THE UTILIZATION OF NASA AND OTHER INTERNET AEROSPACE WEB SITES BY COORDINATORS OF TENNESSEE SPACE WEEK

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PREFACE

This study was conducted to determine the extent NASA and other Internet aerospace Web sites are being utilized by coordinators of Tennessee Space Week for the years 1995 through 1997.

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CHAPTER I

INTRODUCTION

Background

During the past decade, the Internet, a source of independent networks using common standards to connect software and hardware, has become the largest computer network in the world. Although the Internet has vast resources and limitless potential, it has been characterized by a lack of utilization by users in many educational settings. Whereas this lack of use in some cases may be the result of limited resources, it may also be caused by a lack of information concerning how this worldwide network can assist teachers in various educational tasks (Milheim, 1997).

In preparing for the 21st century, the Tennessee Department of Education has responded with an effort to bring state-of-the-art technology into the classrooms via the 21st Century Schools Program. This new program will increase the integration of technology into the classroom to stimulate creative approaches to instruction (Morrisson and Ross, 1995). Another program that has been beneficial in merging Internet technology with classroom instruction has been Tennessee Space Week (TSW). Since 1987, the Tennessee Education Association (TEA), the National Aeronautics and Space Administration (NASA), through its Aerospace Education Services Program

(AESP), and U.S. Space Camp in Huntsville, Alabama have sponsored Tennessee Space Week. This annual event spotlights the educational value of using the space program to motivate students in science, mathematics and technology by utilizing the Internet (Charles, 1997). To assist NASA in organizing Tennessee Space Week, the Tennessee Education Association selects coordinators. Educators selected as coordinators must meet two criteria: a demonstrated interest in aerospace education and experience using technologies, such as NASA Spacelink and the Internet, to access aerospace news and lesson activities for classroom instruction (Wheeler, 1997). Coordinators of Tennessee Space Week organize local TEA Space Week Workshops and NASA-AESP school visits during Tennessee Space Week. These workshops provide a special opportunity for Tennessee educators to discover the benefits of utilizing NASA or other Internet aerospace Web sites to augment classroom instruction. Estimates for 1997 showed that 900,000 students and 50,000 classroom teachers in Tennessee have full graphical (browser) access to the vast resources available on the World Wide Web (ConnectTEN Homepage, 1997).

The Problem of the Study

The extent to which the coordinators of Tennessee Space Week have utilized NASA and other aerospace Web sites to support classroom instruction is unknown. It is useful to understand how coordinators for Tennessee Space Week remain current in aerospace news and teaching methodologies in aerospace education. In doing so, providers of aerospace lesson activities, such as NASA, can better adapt to the

educational needs of the coordinators for Tennessee Space Week and of Tennessee teachers in general. The problem is stated as follows: To what extent do the coordinators of Tennessee Space Week, from 1995 to 1997, utilize NASA and other Aerospace Internet Web sites to supplement the curriculum? This research is undertaken because of recent studies which have shown that acquiring aerospace education from the Internet can enhance the curriculum in teaching of mathematics, science and technology (Hardwick, 1996).

Purpose of the Study

The purpose of this study was to determine the extent to which Tennessee Space Week use NASA or other aerospace Web sites to supplement classroom curriculum. It is designed to collect data on the background of the coordinators of Tennessee Space Week and in how they utilize the Internet. To undertake this research the following data were acquired:

Research Questions

This study was designed to determine the answers to these questions:

1. What are the demographic characteristics of the coordinators of Tennessee Space Week in terms of teaching experience, gender, level of highest degree earned, teaching level, and current teaching responsibility?

2. Do the numbers of special workshops provided for coordinators by NASA or the Tennessee Education Association parallel the use of acquiring additional information from NASA or other Internet aerospace Web sites?

3. How do coordinators of Tennessee Space Week incorporate the Internet in classroom instruction in terms of availability, location of the computers connected to the Internet, and how often lesson activities are acquired from the Internet?

4. Did coordinators obtained aerospace activities from other sources before having Internet access and identify if lesson activities were acquired from NASA or other aerospace Web sites after Internet access was acquired?

5. What were the number of special assignments given by coordinators of Tennessee Space Week before and after acquiring Internet access?

6. How do coordinators of Tennessee Space Week supplement their classroom curriculum by using NASA or other Internet aerospace Web sites?

7. What is the classification of the school (rural, suburban or urban) where coordinators teach?

8. What is the faculty and student body size of the schools where coordinators teach?

9. What are the Internet aerospace Web sites, other than NASA Web sites, that coordinators access in order to acquire information for classroom instruction?

10. Are coordinators more likely to find supplementary aerospace teaching ideas and activities on the Internet than in traditional sources such as periodicals and books?

