daily fruits and vegetables consumption, and

favorite fruits and vegetables. The interactiveness of the Internet allows for

flexibility in the questionnaire content, and for immediate retrieval of the data,

once submitted. This could provide a valuable resource for researchers to

sample children's perceptions and behaviors from throughout the world.

       The use of a Filemaker Pro database on the server allowed the

investigator to have access to a wealth of information on each students'

physical activity patterns, their perceptions of time and intensity of their physical

participation, and their responses to the writing activities, supplying her with

data on the student's application, analyses, and syntheses of the health-related

information of the module. For further studies, this data could potentially be

correlated with data gathered from the questionnaire each student completes at

the onset of the IIM-HH participation, to gain a better understanding of

children's behaviors related to physical activity, eating patterns, and tobacco

usage. The database can, perhaps, also provide a mechanism by which

classroom or physical education teachers can retrieve students' submissions to

the IIM-HH for assessment purposes, which will be discussed in a subsequent

section.

       The interactiveness of the use of electronic mail also provided

opportunities for users of the IIM-HH to communicate with others outside their

immediate environment. The students communicated with experts on the

health-related topics presented in the module, and they submitted their new ideas that they wanted to include in the Movin' and Groovin' section of the module. It also provided timely communication between the teachers and the developer, which allowed the teachers to ask questions, voice concerns, and seek solutions to problems in their settings, provisions that cannot be provided through traditional delivery modes of instruction (i.e. books, videotapes, etc.).

One other recommendation from users concerning the interactiveness of the IIM-HH was to provide more interaction within the content itself. The children suggested that more interactive graphics, animation, and video clips be added to the content to make the text more exciting and appealing.

Time

The timeline of the IM-HH and the time required for successful implementation the module were two issues that surfaced from the data analysis. From the findings of this study, it appears that students need more time than one hour a week to successfully complete the components of the module as intended by the developer. A contextual factor that influenced the amount of time needed each week was the number of computers available for use, which dictated if a child participated in the module alone, or with a partner. Due to the technical function that requires assessing the module individually, more time was needed for those working in pairs than those working alone. Since children in a school setting will most likely be working in pairs at the computers, it seems reasonable to suggest that the technical functions of the IIM-HH should better accommodate students working in pairs.

Another consideration concerning the timeline of the module is the length of time that the class (school) has access to the instructional unit. The IIM-HH was planned on a four week timeline, with an additional week for orientation activities. The study showed that consideration should be given to extending the timeline, perhaps to eight weeks, and to give users more discretionary time to complete the activities in the module. Conforming to the strict timelines of the module, as it is designed now, seems to reduce the students opportunities to participate in many of the activities on the module that they expressed interest in completing, but did not, due to limited time factor. The timeline appeared to stifle their active learning, and their use of some of the important interactive features that the Internet made possible.

Means of Performance Assessment

In addition to the amount of time available for the children to complete the module, a means through which the classroom teachers could assess student performance also needs to be devised. The IIM-HH provided for assessment through successful completion of the quiz and through the points awarded for submitting writing (i.e. contingency management), as well as through self-assessment tactics such as comparing personal responses to those of others found in the module. However, there was no mechanism through which teachers could assess their students' performance. The teachers expressed a need for such changes to the module. It would, perhaps, be possible, as mentioned earlier, for the database to provide access to all of the student data

for the teachers to retrieve. If not, another way for teachers to monitor student performance needs to be devised to accompany the instructional unit.

Another technical function that should be developed to help with performance assessment is that of a mechanism through which students can see a summary of their physical activity logs on a weekly basis. As designed now, the students submit their logs, but do not have access to the information again, therefore, do not actually self-assess their overall physical activity patterns.

Extrinsic Motivators

The point system of the IIM-HH seemed to be a motivating factor in the students' eagerness to participate in the module and in the selected activities. A theme that emerged in the data related to technical functionality was that of the effectiveness of the point system as it was programmed. Throughout the implementation of the instructional unit, glitches in the programming of the point system consistently surfaced, causing the program to report the wrong points to the students. This discouraged the children, and caused many complaints to the teacher, over which she had no control. Although many of the problems were detected during the pilot, some still remain, and must be corrected before continued implementation.

The point system also appeared to affect the functionality of the content because most children used it as a guide in selecting activities in which to participate. Children tended to complete the activities that awarded points first, leaving other important activities until last, and, many times never getting to

them. (As indicated above, the amount of time that the children had to participate in the IIM-HH was also a factor here.) This would indicate that, if the points system remains a part of the IIM-HH, consideration should be given to awarding points for all activities in the module in which the students can participate.

The teachers recommended that a better way to award prizes might be to award them weekly, rather than at the conclusion of the unit, as it presently stands. They felt that this would give the students weekly incentives that would be more effective and would be easier for the students to track. Problems would arise, however, in the number of prizes that this change would require, and in the tracking and delivery of the prizes. Perhaps another type of "prize" or incentive could be used weekly, such as certificates, that could be sent to the student electronically each week.

Other Influences on Instructional Effectiveness

In addition to the prizes another important contextual factor that has influence on the overall effectiveness of the IIM-HH is how the users choose to use the content. In this study, the teachers' decisions that the investigator felt had a significant impact on the module's effectiveness were (1) they *required* students to complete the activities that received points, (2) they did not allow them to use e-mail, (3) they required the students to submit to them their writing activities and activity logs on paper, and (4) they did not extend the content outside of the one hour in the lab. They reported that these decisions were based on the (1) limited time to participate in the IIM-HH, and they wanted them

to have the points they needed to receive prizes (2) lack of computer/Internet knowledge and lack of experience in implementing computer activities into the curriculum, (3) overextended school day, and (4) accountability for what the children are doing/learning.

Both teachers indicated that their inexperience in using the Internet for instructional purpose hindered their use of the IIM-HH. They felt that they would better use the information of the instructional unit if they had an opportunity to use it again, or another module similar to it. Ms. Jones also said that she would make better use of the available on-line computers in her classroom in future implementations. As with any technological innovation in a school setting, it is clear that the expertise of the teacher will be an important factor in how the innovation is implemented. Although IIM-HH was designed to rely on teacher expertise as little as possible, it is clear that teachers will always play an important role in the implementation of IIM-HH.

Teachers and Students Overall Views of the IIM-HH

Even though the two teachers in this study were not as technologically literate as the developer might have preferred, it was clear it did not appear to impact the children's attitudes towards the IIM-HH. They found participating in the instructional unit "fun" "cool", and "interesting", and said it helped them learn a significant amount of new information and more about the Internet and using computers, in general.

The teachers reported that the IIM-HH "fit" well into their curricula goals, and was a new and interesting way for the students to learn. Ms. Smith said that she thought it made her students think differently about physical activity. They also felt it increased the students overall computer and Internet skills and suggested the experience was motivating to some students who where, otherwise, not very motivated to learn. They felt that the module encouraged students to think and work independently. Both teachers said that, with the push for them to implement the Internet into their curriculums, more instructional units such as the IIM-HH need to be available for intermediate grade students.

<u>Recommendations for Future Implementation</u>

Clearly some significant changes to the IIM-HH are necessary before it can become an effective unit of instruction for elementary classrooms. Based on the results of the formative evaluation of this study, the investigator makes the following recommendations for change to the IIM-HH:

<u>Technical Functionality</u>

To improve the technical functionality of the IIM-HH the following changes are recommended:

- Include a link on the Main Menu page to frequently visited pages that are presently embedded within sections of the module (i.e. *Write On* submissions, Experts questions and answers).

- Provide a mechanism through which teachers of each class can acquire a password automatically. If registration information is needed for teachers, then a questionnaire for teachers should to be added to the module which will assign them a password upon its completion.

- Develop a system for assessing the module where two children can log on together, and can both get points for submitting one activity. Consideration must be given, however, to parts of the module where cooperative work is not appropriate, such as *Log It.*

- If password assignment by the program is necessary, shorter passwords are needed, as well as a mechanism for the students or teachers to check the programs' recorded password for a particular individual in the cases when a student has trouble accessing the module.

- Develop a different means of gaining general (i.e. school, class) access so that those not registered to use the module cannot access it.

- Allow other CGI/JavaScript programmers to examine the programming of the points system of the module in an attempt to eliminate all glitches in awarding points when submissions are made by the users.

- Pilot the points system with a small number of children over a four week period before continuing another field test of the entire module.

- Develop a mechanism through which teachers can generate student data weekly (i.e. writing activities, logs, quizzes, expert questions), and individual accumulation of points.