11. What are the NASA aerospace topics which coordinators have integrated within their classroom instruction?

Significance of the Study

Tennessee Space Week has been an annual state educational event since 1987. NASA, the Aerospace Education Services Program, and the Tennessee Education Association have provided extensive time and human resources to assist in implementing this program. The study is significant because NASA is in the business of involving the educational community in its endeavors to inspire the students of America in creating learning opportunities (NASA, 1998). The study is an effort to systematically examine and describe what the coordinators of Tennessee Space Week find educationally beneficial about the aerospace information that is acquired from NASA and other Internet aerospace Web sites. Additionally, this study provides follow-up information to the NASA Aerospace Education Services Program on the extent to which coordinators of Tennessee Space Week are utilizing NASA and other Internet aerospace Web sites to supplement the curriculum.

Assumptions of the Study

The following assumptions were made in this study:

1. Using aerospace activities acquired from NASA and other Aerospace Web sites is desirable and promotes interest in science, mathematics, and technology.

2. Coordinators of Tennessee Space Week use NASA and other Internet aerospace Web sites numerous times to supplement their classroom instruction.

3. The selected coordinators for Tennessee Space Week from the years 1995, 1996 and 1997 were assumed to be representative of the previous coordinators of Tennessee Space Week who have taken part in TEA Space Week.

Limitations of the Study

The study was limited to coordinators of Tennessee Space Week who have participated in Tennessee Space Week for the years 1995, 1996, and 1997. Because of the descriptive nature of the study, it did not gauge the quality and quantity of the coordinators' use of aerospace information which was acquired from NASA and other aerospace Web sites. Future research will be needed to describe this element. Also, the study depended on the voluntary participation of coordinators of Tennessee Space Week in completing the survey instrument.

This study did not examine the relationship of the use of NASA or other aerospace Web sites to the demographics of the coordinators, including geographic, socioeconomic, grade level, and years of teaching experience.

Definition of Terms

In this study, the following definitions will be used:

Aerospace Activities: A term used to describe an aerospace educational procedure or product designed to stimulate learning by hands-on experiences.

Aerospace Education: Aerospace education is a branch of general education which involves the study of space and aeronautics and their impact on society

Aerospace Education Services Program (AESP) : The NASA Aerospace Education Services Program is a nationwide, free program for teachers, students, and the general public. It is designed to increase awareness and understanding of scientific research and technological development and their place in the world in which we live. (http://www.okstate.edu/aesp/AESP.html, 1997)

ConnectTEN Project: ConnecTEN is a not-for-profit cooperation working in partnership with Tennessee state government and private business to bring the educational benefits of the computer into the Tennessee classroom. (ConnectTen. Homepage: http://www.connect-tn.org/).

Coordinators of Tennessee Space Week: Coordinators are appointed by the TEA local association president. Coordinators are responsible for organizing TEA Space Week workshops and disseminating TEA/NASA workshop materials among TEA Space Week teachers within the local association.

Listserv: An e-mail program that allows multiple computer users to connect onto a single system, creating an on-line discussion.

NASA: National Aeronautics and Space Administration.

NASA Spacelink: An on-line database of resources established by NASA for the purpose of electronically disseminating information relating to aeronautics and space to the broadest possible audience (Spacelink: On-line connection to NASA, 1995).

NEWEST AND NEWMAST: NASA Educational Workshop for Elementary School Teachers (NEWEST) and NASA Educational Workshop for Mathematics, Science and Technology teachers (NEWMAST) are NASA educational workshops which are held annually to give outstanding educators the chance to personally experience NASA's state-

of-the-art research and development activities. Selected teachers spend two weeks at a particular NASA filed center.

NASA Quest: A project specializes in providing programs, materials, and opportunities for teachers and students to use NASA resources as learning tools to explore the Internet. Through Quest, teachers can access information about educational grants, interact with other schools that are already on-line, and explore "links" to other NASA educational resources.

On-line: A word which refers to computers when they are linked to a computer network, such as the Internet.

Tennessee Education Association (TEA): The state Association affiliated with the National Education Association having a membership of approximately 45,000 Tennessee teachers.

Tennessee Space Week (TSW): An annual educational event sponsored by the Tennessee Education Association, the National Aeronautics and Space Administration and United States Space Camp. Tennessee Space Week is usually held the last week in February.

World Wide Web: Network based on "hypermedia" that handles graphics, sound and text (Bruning, 1995, p 49).

Web-Based Learning: A method of incorporating factual information found on the World Wide Web into classroom instruction.

Utilization of NASA and other Internet Aerospace Web sites: It refers to the extent and methods that Tennessee Space Week teachers incorporate the aerospace concepts, subject matter, and activities, acquired from the World Wide Web.

U.S. Space Camp - A program operated by the U. S. Space and Rocket Center in Huntsville, Alabama to introduce students, teachers and public on the wonders of space flight.

Summary and Organization of the Study

Chapter I describes the problem, the purpose, research questions, significance, assumptions and limitations of the study, and the definition of terms. Chapter II presents an in-depth discussion of the review of literature, focusing on the history, development, and purposes of Web-based learning and how a segment of Tennessee teachers are aware of the value of using the Internet to augment classroom instruction. Chapter III gives the research design and methodology. Chapter IV contains the analysis of the data collected, and Chapter V contains a summary of the study, conclusions and recommendations.

CHAPTER II

REVIEW OF RELATED LITERATURE

Introduction

This chapter includes a review of the literature which is related to the problem. This review addressees the following areas:

1. Origin of the Internet and its Implementation in Classroom Instruction.
2. Using e-mail and Listservs to Augment Classroom Instruction.
3. Integrating Web-Based Learning in the Curriculum.
4. Creating Internet Access for schools in Tennessee.
5. Aerospace Education and Internet Applications during Tennessee Space Week.

Origin of the Internet and Its Implementation in Classroom Instruction

The Internet began in 1969 when the United States Department of Defense established a network of computers named ARPAnet (Advanced Research Projects Agency Network) to link universities, government laboratories and important defense industries. In 1987, the control of the Internet was taken over by the National Science Foundation which then created a new network called NSFNET (National Science

Foundation Network). The Internet today is a combination of these two earlier systems and numerous other independent networks (Pool, Blanchard, & Hale, 1995).

Morgan, (1997) states that the Internet has become an international computer network composed of thousands of smaller computer networks. State and regional education networks and commercial providers have made the vast resources of the Internet increasingly available to administrators, school library media specialists, and classroom teachers. Teachers who use the Internet mention the ways it can "extend the learning environment" for students (U.S. Congress report from OTA, 1995, p 110). It offers potential for equality in education by allowing students to communicate with other students electronically instead of face to face. As a result, this minimizes the distractions of social status, race, or cultural differences.

The networks that comprise the Internet are owned by countless commercial, research, government, and education organizations and individuals. Users are able to discover and access people and information, distribute information, and experiment with new technologies and services. The Internet has become a major global infrastructure used for education, research, professional learning, public service, and business (Sellers and Robichaux, 1996). Recent surveys conducted to determine Internet usage indicate that Internet growth shows no sign of abating. A survey conducted in 1996 by Nielsen Media Research showed that Internet access in the United States and Canada had increased by 50 per cent of total on-line usage since a previous study done in the fall of 1995 (PC Novice Smart Computing, 1997).

The growth of the Internet results from the development of browsers such as Netscape or Microsoft Internet Explorer. Browsers give the Internet a Graphical User

Interface (GUI) that allows the Internet user to access the graphical part of the Internet known as the World Wide Web (Crolier, 1997). On the World Wide Web, students are transported from the routine instructional materials of the classroom to the exciting documents and discussions of the real world for authentic learning (Peterson, Nicholson, & Mandeville, 1996). Perhaps more importantly, the World Wide Web is being used as a tool for curriculum enhancement and professional development by teachers. Patterson (1995) believes that no lasting positive change would occur in education unless quality opportunities for professional development were provided. The Internet may be the incentive to encourage teachers to acquire information in their search for on-going professional development (Patterson, 1995).

The Internet has linked homes, libraries, schools, and businesses into a community-wide learning resource. Nevertheless, many schools still do not have access to the Internet. President Clinton has made a goal for the nation to have each classroom linked onto the Interent by the year 2000 (The Huntsville Times). The eventuality of having widespread Internet access in everyone's classroom will change the very nature of teaching. Planning for the use of these technologies requires a rethinking of traditional education structures, from administrative organization and cost accounting systems to teacher training and instructional design. Effective use of the Internet in classroom instruction depends on a combination of expertise in technology, content, infrastructure building, and school administration. Few institutions offer opportunities to bring these expertise together. A major barrier to planning is the lack of "technology-friendly" organizational environments. Federal, state, and local governments, educators at all

levels, private industry, and telecommunications service providers must work together making distance learning affordable, effective, and accessible (Withrow & Kohls, 1995).

One of the institutions that can offer opportunities to bring awareness of the benefits of technology in learning is NASA. To assist in the dissemination of how technology can be used in creating educational excellence, the NASA Strategic Plan states the following: "We (NASA) involve the educational community in our endeavors to inspire America's students, create learning opportunities, and enlighten inquisitive minds" (NASA, 1998). It will be a purpose of NASA to contribute what it can to help the education community make use of new technologies such as the Internet.

Because of the overwhelming nature of the Internet, confusion exists as to exactly what the Internet is and how to access it. Starr (1997) states that a clear distinction needs to be made between what is meant by the Internet, the "Information Superhighway" and the World Wide Web. The Internet is an unorganized collection of networks that includes local area networks (LANS), dedicated computer lines, telephone lines, and satellite links. The Information Superhighway is a term popularized by the media, referring to the vast amount of data transmitted by the Internet and by telecommunications facilities in general. The World Wide Web is one of several services on the Internet, easily the most glamorous, and largely responsible for the tremendous increase in Internet usage.