- Develop a mechanism through which students can receive a weekly
  summary of their activity log data. Ideally, the report could be generated by
  the student weekly, and additional weeks added on in succession as the
  module progresses.

- Test the IIM-HH using the newest version of Microsoft Internet Explorer and
  consider making necessary revisions to accommodate this browser.

Content Functionality

To improve the content functionality of the IIM-HH the following changes are
recommended:

- Include all the activities in the point system that are considered important for
  the students to participate in. Particular consideration should be given to the
  Extra Extra writing activity, physical activities submitted for Movin' and
  Groovin, and questions that users send to Experts.

- More closely examine the possibilities and pitfalls of awarding prizes weekly
  to increase motivation and give students an opportunity to "start over" each
  week.

- Include a condensed version of the points system on the exit page.

- Consider adding more color and different backgrounds to the module.

<u>Specific Sections of Content</u>

The Interdisciplinary Internet Module-Healthy Hearts was divided into seven

sections. The sections below make recommendations for improving each

section of the module based on the results of this study.

The following recommendations are made to improve *Get Smart:*

- Change the sections in *Get Smart* that appear to be interactive but are not

  and therefore do not allow the students to put information in the blanks.

- Modify the content in *Get Smart* in Week 3 because the material appears to

  be interactive, but is not.

- Consider adding animation, movie and sound clips, and interactive features

  to *Get Smart*

The following recommendations are made to improve *Guidelines for*

  Teachers:

- Add to the teacher's guide a notice on the importance of the teacher

  checking the e-mail addresses in the registration procedure before the

  student submits the information to obtain his/her password.

- Include a printout of the food labels in Week 3 of *Get Smart* in the guide so

  that they can be distributed to the students

- Extend the *Get Smart* information in the teacher's guide to include the

  weekly headings and subheadings, and the teacher resources and

  activities.

- Include an overhead transparency of the navigational bar in the Guidelines for Teachers hardcopy.

- Provide a better explanation to teachers to help them distinguish between what they should consider "recess" and "physical education class" at their school.

- Include a calendar in the *Guidelines for Teachers* to manually keep a record of daily physical activities.

The following recommendations are made to improve *Do You Know?:*

- Develop a mechanism for detecting legitimate responses to the bonus question in the quiz.

The following recommendations are made to improve *Log It:*

- Disallow submissions of logs after a one week period.

- Add "60 or more" to the time increments in the pop-up menu of the physical activity log.

Overall

The following recommendations are made for the overall implementation of the module:

- Extend the module to 7 weeks, making Week 1 actual on-line activities to orient the user to the program, and Weeks 6 and 7 to make up activities missed and complete additional activities to bring closure to the instructional unit (examples: on-line "chat" with others who completed the program, a

final assessment of their knowledge of cardiovascular health, generate a

class activity roster based on the four weeks of physical activity logs

submitted by the individuals in the class)

- Emphasize to the teachers of future implementation sites the importance of

  adequate time allocation for optimal instruction.

- Conduct a second pilot of the complete module with the targeted audience

  and formatively evaluate.

Conclusion

In conclusion, it appears that the IIM-HH has the potential to be an

effective instructional unit for intermediate grade students and teachers. The

next step in the development of the IIM-HH is to make the recommended

changes to the design and production of the module. Once changes are made,

further formative evaluation is recommended before a summative evaluation is

in order to determine if the instructional goals that are part of the design of this

unit can actually be met by students completing the redesigned IIM-HH. Even

with recommended changes, there will always be contextual factors that will

have some degree of influence over the effectiveness and efficiency of the

instructional unit, as are indicated through the formative evaluation of this study,

and should be considered in any implementation effort.

The IIM-HH is an innovative instructional unit that can potentially

contribute to our educational reform agendas. The ability of this module, or any

similar instructional unit, to serve as an effective means of instruction not only

lies in the quality of the content and technical functionality of the module, but,

most importantly, in the technological context of the schools in our country, and

throughout the world. Will schools become equipped with on-line computers in

instructional settings? Will elementary students have access to the computers?

Will teachers attempt to successfully implement the technology into their

curriculums? Only time will tell.

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Appendix A

Contributors to the Design and Production of Healthy Hearts

The following people have contributed their expertise to make HEALTHY HEARTS possible.

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Appendix B

Partial Listing of Websites used as Resources for the IIM-HH

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Imperial Cancer Research Fund. Teenage smokers: Love holds the key.
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Physical Activity and Health: A report of the Surgeon General. [Online]
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http://www.amhrt.org/heartg/ag10.htm (Your heart is a muscle)

http://sln.fi.edu/biosci/healthy/disease.html (More about Heart Disease)

http://sln.fi.edu/biosci/healthy/stats.html (Heart Statistics)

http://sln.fi.edu/biosci/healthy/healthy.html (longer, happier life)

http://sln.fi.edu/biosci/monitor/heartbeat.html (practice counting heart beats)

http://www.ganesa.com/ganesa/~misc/foodpyramid.html   The Food Pyramid -

http://www.worldguide.com/Fitness/hf.html   The Worldguide Health and Fitness
Forum -

http://www.amhrt.org/heartg/ac9.htm Cardiovascular Disease Statistics from the
AHA

http://www.amhrt.org/heartg/ac16.htm Colestrol in Children by the AHA

http://www.amhrt.org/heartg/ad06.htm   Dietary Guidelines for Healthy Children by the AHA

http://www.amhrt.org/heartg/ad18.htm Exercise and Children - AHA's recommendations

http://www.amhrt.org/heartg/ag10.htm   Heart - How it Works by the AHA

http://www.amhrt.org/heartg/al27.htm Obesity in Children -

http://hyrax.med.uth.tmc.edu/ptnt/00000384.htm   Fitness for a Healthy Heart -

Appendix C

Weekly Outline of Events during Piloting of the IIM-HH

Orientation to the Module:

Week 1:   Gained access; obtained participant permission to participate; met with principal and teachers; planned schedule of IIM-HH implementation; teachers reviewed module; distributed *Guidelines for Teachers* in hardcopy

Week 2:   Prepared the available computers to use the IIM-HH (i.e. bookmarked the site, made Netscape 3.0 accessible); teachers gave students e-mail addresses; teachers conducted orientation activities with students

Curriculum Integration

Week 3:   First week of the IIM-HH implementation into the curriculum; students participated in activities in Week 1 of the module: *About the Heart* for one hour in the computer lab; students completed exit slips and teachers completed a weekly log at the end of the week;

Week 4:   Second week of the IIM-HH implementation into the curriculum; students participated in activities in Week 2 of the module: *Being Active for a Healthy Heart* for one hour in the computer lab; a few students were still completing activities from Week 1; students completed exit slips and teachers completed a weekly log at the end of the week;

Week 5:   Third week of the IIM-HH implementation into the curriculum; students participated in activities in Week 3 of the module*: Eating Right for a Healthy Heart* for one hour in the computer lab; many students were still completing activities from Week 2, and a few were still working on Week 1 activities; students completed exit slips and teachers completed a weekly log at the end of the week;

Week 6:   Fourth week of the IIM-HH implementation into the curriculum; although the students had access to the activities in Week 4 of the module, *Living Tobacco-free for a Healthy Heart*, most students were still working on activities from previous weeks, and many did not get to Week 4 activities by the end of the one hour class; teachers asked that the IIM-HH timeline for student participation be extended for another week; students completed exit slips and teachers completed a weekly log at the end of the week

Week 7:   Fifth week of the IIM-HH implementation into the curriculum; most students participated in activities for Week 4 of the module, although some were still completing activities from Week 3; this was the final week of student participation on the module, so students received their final points accumulated throughout the implementation; students completed exit slips and teachers completed a weekly log at the end of the week

Conclusion of the IIM-HH Implementation

Week 8:   Students were permitted by the teachers to return to the IIM-HH to view their writings and those of others, and to read student questions and Expert responses in *Ask an Expert* ; students ` requested earned prizes; students completed a questionnaire at the investigators request; teachers and nine selected students participated in formal interviews

Appendix D

Questions on the on-line student questionnaire required for initial registration

1. **Which statement best describes how you feel about being physically active?**

   I like to be physically active.

   I don't like to be physically active.

   I don't have strong feelings one way or the other about being physically active.

2. **Which statement best describes how you think you rate when participating in most physical activities?**

   I think I am better at performing many physical activities than most of my friends my age.

   I think I am as good at performing most physical activities as most of my friends my age.

   I think I am not as good at performing most physical activities as most of my friends my age.I don't know.

3. **Have you played on a youth sports team this year?**

   Yes   No   What sport?

4. **Do you take lessons or go to other functions on a regular basis (weekly) that involve physical activity, such as dance, gymnastics, skate boarding club, etc.?**

   Yes   No

5. **Which statement best describes how often you think your parents (guardians) are physically active?**

   One of my parents (guardians) participates in physical activity 3 or more times a week.

   Both of my parents (guardians) participates in physical activity 3 or more times a week.

One of my parents (guardians) participates in physical activity 1-3 times a
week.

Both of my parents (guardians) participates in physical activity 1-3 times
a week.

My parents (guardians) do not participate in any physical activity on a
regular basis that I am aware of.

6. Select the statement that best describes you.My parents (guardians) often
encourage me to participate in physical activity.

My parents (guardians) sometimes encourage me to participate in
physical activities.

My parents (guardians) seldom encourage me to participate in physical
activities.

My parents (guardians) never talk to be about physical activity.

7. On an average, how many fruits and vegetables do you eat a day?

8. Name three of your favorite physical activities outside of school.1.2.3.

9. How often do you think you participate in physical activities outside of
school?

10. On an average, how much time do you think you participate in physical
activity each day that you are active?

11. Do you have PE at school with a PE teacher?
Yes   No

12. Do you have PE at school with your classroom teacher?
Yes   No   # days per week

Appendix E

Formal Interview Guide for Students

Experience Questions

If you were to explain HEALTHY HEARTS to another student who was thinking about doing it, what would you say?

Experiences and behavior when working on the IIM-HH

Did you have any problems when using the module? Explain.

Was there any part of the module that was too hard for you?
too easy?

Did you need more time to work on it at school? If so, how much more time?

What was you experiences in working with Log It? Dear Gabby?   Opinion?
Quiz? Did you ever do Extra Extra? Ask Expert? Headline News?

Opinion Questions

Likes and Dislikes; Strengths and Weaknesses of the Module

What did you like best about the IIM-HH? dislike?

Do you think the information in the module was important? Did you learn
    anything about PA that you didn't know? about eating right? about
    tobacco usage?

If you could change the module to make it better, what would you change?

Do you have a computer at home that is hooked up to the Internet? would you
use IIM-HH at home?

APPENDIX E
Guiding Questions
Teacher Final Formal Interview

Experience and Opinion Questions:

About HEALTHY HEARTS in your Curriculum:

What has this HEALTHY HEARTS experience really been like for you?
greatest advantages to teaching with this module? biggest drawback?
biggest problems?

How would you describe HH to another teacher?

Student assessment - views on assessment opportunities in HH;
recommendations for change? anything else you are doing to assess learning
from HH?

Views about the Teacher's Manual....things that were particularly helpful...things
that needed to be included that weren't...

How beneficial was HH to your curriculum?

Feelings about components of HH - Get Smart, Do you Know?, Write On, etc.

About the Kids

How much did the kids work on HEALTHY HEARTS outside of the 1 hour?

After participating in the module, what do the children talk about?

Overall views about the kids' attitudes about HH; learning from HH?
What do you think they liked most about HEALTHY HEARTS? Least?

Recommendations for Change:

What do you think are the most important things to change to make it better for
you, the teacher?

What do you think are the most important things to change to make it better for
the students?

Is there anything that you think is "missing" in the module..that should in
included?

Recommended # of days per week and time per day.

Concluding Comments:

How would you describe your students computer/Internet experiences and skills? Yours?

Would you use this module or a similar module again in your curriculum, given the chance?

What would your advice be to a teacher who is thinking about using HEALTHY HEARTS or another IIM in her curriculum?

Appendix F

Students Questions and Experts Responses in *Ask Experts*

March 21, 1997
Question:
Dear Expert:
do you eat veggs every day.
Mason
The Expert's Answer:
Dear Mason,
I do my best to eat vegetables, as well as fruits, every day. There is a
national program called "5 A Day" that is designed to encourage all
Americans to eat 5 servings of fruits and vegetables each day. This means
trying to eat at least 2 fruits (an apple, banana, handful of grapes, or
even drinking a glass of orange juice) and at least 3 vegetables (a handful
of carrots, green beans, potatoes, broccoli, or corn) each day. Try a new
fruit or vegetable that you have never had before. Have fun and happy
munching!
Dr. Kathleen Poole

March 21, 1997
Question:
Dear Expert:
If you are fat can you get thin agin
love, amanda
Expert's Answer:
Dear Amanda,
If a person is overweight, he or she can lose weight to help get thin
again. The best way to do this is to eat a variety of low-fat foods and be
physically active for at least 30 minutes a day on most days of the week.
This means, riding a bike, going for walks, playing outside, and not
watching too much TV. The best kinds of food to eat are more fruits,
vegetables, spaghetti, rice, and grain cereal, and not eating too much
pizza, hamburgers, french fries, and ice cream. It doesn't mean someone
can never have ice cream, only smaller amounts. Losing weight takes time
and patience. Remember, happiness is being fit!
Dr. Kathleen Poole

March 13, 1997
Question:
do you like being phsiclly active
Corey
The Expert's Answer:
Dear Corey,

Yes, I like to participate in a variety of physical activities. My favorites are riding my bike, skiing, rollerblading, walking through the woods, and playing racquetball. I like the way I feel when I am physically fit. Being physically active is also one way I try to keep from getting too heavy.
Dr. Elliott

March 13, 1997
Question:
Dear Expert:
What would happen if you was to try tobacco and you don't get adicted to it? how would you hellp someone to stop.
do you like your job.
logan
The Expert's Answer:
Dear Logan,
If you were to try tobacco only once or twice, there would only be a small amount of damage done to your body and it would get better. Unfortunately, tobacco is very addicting and it is very difficult for many people to quit until quite a bit of damage is done. It is best not to try it at all.
You asked how to help someone to stop smoking. The most important thing is to help them to WANT to quit. It is hard to quit tobacco unless someone really wants to very much. You can help by explaining how tobacco hurts your heart and lungs, and how it causes cancer of many organs. You can also explain how expensive tobacco products are to buy. Most people feel much better when they quit using tobacco. You can also explain how tobacco can stain someone's teeth and make them smell bad.
You asked if I like my job. Yes, I like being a physician. I like helping people who are sick and making them feel better. However, doctors always like patients best who take care of themselves and who try to live healthfully.
Dr. Elliott

March 13, 1997
Question:
What would should someone do if they get addicted to tobacco? Also what would happen if you get addicted to tobacco and stop? Would that person Die? Why or Why not?
Brandon
The Expert's Answer:
Dear Brandon,
People who are addicted to tobacco are prone to a variety of illnesses, especially lung problems which make it difficult to breathe, heart disease including heart attacks, and cancer of the mouth, throat, lungs, and bladder. When someone stops using tobacco, some of the damage is able to repair itself, but many times there is permanent damage to the lung or heart or other organs which will never get completely better. Sometimes, of course, tobacco use leads to illnesses that result in death, even if someone stopped using tobacco if they stopped too late.
Dr. Elliott

March 13, 1997
Question:
Dear expert,
How long does it take for a heart to start to decay? Please answer bacck.
From, Aaron and Chris
The Expert's Answer:
Dear Aaron and Chris,
Just like the rest of your body, your heart begins to decay at the moment of death. Every living thing suffers constant breakdown of body tissues, but the process of life provides for constant regrowth and renewal of these tissues. However, in the absence of life, regrowth and renewal of tissues in the human body are not possible, so the body begins to decay.
Dr. Elliott

March 8, 1997
Question:
Dear Expert:
If i am active some of a time and I qiet and i start a gen will it hert me
love, amanda
The Expert's Answer:
Dear Amanda,
You are asking if it will hurt you if you are active some of the time and you quit and start again. I'm going to give you two answers, because it depends on what you mean.
Answer #1:
If you mean going and stopping all in one exercise bout (one time that you exercise) we call that interval training. It will not hurt you. Interval training is a good way to exercise to get better at a lot of sports and activities. But if you want to get the best kind of exercise for your heart, you should exercise at least 10 minutes at a time, hard enough that that you get sweaty, but not so hard that you get very tired. This kind of exercise can be running, walking fast, dancing, roller skating, biking, swimming, playing tag and many more. The important thing is that the largest muscles in your body(legs, bottom, arms) are moving continuously (without stopping for at least 10 minutes, that is called aerobic exercise). Every day you should get at least 20 minutes total of this kind of exercise.
Answer #2:
If you meant starting and stopping an exercise program, that wont hurt you either. But it is better to exercise every week, or every day if you can. The only people that need to worry about starting and stopping an exercise program are older people, people that are very overweight, or people with heart disease and some other diseases.
I hope this answers your question, if not, e-mail Healthy Hearts again, and I will try again :-)
Stay active!
Cathrine