Utilization of the Internet by educators and educational institutions has been the subject of a number of different studies during the past several years. Results of this research (Nejdl, 1997) indicate that Internet-based teaching and learning will continue to play an important role in learning and research work, however, it is important to realize that while it is relatively easy to use the Internet to transport conventional types of lectures

and course notes, it is more difficult to utilize the full power of Internet-based techniques to advance teaching and learning conceptually.

Wilson and Utecht (1995) suggest that the K-12 community promises to be one of the largest groups of new Internet users. In addition, Futoran, Schofield, and Eurich-Fulcer (1995) describe the Internet as eventually allowing school walls to become transparent and permeable, with students becoming both consumers and providers of information.

Maddux (1994) made the following recommendations that must be provided to teachers to implement using the Internet as an educational resource:

- Sufficient hardware (Computers, printers, modems);
- Sufficient software (Connectivity programs, virus checkers, etc.);
- Faculty training concerning how to use the Internet;
- Specific teaching materials; and
- Suggestions for teachers concerning how to integrate Internet resources into their educational curricula.

Futuran, et al. (1995) examined ways to make the Internet more effective in classroom instruction in allowing as many students as possible to access it. Futuran suggested the following guidelines:

- Limiting Internet access to hours when students are in school.
- Limiting the type of access that students have to the Internet, possibly through menu-based systems where only specific items are available: and

- Socializing students to appropriate behaviors, including warnings about problematic materials or potentially dangerous adults who may utilize various Internet resources.

Whether we like it or not, the nature of literacy and learning is being redefined by the digital technologies that are quickly becoming part of the information age in which we live (Negroponte, 1995; Reinking, 1996).

New technologies are also redefining the role of the educator to that of facilitators of knowledge, e.g. multimedia environments will increase, not decrease, the central role of teachers in orchestrating learning experiences. We will be challenged to thoughtfully guide students' learning within information environments that are richer and more complex than traditional print media, presenting richer and more complex learning opportunities for teachers and students (Leu, 1996).

Using the Internet in classroom instruction dramatically changes the role of the teacher. Rather than the deliverers of information, teachers are now becoming the facilitators of learning - the coach that guides students to discover new areas, to ask probing questions, to question information found, to develop new theories and search for information that supports or refutes new ideas (Manual & Norman, 1992).

Teachers cannot be merely tour guides showing students all to see along the Information Highway. They must help students learn to narrow their search for information and evaluate the information they find, while still providing students with the opportunity to explore and discover new areas of learning along the way. This is perhaps the hardest kind of teaching (Hardwick, 1996).

Using E-mail and Listservs to Augment Classroom Instruction

Some of the more apparent ways teachers can incorporate the Internet in classroom instruction is by using the capabilities of the Internet to send and receive electronic mail. Electronic mail (or e-mail) is typically described as the most commonly used function of the Internet and is also the first and most frequent application used by most teachers and students. This type of activity allows users to create, send, save, delete, forward, print, transfer files, and reply to various electronic messages (Carmona, 1995).

Electronic communication, because of its speed and broadcasting ability, is fundamentally different from paper-based communication. Because the turnaround time can be so fast, e-mail is more conversational than traditional paper communications. With e-mail access, educators can carry out professional conversations among themselves concerning issues that may require a timely response (Sherwood, 1997).

Educators are beginning to take advantage of the Internet as a classroom tool to enhance their subject matter. Although much of the use centers around e-mail and research, there are other activities taking place. An example of how e-mail is being used is having students correspond electronically with students in other school districts to collaborate on projects of various topics in science and mathematics (Smallwood, 1997). There are many reasons to get students involved using Internet tools for team design. First, a need to get students interested in working with the Internet. Once they are interested, students can:

1. exchange information quickly and conveniently,
2. access experienced and expert individuals in thousands of fields,
3. receive regular updates on topics of interest,
4. gain wide-area access to data,
5. develop teams and enhance teamwork across geographic distance
6. gain access to achieve information,
7. translate and transfer data between machines,
8. have fun and be entertained (Tolhurst et al, 1994).

Students and teachers are using computers for: e-mail, which includes distribution lists, newsgroups and electronic bulletin boards; file downloading, which allow users to copy files containing text, software, pictures, and music. Teachers may use computers connected to the Internet to send their work to some other parties for evaluation or response by using e-mail. Teachers communicate with colleagues, scientists, and experts on various subjects. The Internet serves as a forum to learn about distant events and different cultures. The exchange of writing samples with professional writers for editing and engineers for technical review provides a valuable dialogue. Information technology in the classroom does much more than boost enthusiasm or expand information sources. Its use fundamentally alters the roles of teachers and students (Peha, 1995).