March 8, 1997
Question:
Dear Expert:
Hi this is J.C. and Kelly
when you die does you heart get smaller or bigger.
The Expert's Answer:
Dear J.C. and Kelly,
When you die your heart, like the rest of your body, disintegrates.
Dr. Elliott

February 28, 1997
Question:
Dear Expert:
When you have a heart attack does your heart get littleer ?
JC, age 11
The Expert's Answer:
Dear JC,
Well, no, J. C., your heart does not get smaller. Actually when your heart gets weaker, it dilates (the walls get thinner and the cavities get larger and hold more blood), so if the heart attack is big enough to cause a lot of damage the heart will actually be bigger.
Dr. Pirachi

February 28, 1997
Question:
Dear Expert:
What would happen if some one was to get shot in the heart?
Brandon, age 10
The Expert's Answer:
Dear Brandon,
Getting shot in the heart is usually a very serious event, and unless it is repaired by surgery very quickly, the person would die. A gunshot wound in the heart will usually cause a great deal of blood to leak out of the circulation (cause a major hemorrhage). If the gunshot causes holes between the cavities of the heart, it can interfere with its normal pumping action and cause blood to flow the wrong way.
Dr. Pirachi

February 28, 1997
Question:
Dear Expert:
If you have a heart attack can i still extersize.
love, mandy, age 10
The Expert's Answer:
Dear Mandy,
You asked if you can exercise if you've had a heart attack. The answer depends on how serious the heart attack was. Sometimes doctors will make their patients

exercise after they've had a heart attack to try to make sure they don't have another one. But always if you have any kind of heart disease, you should ask your doctor who is a heart specialist if you can exercise, what kind of exercise you can do, and how much. Normally people that have had heart attacks will exercise while doctors or nurses or exercise specialists watch over them closely. Sometimes the people even have to wear electrodes while they exercise. Electrodes are hooked up to a machine that prints out an ELECRTROCARDIOGRAM that tells the doctors and nurses how the heart is reacting to the exercise.
Love, Cathrine

APPENDIX G

Week 2 Exit Slip for Students (with responses)

Healthy Hearts   name:_____
Week Two - **Feb. 28** - **March 6**

1. Check the days this week that you logged on to Healthy Hearts?
       ___Fri.   ___Mon. ___Tues. ___Wed. ___Thurs.

2. Did HEALTHY HEARTS give you the right amount of points?
_____
If not, how many points did you earn? _____How many points did
HEALTHY HEARTS give you? _____

8 children reported that the program did not give the right amount of points this
week. 2 said they did not know. The rest said that they did receive the right
amount of points.

3. So far, what do you like best about HEALTHY HEARTS?

-doing Dear Gabby and all the things that I learned
-Dear Gabby
-Dear Gabby
-the Dear Gabby section
-Dear Gabby part
-Dear Gabby
-opinion, and Dear Gabby
-Dear Gabby
-I like Dear Gabby and Opinion

-the excitment of getting points
-the points
-the points-
-points,
-the points

-doing Log Its
-Log It
-Log It
-nothing - I kind of like Log Its - except the beginning; I don't like the recess and
PE part, but I like the after school part

-it is fun
-taking notes
-everything
--using computers

-so far, I like reading the information
-I like learning neat and different things about the heart
-to learn about the heart
--it is fun learning and its cool the way it works
-you learn about your body
-what you learn about your and other people hearts
-learning about the heart
-learn about Health stuff

-the quizes
-the tests
-I like the tests
and doing the questions

--activities
--everything
-it is fun
-I like Log in
-it helps you be phicley active
-everything
-its easy - the quizes give you the answers

4. If you could change something about HEALTHY HEARTS, what would it be?

-15 children responded "nothing"

-we wouldn't have to write down our Log Its
-the Log Its
-Log Its
the Log Its
-to not have so many Log Its
-You did not have to do as many Log Its
-all the Log Its - they are too hard to keep up with
- the points - more points for Log It

-It would be making the scores right every thime
-points

-Gabby
-Dear Gabby

-We didn't have to take quizes
-I would make the tests games

-the pictures - "the picture of the heart pumping kinda grosed me out!"
-to have more reading included
-to be able to log on at home
-it takes too long to connect to the host - have to sit and wait
--I couldn't change anything, because everything is perfect
-it would have a game of the heart
-to have more time

5. How does being physically active help your heart?
-makes it stronger
-it makes your heart beat faster and it makes it stronger
-it makes it get stronger
-it helps it get stronger
-by being physically, your heart become stronger
-being physically active helps your heart be stronger
-it helps your heart be strong
-it makes your heart stronger
-it make your heart stonger

-it makes it strong and healthy
-helps keep it healthy
-it keeps your heart healthy and can reduce the heart disise
-it helps my heart by being heathy
-by keeping my heart healthy
-it keep it healthy
-it can make your heart healthy

-it helps it stay in good shape so your heart isn't like a torn up car so you wan't die
-prevent heart disiese and other things
-it hlep your heart because it can reduce the risk of having a heart attack
-it keeps your heart healthy, and it can reduce the risk of heart disease and heart attack
-it helps you when you get older not to have a heart attacks
-helps you live longer

-by pumping more blood to the body
-it pumps blood throw your body
-it helps it by making it pump faster
-it hap it get blod
-blood pumping

-more active, beats better
-it makes you brethe harder
-it hleps it stay clear
-alot

-It helps me be more healther
-very good
-you get more energy
-it helps you be more active

Appendix G

Teacher Weekly Log And Reflection

WEEK Four
March 13 - March 21

Please indicate the days this week that students participated in the IIM-HH by recording the time spend for that day, whether "all students" or "some students" participated, and whether they participated "as a group" or "on their own".

Day	Time per Day (estimated)	All (A) or Some (S) Students	As a Group(G) or On their Own (OO)
Friday			
Monday			
Tuesday			
Wednesday			
Thursday			

Please identify the strengths and weaknesses of each section of the module that the children accessed this week.

Get Smart
STRENGTHS:

WEAKNESSES:

Do You Know?
STRENGTHS:

WEAKNESSES:

Movin' and Groovin'
STRENGTHS:

WEAKNESSES:

Log It
STRENGTHS:

WEAKNESSES

Write On
STRENGTHS:

WEAKNESSES:

Ask Experts
STRENGTHS:

WEAKNESSES:

Go for the Gold
STRENGTHS:

WEAKNESSES:

The technology, in general
STRENGTHS:

WEAKNESSES:

The module, in general
STRENGTHS:

WEAKNESSES:

Problems you and /or your students encountered this week:

Your recommendations for change to make the module work better in the future:

OTHER COMMENTS:

Summary of Suggestions from Expert Reviewers

General Module Revisions

CONTENT:
-may be good to put e-mail on several pages or make it part of the frame (MM-1/19)
-either bold all of the text or don't bold it....but be consistent (MM-1/8)

TECHNICAL FUNCTIONALITY:
-you can't get back to the front page without exiting HEALTHY HEARTS, therefore you cannot get to the disclaimer, for teachers, contacting us, etc. (EE)

Front Page

CONTENT:
-system requirements need to be more clearly defined right up front (DCT)

About HEALTHY HEARTS:
-either make both the red/blue lines centered or not centered (MM-1/26)
-do not make the text in bold lettering (MM-1/26)
-text should be larger (MM-1/26)
(KB)

For Teachers:
-"for" is at the top right at the end of the red/blue line - need a <br> at the end of the line and then center the entire title (MM-1/26)
-do not make the text in bold lettering (MM-1/26)
-text should be larger (MM-1/26)
-objectives need to be redone; make sure they are performance objectives (GG)

Disclaimer:
-word "copyright" in the title is at the end of the red/blue line (MM-1/19)

Contacting Us:
-put the red/blue line on the "Contacting Us" section (MM-1/19)
-center the address and e-mail address because of the blankness of the page
-I would not put a phone number (GG)
- what are you going to do when people want to register? (GG)

Get Smart

CONTENT:
-consider removing the faces of the kids on the GS pages (MM-1/8)
-consider removing the heart bar (MM-1/8)

-don't like scrolling in the subheadings pages; think it may be problem for kids (MM-1/8)
-reduce the amount of spaces between text (MM-12/9)
-avoid writing text in green (MM-12/9)
-Facts about the heart - make the heart guy smaller (MM-12/9)
-put "back to" buttons closer to text (MM-12/9)
-change "teacher resources" to "teacher Resources and Activities" (MM-12/9)
-in Teacher Resources, put activities first, and career opport. awareness last (MM-12/9)
-include a picture of a teacher to frame the title (MM-12/9)
-need to include in the teacher resources how to take your pulse rate (MM-12/9)
-Being Active - bold blue and red writing (MM-12/9)
-number the subsections in each section of GS - (J&KP)

TECHNICAL FUNCTIONALITY:
-put an <LI> in front of the links in the Teacher Resources page (ie. AHA) (MM-12/9)
-put a note about clicking on arrow to return to menu (MM-12/9)

About the Heart
-number each subsection at the heading of the subsection (J&KP)

-How the Heart works - change "2 1/2 billion" (J&KP)

-Risk Factors that affect your Heart - change the spelling of "cholesterol" in second paragraph (J&KP)

-Facts about the heart: may want to say heart beats 60-90 beats per minute when you are at rest. It might be more meaningful to the kids to say the hearts beats ___ beats per minute in one day (TP)

-Heart looks like: a small thing, in the diagram of the heart inside view you may want to put pulmonary artery all on the same line, when it was on two lines it seemed to run into superior vena cava. (TP)

-Check the spelling of cholesterol under risk factors and what age is this program geared toward? Is cholesterol advanced or would a discussion of fat be better? (TP)

Being Active for a Healthy Heart
-in the subheading, number the first three - not the "Other Heart Information on the Web" (J&KP)
-How PA helps your heart - "anything" is one work (J&KP)
-in that section, "vacuum is spelled wrong (J&KP)

<u>Eating Right for a Healthy Heart</u>
- the subtitle in this section "Foods and Your Heart" should be changed to something like "How Foods Affect your Heart" (J&KP)

-in the first section where I talk about "plaque", would kids better understand this if compared with plaque on their teeth etc. (J&KP)

-Figuring Your Daily Fat Grams: Content is WRONG! Instead of dividing the number of daily calories by 30 to get 30%, you should multiply by .30 to get the number of calories from fat. This is different from the number of fat grams. (My question: how do you convert these 660 calories of fat into the number of fat grams??) (J&KP)

-When you were figuring fat grams, the numbers were close; but something did not seem right with the method you used. Not sure about it so you may want to double check it. There are 9 calories per gram of fat
2000 cal. x .30 = 600, divided by 9 = 66 grams of fat for a 2000 calorie diet.
2,200 x .30 = 660 divided by 9 = 73 grams of fat/ 2,200 cal. 2,500 x .30 = 750 divided by 9 = 83 grams of fat. (TP)

-on the "Click here to get a Daily Diet Diary", it should encourage kids to do this AFTER they read "From the Label to the Table". (J&KP)

-"Choosing Healthy Snacks" should say "Choosing Heart Healthy Snacks" (J&KP)

Food Pyramid: fruits are a separate group from vegetables, you talk about them together frequently which could be confusing... 2-4 servings of fruit, 3-5 servings of vegetables   (TP)

<u>Living Tobacco-free for a Healthy Heart</u>
-number the subheadings - except for other heart info on the web(J&KP)
-change "How tobacco Use affects your heart" to "Harmful affects of Tobacco Use on your heart" (J&KP)
-"other heart information on the WWW" should say something about tobacco - like "other tobacco information on the WWW - A.C.S. etc. (*What is ACS?)* (J&KP)
-in the "Facts about Tobacco Use" section, change "drug abuse" to "substance abuse" , can compare it to alcohol (J&KP)
- second section title "Harmful Affects of Tobacco Use" needs to be consistent with the title at the beginning of this section (J&KP)

Do You Know?

CONTENT:
-spaces need to be condensed (MM-12/10)

-#2 on the second link needs to have it read "physical" instead of "physically" (MM-12/10)
-avoid the bonus questions (MM-12/10)

- the title page of this section needs to have consistency in the quotation marks of each weeks quizzes (J&KP)
-Quiz 2 - Question 2: "physically" should be "Physical" (J&KP)

Movin' and Groovin'
CONTENT:
TECHNICAL FUNCTIONALITY:
-center the sentence that begins with "here's" - (MM-1/12)

not sure it's a good idea to include golf on the heart activity list unless you say no cart (TP)

Log It
CONTENT:
-take out the word "your" before Yesterday's Activity Log (KB)
-define physical activity under "first" - it is defined but later in the text   (KB)
-In "Important Note #1", change "physical activity time". (KB)
- In "Important Note # 2", change "It" to "If". (KB)
-Check on the mechanics of info under "Third". (KB)
-PA during School in the log section, should be a blue caps heading. (KB)

-Ken thought that the children will be able to understand the directions as they are written. He questioned the length of the text in the instructions, but agreed that all the information was needed for them to understand the procedure.

-Ken questioned the wording of the intensity level section - "Makes you breathe harder".. He commented that maybe it should say "Makes you breathe hard".....harder indicates that it's harder than something else, which is not identified in the log (although it is in the directions - "harder than you do at rest" -

Go for the Gold
CONTENT:
TECHNICAL FUNCTIONALITY:
-something wrong with the trophy picture - not in the center?? (MM-1/15)

Teacher's Manual
CONTENT:
-Objectives need to be redone (GG-2/3)

-Go for the Gold needs to explain that the students will actually get prizes (GG-2/3)

-need a practice task for kids to practice Log It - a way to tell if they are right or wrong e.g.enter log for student who did this much activity -- walked the dog for 30 minutes before school, played soccer for 20 minutes in PE class, had baseball practice for 90 minutes after school (GG-2/3)

-need to reconsider the minutes per day, week, that kids need to participate in HEALTHY HEARTS, too much time will scare teachers; (GG-2/3)

-need to understand that time needed will be contingent upon things sure as typing ability, where they are working in pairs or alone, etc. (GG-2/3)

-the explanation of a hotlink needs to be redefined - since there are so many colors in HEALTHY HEARTS, it should be stressed that the word must be underlined, and that the mouse turns to a hand when placed on the word (MM-2/3)

TECHNICAL FUNCTIONALITY

-teacher's manual should not be placed on the Main Menu page (DCT)

-teacher's manual should be placed on the Main Menu page (MM-1/19)

-the bar of icons in the text are linked and should not be (MM-2/3)

-The link to LI from the TM is not the same page as the link to LI from the Main Menu and the frame (MM-2/3)

-is it important for teachers to be able to get back to the teachers manual if they are in HEALTHY HEARTS? There are no links that allow them to do that...)MM-2/3)

Appendix H

Formative Evaluation Results of the Pre-pilot of the IIM-HH

Technical Functionality

In the small-group pilot of the IIM-HH, implementation problems arose that were caused by the technical functionality of the instructional unit. One primary problem was the inability of the IIM-HH to run successfully on Netscape 2.0. Another was the incapability of the 386 computers in the school to run the IIM-HH, even though they had Internet access. Many other discoveries were made during the small-group pilot with the students, including the need for the program to be able to assign points to both students if they are working in pairs, and the difficulty for students to have individual e-mail addresses in a typical school setting. There were functionality problems in the interactive areas of the module, specifically *Log It, Do You Know?,* and *Write On.* The assignment of a password to an individual student after his completion of the registration form worked well.

Changes Made to Technical Functions

- Modifications to the Javascript language were made by the technical producer so that the module would run on Netscape 2.0.

- Requirements were modified for a school to successfully use the IIM-HH with their technology. Computers cannot be 386s, and must use a web browser that supports Javascript, such as Netscape 2.0 or higher.

- The weekly information of Get Smart, Do you Know?, and Write On was programmed so that a user could only access the first week of information on Week 1, and then each week of information added successively thereafter.

- Modifications were made in the programming of some of the interactive features of the module.

Content Functionality

As the students began using the IIM-HH, it became obvious that they needed specific instructions in using the module before actual participation began. Even though the overall module as well as each individual section is explained online, the students would have benefited from direct instruction from the teacher in the overall design and general use of the module. The efficiency of the module content was about as expected. Two areas were specifically noted, Log It and the registration form required to receive a password. It took approximately fifteen minutes for students to complete the registration form and approximately twenty (20) minutes for them to read instructions and complete their first physical activity log in Log It. After their initial visit to Log It, the two students could expeditiously complete a physical activity log in less than five minutes. Both students and teachers indicated that the content was appropriate and motivating to intermediate grade students.