The Internet contains literally thousands of special interest discussion groups, each individually managed by an Internet server known as a list server, commonly referred to as a Listserv, list processor or a list. Lists are often moderated by a list owner, but this is not always the case; some lists are simply a free-for-all discussion without a person filtering the messages. Most lists can be provided to the user either in a digest form or on a post-

by-post basis. Any member of a list may take part in a conversation or begin a new topic. Listservs can also distribute electronic journals (e-journals) and newsletters, which are simply on-line magazines that are edited and distributed as a list. In general, most lists and e-journals can be joined by posting an e-mail to the listserv address (EARN Association, 1994).

To join a discussion group, the user sends a brief electronic message to the subscription address on the listserv, generally composed of the word 'LISTSERV' or similar heading combined with the location of the list itself. As an example, the following wording style would be used to subscribe to a NASA listserv on education: listmanager@quest.arc.nasa.gov would be used for the NASA K-12 Internet Initiative mailing list.

Listservs can become a powerful tool for acquiring information on a particular subject that one may be interested. Listservs provide a valuable asset in keeping teachers informed of current educational practices and/or appropriate research. This resource also provides access to significant dialogue among list members concerning a variety of issues, both for conference participants and those who simply follow the information exchange without participating (Milheim, 1997).

Integrating Web-Based Learning into the Curriculum

The World Wide Web has emerged rapidly to become the premiere electronic medium. The attributes of the World Wide Web match those of print, audio, video, and computer, but with the addition of vast scope (content and geography). This scope enhances communications, information retrieval, and sharing, and consequently appeal

(Hackbarth, 1997). In addition, Hackbarth noted that in classrooms having reliable access to the Web, teachers may consider it as a viable option among other readily available traditional sources of information, such as periodicals and books.

Wilkinson (1997) expresses his concern of a drawback to such easy access to the World Wide Web when Web-Based Learning is used instead of traditional sources of information from published books and journals. The drawback is that of deciding which aspects of the Web have valid educational value. Many Web sites overemphasized technological "bells and whistles" over relevance and scope, validity, and even accuracy.

Milheim (1997) states that the Internet and the multimedia attraction of the World Wide Web are fast becoming some of the most important resources for current information. Whereas educators may have some difficulty gaining access to these powerful information and communication options, it is becoming increasingly evident that these minor problems are far outweighed by the potential benefits to educators and students.

The growing popularity of the World Wide Web has brought the Internet to the forefront of instructional technology discussion. The availability of the Web and ease of use have fueled a tremendous increase in distance learning activity in the years since its inception (Starr, 1997).

Kearsley (1996) elaborated on attributes of the Web as follows:

> The most significant aspect of the Web for education at all levels is that it dissolves the artificial wall between the classroom and the 'real world.' . . . With the Web . . . students can find original materials and collect first-hand information themselves . . . The second powerful aspect...is that it provides an easy mechanism for students (and teachers) to make their work public...Furthermore, students can examine the work of others. . ., [which] allows for global comparisons, collaborations and competition...A third aspect...is that it provides an easy way to create and dis-

> tribute multimedia materials . . . Finally, . . . students...can include links to the source material in their work . . . [And they can] include input fields in a Web document [to] collect data or comments from everyone who visits. (pp.28-29)

To help support this concept of using the Internet to facilitate a learning environment, NASA has created a variety of Aerospace Web sites for teachers, faculty and students. These Web sites are the NASA Education Home Page, NASA Spacelink, Quest, and the NASA Television Home Page. These NASA On-Line Resources for Educators are described as follows:

> NASA Education Home Page (http://www.hq.nasa.gov/office/codef/education).
>
> NASA On-line Resources for Educators provide current educational information and instructional resources to teachers, faculty, and students. A wide range of information is available, including science, mathematics, engineering, and technology education lesson plans, historical information related to aeronautics and space program, current status reports on NASA projects, news releases, information on NASA educational programs, and useful software and graphics files. Educators and students can also use NASA resources as learning tools to explore the Internet, access information about educational grants, interact with other schools that are already on-line, participate in on-line interactive projects, and communicate with NASA scientists, engineers, and other team members to experience the excitement of real NASA projects.
>
> NASA Spacelink (http://spacelink.nasa.gov). NASA Spacelink is one of the Agency's electronic resources specifically developed for use by the educational community. It is a comprehensive electronic library that contains current information related to NASA's aeronautics and space research. Teachers, faculty, and students will find that Spacelink offers not only information about NASA programs and projects, but also teacher guides, pictures, and computer software that can enhance classroom instruction.
>
> Spacelink also provides links to other NASA resources on the Internet. Educators can access materials chosen specifically for their educational value and relevance, including science, mathematics, engineering, and technology education lesson plans, information on NASA educational programs and services, current status reports on Agency projects and events, news releases, and television broadcasts schedules for NASA Television (NASA On-Line Resources for Educators Fact Sheet, 1996).