Changes Made to Content

- Many additions were made to the Teacher's Manual to aid the teacher in selecting pertinent orientation activities for the students before they begin

the module (i.e. navigational bar instructions, recommended sequence of instruction, Log It instructional page, main menu instructions)

- A recommended timeline for the module was devised, indicating to the teacher the suggested days, times, and activities per week for successful implementation.

- The quiz in Do You Know was updated to include a response after each user selection, whether right or wrong. The user was given the right answer, and an explanation why it was the correct response.

- Minor changes were made to the wording of content, organization of content, and graphics throughout the module.

- Go for the Gold icons and brief description were added to each section in the module where students could earn points.

Teachers' Overall Views of the IIM-HH

Both teachers liked the IIM-HH, and thought that, considering content, it could successfully be implemented into an intermediate grade curriculum. They considered all sections to be developmentally appropriate for intermediate grade students, and they thought that this age student would like the IIM-HH and would be motivated to participate in it. Both teachers reported that the level of difficulty, readability level, and length of content were all appropriate. They both thought that the students would particularly like the Write On activities and Go for the Gold (point system). One teacher recommended that Go for the Gold

be highlighted more in each section where points would be earned. Both commented on the importance of the Ask Experts section in the module. One teacher pointed out that her main area of concern for implementing the module in schools is the limited numbers of computers, and lack of time for students to use the computers.

Students' Overall Views of the IIM-HH

All the students expressed enthusiasm for using the IIM-HH. They commonly said "This is cool". One child said , "I like Healthy Hearts much better than what we usually do on computers. This is fun!" One child reported that working in the IIM-HH was "actually, pretty hard work". When the children were asked what they liked best about the IIM-HH, four of the five children said that they liked the content (learning about the heart). The one thing they would change was to get new, better computers!

Appendix I

Database Information From Registration Questionnaire

NAME	GENDER	SCHOOL	E-MAIL	AGE	PA Attitude	PA Self-rating	Teams
BW	male	Riner Elementa	s2daniel@pen.l	10	Like	asgoodasfriend	no
LT	male	riner elementa	s2daniel@pen.l	11	Like	asgoodasfriend	yes
JM	male	Riner Elementa	s2daniel@pen.l	11	Like	betterthanfrier	no
AJ	female	riner elementa	jwroark@pen.k	10	Like	notasgoodasfri	no
CB	male	riner elementa	jwroark@pen.k	10	Like	asgoodasfriend	no
JH	male	riner elementa	jwroark@pen.k	10	Like	betterthanfrier	yes
AH	female	Riner Element:	jwroark@pen.k	11	Like	notasgoodasfri	no
CW	male	riner elementa	jwroak2pen.k1	11	Like	asgoodasfriend	no
TA	female	Riner Elem.	s2daniel@pen.l	10	Like	notasgoodasfri	no
JM	male	riner elementa	jwroark@pen.k	10	Like	betterthanfrier	yes
JCM	male	riner elementa	s2daniel@pen.l	11	Like	asgoodasfriend	yes
TL	female	Riner element	s2daniel@pen.l	10	Like	asgoodasfriend	no
KH	female	Riner Element:	jwroark@pen.k	10	Like	notasgoodasfri	no
JS	male	riner elementa	jwroark@pen.k	10	Like	asgoodasfriend	no
BS	male	Riner elementr	s2daniel@pen.l	11	Like	notasgoodasfri	no
MM	male	riner elentry	jwroark@pen.k	10	Like	betterthanfrier	yes
CA	female	riner elementa	jwroark@pen.k	10	Like	asgoodasfriend	no
JM	female	riner elementa	jwroark@pen.k	10	Like	asgoodasfriend	no
AM	male	riner elementa	s2daniel@pen.l	11	Like	notasgoodasfri	no
AS	female	riner elementa	jwroark@pen.k	10	Like	dontknow	no
KV	male	riner elementa	jwroak@pen.k1	11	Like	asgoodasfriend	no
KM	female	Riner elementa	jwroark@pen.k	12	Like	dontknow	no
AR	female	riner elementa	jwroark@pen.k	11	Like	asgoodasfriend	yes
BA	male	Riner Elementa	jwroark@pen.k	10	Like	asgoodasfriend	yes
AB	male	riner elementa	s2daniels@pen	10	Like	dontknow	no
HW	female	riner elementa	jwroark@pen.k	11	Like	dontknow	no
AK	female	riner elementa	jwroark@pen.k	10	Like	betterthanfrier	no
CY	female	riner elementa	s2daniel@pen.l	11	Like	asgoodasfriend	no
CT	male	Riner Elementa	s2daniel@pen.l	10	Like	betterthanfrier	yes
DS	male	riner elementa	s2daniel@pen.l	10	Like	dontknow	yes
MM	female	riner elementa	jwroark@pen.k	11	Like	dontknow	no
JB	female	Riner Elementr	s2daniel@pen.l	10	Like	asgoodasfriend	no
JL	male	RINER ELEMENT	s2daniel@pen.l	11	Like	asgoodasfriend	no
RK	male	riner elementa	s2daniel@pen.l	11	Like	dontknow	yes
AA	male	Riner Elementa	s2daniel@pen.l	11	Like	betterthanfrier	yes
RR	female	Riner Elementa	s2daniel@pen.l	11	Like	asgoodasfriend	yes
ML	female	riner elementa	52daniel@pen.	11	Like	asgoodasfriend	no
JH	male	Riner element:	s2daniel@pen.l	10	Like	asgoodasfriend	yes
JM	male	riner elementa	s2daniel@pen.l	10	Like	asgoodasfriend	yes
SB	female	Riner Elementa	s2daniel@pen.l	10	Like	dontknow	yes
JW	male	Riner Elementa	s2daniel@pen.l	10	Like	asgoodasfriend	yes
ML	male	riner elementa	jwroark@pen.k	12	Like	notasgoodasfri	no
AL	female	riner elementa	s2daniel@pen.l	10	Like	asgoodasfriend	no

NAME	PPPW	Par Encour	F and Ve	Fav PA 1	Fav PA 2	PA Freq PW
BW	none	often	4	basketball	bikeridding	5 or more days a
LT	1*1-3	often	4	runing	soccer	5 or more days a
JM	none	sometimes	2	Baceball	Football	5 or more days a
AJ	2*3	sometimes	3	tag	ride my bike	1 or 2 days a we
CB	1*3	never	2	kickball	football	5 or more days a
JH	1*3	sometimes	6 or mor	football	baseball	1 or 2 days a we
AH	1*3	often	4	runing	working in	3 or 4 days a we
CW	2*1-3	sometimes	4	skateboard	ride bike	3 or 4 days a we
TA	2*1-3	sometimes	3	Apple	Orange	1 or 2 days a we
JM	1*1-3	often	4	runing	basball	5 or more days a
JCM	1*3	often	4	sports	sports	5 or more days a
TL	none	never	2	basket ball	runing	1 or 2 days a we
KH	none	sometimes	5	na	na	1 or 2 days a we
JS	1*1-3	often	3	riding biks	war ball	5 or more days a
BS	2*3	seldom	4	football	soccer	3 or 4 days a we
MM	2*3	often	3	football	basketball	5 or more days a
CA	2*3	sometimes	3	walking my dog	riding my bik	1 or 2 days a we
JM	1*1-3	sometimes	3	kick ball	basket ball	3 or 4 days a we
AM	none	never	5	football	soccer	1 or 2 days a we
AS	2*3	sometimes	2	bike	rolerblad	1 or 2 days a we
KV	none	sometimes	4	foot ball	kick ball	5 or more days a
KM	2*3	sometimes	5	Play with the d	Push carts	1 or 2 days a we
AR	none	sometimes	6 or mor	basketball	running	5 or more days a
BA	2*1-3	sometimes	2	baseball	basketball	5 or more days a
AB	1*1-3	seldom	4	hunting	jump	5 or more days a
HW	2*3	sometimes	3	apple	banna	1 or 2 days a we
AK	2*3	often	6 or mor	running	swimming	5 or more days a
CY	1*1-3	often	6 or mor	bike riding	runing	3 or 4 days a we
CT	none	often	3	baseball	football	5 or more days a
DS	1*3	often	6 or mor	football	baseball	5 or more days a
MM	2*1-3	sometimes	5	walking	runing	5 or more days a
JB	2*3	sometimes	5	Bike Riding	Water/Snow	3 or 4 days a we
JL	none	often	3	wagon ride	pull wood	5 or more days a
RK	2*3	sometimes	3	soccer	football	1 or 2 days a we
AA	1*1-3	often	3	baseball	football	5 or more days a
RR	1*1-3	often	3	Apple	Orange	3 or 4 days a we
ML	2*3	sometimes	5	swimming	walking	1 or 2 days a we
JH	1*1-3	often	2	bike riding	running	5 or more days a
JM	none	sometimes	3	football	baseball	5 or more days a
SB	none	often	1	dance	soccor	3 or 4 days a we
JW	1*1-3	sometimes	4	Basketball	Soccer	1 or 2 days a we
ML	1*1-3	sometimes	5	runing	swiming	1 or 2 days a we
AL	2*1-3	sometimes	5	ridding my bike	jumping on r	1 or 2 days a we

Appendix I

Overview of IIM-HH Tasks Completed by End of Pilot

NAME	PTS	LOG 1	LOG 2	LOG 3	LOG 4	QUIZ 1	QUIZ 2	QUIZ 3	QUIZ 4
BW	100	5	5	5	5	TRUE	TRUE	TRUE	TRUE
JM	74	5	5	5	5	TRUE	TRUE	TRUE	TRUE
CB	55		2	1		TRUE	TRUE	TRUE	TRUE
JH	74	3	3	4	3	TRUE	TRUE	TRUE	TRUE
AJ	80	5	5	5	5	TRUE	TRUE	TRUE	TRUE
AH	71	5	3	5	5	TRUE		TRUE	
TA	48	5	4		2	TRUE	TRUE		
JM	53	5	5	4	5				TRUE
JCM	96	5	5	5	3	TRUE	TRUE	TRUE	TRUE
TL	27	4	2			TRUE			
KH	54	3	1	3		TRUE	TRUE		
JS	17	1				TRUE			
BS	75	5	5	5	5	TRUE			
MM	67	4	4	3	1		TRUE	TRUE	TRUE
JM	94	5	5	3	4	TRUE	TRUE	TRUE	TRUE
AM	91	5	3	5	2	TRUE	TRUE		TRUE
AS	58	5	5	5	2	TRUE			TRUE
KM	12		1	4		TRUE			
AR	90	5	5	5		TRUE	TRUE	TRUE	TRUE
BA	63	2	2	5		TRUE		TRUE	TRUE
HW	81	3	5	5		TRUE	TRUE	TRUE	
AK	76	3	5	5	1	TRUE	TRUE	TRUE	TRUE
CY	94	2	5	5	5	TRUE	TRUE	TRUE	TRUE
CT	100	5	5	5	5	TRUE	TRUE	TRUE	TRUE
DS	85	5	5	5		TRUE	TRUE	TRUE	
MM	95	4	5	5	4	TRUE	TRUE	TRUE	TRUE
JB	98	5	5	5	4	TRUE	TRUE	TRUE	TRUE
RK	70	5	5	5	4	TRUE	TRUE		
AA	100	5	5	5	5	TRUE	TRUE	TRUE	TRUE
RR	73	4	5	5			TRUE		TRUE
ML	25	5				TRUE			
JH	94	5	5	4	2	TRUE	TRUE	TRUE	TRUE
JM	75	5	4	3	3	TRUE			
JL	73	5	4	5	5	TRUE	TRUE		TRUE
AB	66	4	5	4	1	TRUE	TRUE		TRUE
SB	95	5	5	5	4	TRUE	TRUE	TRUE	
JW	85	5	5	5		TRUE	TRUE	TRUE	TRUE
CW	48	1	5	1		TRUE			
ML	48		2	5	2	TRUE			TRUE
KV	40	5	3	3	1			TRUE	TRUE
AL	85	3	4	3	5	TRUE	TRUE	TRUE	
LT	90	5	5	5	2	TRUE	TRUE	TRUE	TRUE
ML	60	5	5			TRUE		TRUE	

NAME	GABBY 1	GABBY 2	GABBY 3	GABBY 4	OPIN 1	OPIN 2	OPIN 3	OPIN 4
BW	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
JM	TRUE	TRUE	TRUE		TRUE	TRUE	TRUE	
CB	TRUE	TRUE			TRUE	TRUE	TRUE	
JH	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
AJ	TRUE	TRUE	TRUE		TRUE	TRUE	TRUE	
AH	TRUE		TRUE	TRUE	TRUE	TRUE	TRUE	
TA	TRUE	TRUE			TRUE	TRUE		
JM		TRUE	TRUE			TRUE	TRUE	
JCM	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
TL		TRUE				TRUE		
KH	TRUE		TRUE		TRUE	TRUE	TRUE	
JS	TRUE				TRUE			
BS	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
MM	TRUE	TRUE		TRUE	TRUE	TRUE		TRUE
JM	TRUE	TRUE	TRUE		TRUE	TRUE	TRUE	TRUE
AM	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
AS	TRUE	TRUE	TRUE	TRUE		TRUE	TRUE	
KM						TRUE	TRUE	
AR	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
BA	TRUE		TRUE	TRUE	TRUE		TRUE	TRUE
HW	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
AK	TRUE	TRUE	TRUE		TRUE	TRUE	TRUE	
CY	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	
CT	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
DS	TRUE	TRUE	TRUE		TRUE	TRUE	TRUE	TRUE
MM	TRUE		TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
JB	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
RK	TRUE	TRUE	TRUE		TRUE	TRUE	TRUE	
AA	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
RR	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
ML	TRUE				TRUE			
JH	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
JM	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
JL	TRUE		TRUE	TRUE		TRUE	TRUE	
AB		TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	
SB	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
JW	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	
CW	TRUE	TRUE	TRUE			TRUE	TRUE	
ML		TRUE	TRUE	TRUE	TRUE		TRUE	
KV								
AL	TRUE	TRUE	TRUE		TRUE	TRUE	TRUE	TRUE
LT	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE
ML	TRUE	TRUE	TRUE		TRUE	TRUE	TRUE	

Appendix J

Final Student Questionnaire Results

Final Student Questionnaire for HEALTHY HEARTS
(Total N = 40)

1. Overall, what is your opinion about the Internet?

dislike very much   **like very much**
     1   **2**   **3 (n=3)**   **4 (n=10)**   **5 (n=27)**

2. Overall, what is your opinion about Healthy Hearts?

dislike very much   **like very much**
    1(n=1)   **2 (n=2)**   **3 (n=10)**   **4 (n=19)**   **5 (n=8)**

3. Do you think that Healthy Hearts taught you

very little new information   **a lot of new information**
    1(n=2)   **2 (n=2)**   **3 (n=9)**   **4(n=17)**   **5 (n=10)**

4. Since you participated in Healthy Hearts, do you

think less about being physically active	think about the same about being physically active	think more about being physically active
1 **2**	**3 (n=5)** **4 (n=19)**	**5 (n=16)**

5. Since you participated in Healthy Hearts, do you

think less about eating eating foods low in fat	think about the same about eating foods low in fat	think more about foods low in fat
1 (n=2) **2** (n=3)	**3** (n=4) **4** (n=17)	**5** (n=14)

6. If you have friends or family members who smoke, how important do you think it is to encourage them to stop?

not important   **very important**
      1 (n=1)   **2**   **3** (n=1)   **4** (n=1)   **5** (n=37)

7. Rate each of the sections of the Healthy Hearts module:

    A. Get Smart

poor   **okay**   **good**   **awesome**
 1 (n=3)   **2** (n=6)   **3** (n=20)   **4** (n=11)

    B. Do You Know?

poor   **okay**   **good**   **awesome**
 1 (n=3)   **2** (n=7)   **3** (n=19)   **4** (n=11)

    C. Movin' and Groovin'

poor   **okay**   **good**   **awesome**   **Did not see:**
 1 (n=1)   **2** (n=4)   **3** (n=4)   **4** (n=7)   (n=24)

    D. Log It

poor   **okay**   **good**   **awesome**
 1 (n=3)   **2** (n=7)   **3** (n=12)   **4** (n=18)

    E. Write On

poor   **okay**   **good**   **awesome**   **Did not see:**
 1 (n=1)   **2** (n=4)   **3** (n=19)   **4** (n=15)   (n=1)

    F. Ask Experts

poor   **okay**   **good**   **awesome**   **Did not see:**
 1 (n=1)   **2** (n=3)   **3** (n=5)   **4** (n=18)   (n=8)

G. Go for the Gold

poor	okay	good	awesome	Did not see:
1 (n=1)	**2**	**3** (n=7)	**4** (n=27)	(n=5)

7. What did you like <u>most</u> about Healthy Hearts? Why?

-Dear Gabby; it was fun
-I liked Dear Gabby the best in Write On; because it was a neat way of answering a questions but with our oppion. Theres no right or wrong.
-The Dear Gabby; because you get to help other people
-Write On; because you got to write
-I liked Dear Gabby; because you can tell your opinion on things that can really happen
-Dear Gabby; because I enjoyed writing back to the kids.
 -Dear Gabby and Openyn; it was really cool and it tot me alot
-Dear Gabby and Opion
-The Write On; because it was fun
-Dear Gaddey; It 's like I was doing something good.
-I liked the Write On like Your Opioin and Dear Gabby; because I like giving people my adivce and writing to Gabby and stuff like that.