> Quest (http://quest.arc.nasa.gov). Quest is home of NASA's K-12 Internet Initiative, one of the electronic resources that the Agency has developed for the educational community. The project specializes in providing programs, materials, and opportunities for teachers and students to use NASA resources as learning tools to explore the Internet. Through Quest, teachers can access information about educational grants, interact with other schools that are already on-line, and explore 'links' to other NASA educational resources.
>
> One of Quest's most unique endeavors is the 'sharing NASA' on-line interactive project. Students and educators are given the opportunity to communicate with NASA scientists and researchers to experience the excitement of real science in real time. In addition to these programs, the project also houses information about materials that accompany the K-12 Internet Initiative videos. These videos promote the Internet in schools and assist educators in acquiring and integrating the Internet into the classroom.
>
> NASA Television (http://www.nasa.gov/ntv/). NASA Television (NTV) features Space Shuttle mission coverage, live special events, interactive education video conferences, electronic field trips, aviation and space news, and historical NASA footage. Programming has three blocks--Education File, History File, and News Video File--repeated at intervals 24 hours a day.
>
> The Education File features programming for teachers and students on science, mathematics, and technology. You and your class can investigate exciting NASA research endeavors in aeronautics, microgravity, planetary sciences, human exploration of space, Earth systems, robotics, and more. Educators are welcome to videotape from NTV.
>
> The *NASA . . .On the Cutting Edge* Education Videoconference Series offers teachers and students opportunities for live, interactive dialogue by telephone with NASA scientists. Conferences highlight current NASA research and technology. Participation is free (NasaEduTV@smtpgate.osu.hq.nasa.gov). (NASA On-Line Resources for Educators Fact Sheet, 1996).

In addition to the above NASA Web sites that are suited to educators and students, NASA also organizes various interactive on-line projects that connect classrooms with ongoing science and engineering work. Classrooms participating in these projects receive frequent reports from the professionals and background information on their research. The diversity of the team becomes clear; most teams are a broad mix of different educational levels, genders, and ethnicities. Opportunities to

interact on-line with the NASA experts are provided via e-mail, chat and network video. The projects provide real and relevant content to enhance various classroom curriculums (NASA Fact Sheet: The Internet in the Classroom, 1997).

These projects are geared for teachers in grades 4-12, home-schoolers and adult learners. They are designed for a wide range of Internet skills and abilities, from newcomers to on-line experts, including those with dial-up access at home through schools with high-speed access in the classroom. About half of these projects are done in partnership with a group called *Passport to Knowledge* (funded by the National Science Foundation, Public Broadcasting System and NASA). In addition to the on-line resources, these projects also include live television programming and a teachers' guide. The video component are available via PBS and NASA-TV and further enhance the ability of students to connect with the working professionals. (The Internet in the Classroom, NASA Fact Sheet, (1997).

Cornish and Monahan (1996) summed up the range of Internet-based learning activities:

> Educational professionals, elementary students, and parents all have an opportunity to gather information. Teachers can exchange lesson plans and information, participate in educational discussions, and consult researchers. Students can participate in interactive projects and improve their writing skills by communicating with students around the world. Parents are able to keep in close contact with the school and exchange information with one another via e-mail. They could also get assistance from specialists when available. (p. 56)

Dyrli and Kinnaman (1996) enthusiastically observed that the advantages of computer-based telecommunications was to bring "immediacy and individualization to the school curriculum." They noted the following:

> Teachers and students can individualized learning according to their needs and interest by selecting from a host of on-line educational experiences such as key-pals and electronic field trips. Teachers can also find up-to-date materials including articles, reports, surveys, databases, maps, diagrams, photographs, film clips, and sound bites--and bring them to the classroom at the very time they are needed. Users can connect to world-wide events as they are happening, communicate instantaneously with people on every continent, participate in cooperative on-line projects, and explore content themes interactively in an infinite variety of sequences.

The World Wide Web is now at the disposal of most educators. The question now facing teachers is to adapt Web-based learning in such ways as to be integrated effectively into more human relation centered, inquiry-based, and open-ended curriculums (Hackbarth, 1997).

Web-based learning has taken hold in many parts of the country. A teacher at the Dalton School in New York City developed an astronomy course which required students to access the Web in order to acquire to complete assignments. As an example, students are given assignments on the evolution of galactic clusters by downloading Hubble Space Telescope images from a NASA Web sites. Acquiring information from World Wide Web sites that are maintained by NASA allows students at the Dalton School to acquire needed information to research questions on astronomy. The teacher who developed the Web-based learning course on astronomy at the Dalton School observed that, "One of the things about kids is that they won't ask a question if it will take them a long time to answer it." The Internet makes learning vibrant, and the experience takes students from where they are in the world and tells them how it connects to the real world by showing the interrelationships of various topics that are linked on the World Wide Web (Sapers, 1996).