-Log It; because I like to put stuff into the computer
-Log It; I don't know why
-Log It; because I like being phisictaly active and useing the mouse
-Log It; you can rember the activites I did in the week
-Log It; because its cool!
-Log It; because I got to us the mouse
-Log It and taking the quiz; because it was fun
-Log It; that's where you got the most points
-Log It; because you could go in and print what you did. It was a good way to keep track of what you did.
-Log It; because I liked feeling in the chart.

-I learned more about my heart
-Learning; to help you and others
-Learning; why you should not smoke, because you could have a longer life if you don't smoke.

-Points; because you get things after you earn the points
-I liked to get more points in Go For the Gold
-Getting the points; because it was fun
-Points; because of the prizes that you could get and the ratings between points

-Get Smart; ecause it told you interesting things

-I liked the Get Smart part because I learned a lot
-I liked Get Smart the best; because I learned a lot from it
-I liked Get Smart the best; I liked that because I learned more about having a healthy heart.

-Taking the test (DYK)
-I like the test; because it gave you the answer if you got it right
-Quiz; because points

-Ask Experts; I liked it because I learned somethng new
-Ask Expert; they would tell you want you wanted to know
-Ask Experts; because it gives you good information about other peoples
         thoughts

-I liked the prizes and working with computers.

-The whole thing; because it was fun

8. What did you like <u>least</u> about Healthy Hearts? Why?

-Get Smart; takes too long to read
-Get Smart; because it was so much to read
-I liked just about everything but Get Smart was just a tiny tiny bit boring.
-Get Smart; get the information in shorter coloms

-Get Smart and Do you Know; Because you had to go through and read 3-5 things in Get Smart then take a quiz. And if you missed 2 or more questions you had to retake the quiz.
-Did You Know; because you had to read so much
-Taking the Quiz; I don't like taking quizs.
-I didn't like Do You Know, because I hate tests.
-Quizes; I am never good with quizzes
-I did not like the quizes because they were a little hard.
-Do you now; I couldn't keep up with my homework.
-Quiz; because you had to study

-It was hard for me to do Dear Gabby and the quizzes (SE student)
-Dear Gabby and Movein and groovin and write on and ask experts
-Write on; because it was not fun

-Log It; points
-All the Log Its; too many
-Log It; it was to boring
-Log It; because I got tired of doing it
-Log It; boring

-Log It; because you don't really need to keep on paper the things you do
-pichers; they looked real
-Log Its are the worst. They slow you down.
-Being rushed when using Log It
-Log It; because it was hard to get on the computer everyday

-Ask Experts; it wasn't cool

-Getting on to it; it took to long
-I didn't like getting on because it took too long
-It took too long to get on. We ahd to wait and wait and it wouldn't open.

--When the computer messed up the writing and the points

-Nothing really, because it was good to learn
-Nothing.
-I liked everything because it helped me learn about the human heart
-Nothing
-Nothing
-nothing; it was all okay
-I liked all of the Healthy Hearts.
-Nothing, because it was all so neet.
-nothin
-all of it was good

9. If you could help the designer of Healthy Hearts change it to make it better for other children your age, what would you recommend be changed? Why?

-make more Healthy Harts programs
-more colores
-get rid of Write On because it is not fun and make more choices for prizes
-I would recommend that they keep the points straight. Because you get mad when you didn't get what you earned.
-for the computer to keep up with the points better
-Get Smart; get the information in shorter coloms
-I think some of the hard words should have something beside it to help you prounonse it
-No quizes; because you have to study too much!
-nothing at all
-I would not change anything because other people could do Healthy Hearts
-Write On; the write on things didn't teach you anything
-Change the Log Its to make them funner
-I would make it easier to get on the program, because it takes too long
--nothing; its fine the way it is

--more interesting; kids do more
-nothing, because it's perfect the way it is
-A congratulations if you get the best Dear Gabby or Opinyen, because if you write a good paper you should be rewarded
--nothing
-nothing; I like it as it is
-have more writing in the whole thing
-nothing, because I liked everything
-I would put in one more Dear Gabby because they were really fun to do
-enformasn - mak it read it for you
-you could make it harder and funner
-Quizes, because I wouldn't give that much of that to read
-give more prizes and lower how much points you have to get them; they'll like it better
-give a little more information; need more info
-quiz points; log its
-I would change the questions on the quiz because it was hard
--nothing; all of it is grat!
-I would recamend not having the tests, because almost everyone hates tests
-Dear Gabby; it wouldn't give enough time to wirte everything down (SE student)
-I would not change it because it helped me learn a hole lot about smoking so I'm pretty sure it will teach them to
-I wouldn't recommend anything because everything went well
-we had 6 weeks because it would be fun to ahve more of the fun.
--You could make the reading shorter.
-There should be little movies and sound clips on Get Smart

10. What did you find most helpful in finding your way around the module?

 19 children said they used the pictures, icon, or bar at the bottom.
10 children said that the back and forward arrows were most helpful.
3 children said they went back to the Main Menu and then clicked on the icons.

Other responses:
-I needed mroe help from a person to find my way around.
-It was difficult.
-that it was bookmarked, and you could go back.
-the mouse and the eyecons
-I use the icons
-it was very easy, you had everything, all you had to do was click
-I don't know

Examples of Students' Writing Responses to "Dear Gabby" in *Write On*

Dear Gabby - Week 4

Here are some of the suggestions that Dear Gabby has given in response to the letter this week from Josh that said:

Dear Josh, If I was you I would tell him how it's bad for your health and that you don't need to smoke to be popular and tell him if he smokes even longer that he won't and if he stops smoking tell him that the quicker that he stops the better. Brandon 10

Dear Josh,justsay no because your cool the way you are jeremy haley 10Dear Josh, I would not smoke because I would routher be on kool then smoke. jc 11

Dear Josh,no dont start smoking becuase you can mess up your life and your more popular when you dont smoke and you can have more friends becuase if you started smoking i would not be your friend. barry11

Dear Josh,you dont need a friend like grege. If he offers you some say no matt 10

Dear Josh, Do not wary about them just be your self. anthony11

Dear Josh,josh i would not smoke if you want to be popular hang around people who don't smoke alecia11

Dear Josh,i think you shouldn't smoke to be popular. just ignore them and go on. bobby 10

Dear Josh, well iwouldtell greg that smking is unhealthy for you and the people around and that he should stop because it's unhealthy. heather 11

Dear Josh, Just find a new friend whodoesn't smoke and ignore Greg. Chris 10

Dear Josh, I would not smoke because you could get cout and get sick and die. Aaron 11

Dear Josh, Smoking is not cool! Don't start smoking if you want to be halthy. Sarah 10

Dear Josh, I would not smoke.If you want to be popular,dont smoke.You can get more friends by not smoking logan 11

VITA

Eloise McClung Elliott

Born June 16, 1955, I attended public schools in Greenbrier County, West Virginia, and graduated in 1973 from Greenbrier West High School. Graduating from Concord College, in Athens, West Virginia, in December, 1976, I earned a BS degree in Elementary Education, with a specialization in Early Childhood Education. I began teaching elementary physical education immediately upon graduation in Mercer County, Princeton, West Virginia. I taught for 12 1/2 years in the Mercer County School system, both as an elementary physical education teacher, and also as a kindergarten teacher. During that time, I pursued a Masters degree from Salem Teikyo University, in Salem, West Virginia, and in 1986 completed a MA in Physical Education. In 1989, I joined the HPE faculty at Concord College as an instructor of Physical Education. While teaching at Concord, I began classes at Virginia Tech in the fall of 1992 in pursuit of a doctoral degree. In June, 1997, I completed the requirements of a Ph.D. in Curriculum and Instruction with a specialty in Physical Education Pedagogy.

Currently, I am returning to my job at Concord College, where I also serve as the Chair of the Department of Health and Physical Education.   My continued focus will be on children's physical education, and on the use of technology to enhance physical education.