Shrivastava (1997) asserts that successful learning via the Internet and World Wide Web requires learners to have access to diverse sources of information built around themes and interests relevant to them. Information must be easily accessible at all times. Shrivastava categorized four areas of pedagogy that a Web-based curriculum should be grounded upon:

1. Diffusion with Focus. Good Internet learning is facilitated when diverse and diffused sources of information are made available. It is useful to meld substantive subject related information with information on student interests only peripherally related or even unrelated to the subject. Careful balance of relevant and not so relevant but interesting information, helps retain long term interest of the learner.

2. Open Access. Open access to information is a key element of Internet based pedagogy. Integration and automation of Internet access into learning services is needed to prevent learners from becoming frustrated with technical and programming problems. The most desirable practice is to have continuous and transparent (to learner) access to the Internet via a Net-PC.

3. Text Image. The current generations of conventional students (18 to 22 years old) have image driven learning styles. Having grown up with TV, video, and computer technologies they grasp information in images and have less patience with text. Internet provides unique opportunities to deliver text as image. Good Internet pedagogy builds multimedia text images of subject matter by combining graphics, images, color, text and sounds.

4. Assessment and Accountability. Our received notions of learning evaluation, grading, and responsibilities of instructor and student, are not suitable for Internet based pedagogy. In the active learning implicit on the Internet, students are far more empowered than in conventional teaching situations. "Instructors" are better viewed as learning facilitators and mentors rather than owners of information. However, good grading and evaluation is feasible by following simple and explicit rules.

A concern that must be addressed when using the Internet in a Web-based learning curriculum is the need to inform students in the methodology of acquiring useful research materials from the Internet. When using the Internet, one must have

knowledge of using what are called "search engines" to find the information needed. The amount of information on the Internet is so vast that one can only speculate on the number of Web sites available at any given time. Currently, somewhere between one hundred and two hundred and fifty new Web sites are estimated to be added to the World Wide Web each week. With all this information available, one of the biggest problems with the Internet continues to be trying to locate specific information (Ressel, 1997).

Today, a number of teachers are assigning class work for independent study which requires students to access information from the Internet. As an example, teachers can assign research projects that span the school year and use technology as a cornerstone of students' work. Independent scientific research, which utilizes when the Internet, allows students to explore scientific developments that have shaped their world. Students can learn to focus on a science topic that falls within the scope of what they will study during the school year. In the process, students develop minds-on science skills through scientific inquiry (Wetzel, 1997).

Creating Internet Access for Schools in Tennessee

Statewide Internet access in the public schools in Tennessee began in 1991 with a program implemented by Vanderbilt University in Nashville. Vanderbilt University and various Nashville businesses started the Virtual School Program to provide free training in educational applications of computer technology for K-12 educators within Tennessee. During the first three years of the Virtual School, Vanderbilt provided network accounts to participating teachers who had taken part in a Saturday workshop

to acquaint teachers on the Internet. In 1994, the Virtual School was incorporated into the Tennessee Department of Education 21st Century Classroom program. Computer accounts are now sponsored by the Tennessee Department of Education in cooperation with the Tennessee Board of Regents (About the Virtual School On-line, 1997).

The Virtual School has enabled thousands of Tennessee teachers and administrators to learn how to use the Internet for professional development and classroom activities. In Fall 1996, the ConnecTEN initiative began bringing the Internet to every school in the state, giving access to all Tennessee students (Vanderbilt Web site, 1997). The ConnectTen Project is a program that elevates and levels the learning field for each student in Tennessee. It is designed to make every youngster in Tennessee a citizen with access to the World Wide Web (ConectTen Homepage, 1997).

During its development stage in December, 1993 the ConnectTEN program had the following vision as its goal:

> Tennessee educators will have access to their colleagues and specialists around the world. Opportunities will be available to connect student work with real-life problems associated with the work of other students and adults. Tennessee teachers will be able to network with their peers to share ideas and to explore creative learning approaches (NCTP Homepage).

Higher education in Tennessee has not neglected its role in providing practical advantages of having Internet access available to classroom teachers. Hannah (1995) focused on how Middle Tennessee State University, through the Center for Economic Education, developed a basic mission to assist high school economic instructors in evaluating the quality of teaching economics in the Middle Tennessee area. In one

case, an economics high school student made an inquiry about foreign investments in Tennessee, and the Center was able to direct him to some excellent electronic archives.

Middle Tennessee State University has also established an economics teaching-related discussion group for Tennessee high school teachers, TENNECON-L@FRANK.MTSU.EDU. These kinds of efforts accelerate the use of Internet in the classroom and allow the expansion of teaching expertise through the exchange of ideas (Hannah, 1995). Access to the Internet is also making its mark in college classrooms in Middle Tennessee with the development of Master Classrooms. Master Classrooms are specially equipped classrooms that contain a wide range of computer, media, projection, communication, and control capabilities, including connection to the campus network. Master classrooms typically contain one computer, which can be used by instructors and students for presentation development, simulations, on-line access, and multimedia (Roberts & Gena, 1996).

Aerospace Education and Internet Application During Tennessee Space Week

The Tennessee Education Association (TEA) created Tennessee Space Week (TSW) in 1987. The goal of the program was to promote aerospace education through teacher workshops and inservice (TEA Memo, 1996). Tennessee Space Week is held the last week in February. To help facilitate and coordinate the logistics of Space Week NASA workshops and school programs, coordinators of Tennessee Space Week are appointed by local TEA association presidents. It is the coordinator's responsibility to organize Space Week events in their respective school districts. (Cartwright, 1997).

The growth of the Internet in Tennessee schools by the ConnectTen Project has provided Tennessee Space Week coordinators with opportunities to keep informed of NASA programs and activities which students can participate. Coordinators of Tennessee Space Week are therefore in a unique position to utilize the information that is available from the Internet to supplement the classroom curriculum. (Charles, 1997).

During Tennessee Space Week, an average of six Aerospace Education Specialists from NASA conduct teacher workshops in Tennessee. Through these workshops, Tennessee teachers become aware of using aerospace as a motivational tool to teach science, mathematics and technology. In addition, TEA Space Week allows the NASA education specialist spotlight Internet Web sites like NASA Spacelink and NASA Quest, where teachers are encouraged to use these Internet resources to supplement their classroom instruction (Ehmen, 1995).

Since 1987, the Tennessee Education Association has utilized the services of NASA, the Marshall Space Flight Center, the Aerospace Education Services Program (AESP) and U. S. Space Camp to make Tennessee Space Week a successful annual educational event. Tennessee Space Week workshops facilitated by NASA have provided a valid educational experience in developing student awareness of the U. S. Space Program. This is evident by the enthusiastic endorsement from both coordinators of Tennessee Space Week and from teachers who have participated in Tennessee Space Week since its inception (Wheeler, 1997).

The educational impact that NASA and Tennessee Space Week has made on schools in Tennessee was brought to the attention of the Untied States Congress. In 1992, a Congressional hearing entitled, "The U. S. Space Program Benefits to

Education," was brought before the Subcommittee on Space of the Committee on Science, Space, and Technology. This hearing was held to review the educational benefits of the U.S. Space Program, a program which was given credit in helping young people to become more interested in science, mathematics and technology was Tennessee Space Week (U.S. Space Program Benefits to Education, ERIC 1992).

Summary

This chapter has reviewed the relevant literature for this study. It has examined the history and development of the Internet and how the Internet is being used to augment instruction by teachers. This chapter related how teachers can assist students' learning by accessing a variety of World Wide Web sites operated by government, education, and business entities. It has also explained how using e-mail and Listservs, can promote effective use of the Internet in the classroom. In addition this chapter details how Tennessee has been on the forefront since the early 1990s, in getting their schools connected to the Internet by implementing the technology plans of the Virtual School Project at Vanderbilt University and the Tennessee Department of Education ConnectTEN Project. This chapter also outlines the efforts of the Tennessee Education Association to implement Tennessee Space Week and how NASA Aerospace Education Specialists have conducted teacher workshops in Tennessee. As a result of these workshops, Tennessee Space Week teachers have become aware of Web sites such as NASA Spacelink and NASA Quest, and they have been encouraged to use the Internet to supplement classroom instruction.

CHAPTER III

DESIGN AND METHODOLOGY

Introduction

This chapter explains the methodology of the study and describes the population represented by the sample including the size and major characteristics. The development of the instrument is explained, including a description of its purpose and context.

The purpose of this study was to determine the extent to which coordinators of Tennessee Space Week use NASA or other aerospace Web sites to supplement classroom curriculum. In this self-reported study, data were collected using a questionnaire which was validated by a panel of coordinators of Tennessee Space Week that had participated in an Aerospace Education Services Program workshop during the fall of 1997. In addition, the survey questionnaire was also transmitted by e-mail to several teachers that had been coordinators of Tennessee Space Week from 1995 to 1997. Permission to perform research involving Tennessee Space Week teachers was granted by Mrs. Kathy Wheeler, Communications Director of the Tennessee Education Association in Nashville, Tennessee.

Population

The population for the study consisted of educators selected as coordinators of Tennessee Space Week. These coordinators are responsible for organizing workshops during TEA Space Week and disseminating TEA/NASA workshop materials among TEA Space Week teachers within their local associations. Because of their ability to have access to the Internet, their knowledge of aerospace, and their understanding of the role of NASA education during TEA Space Week, this group was chosen to investigate the research questions in this dissertation. Coordinators interviewed for the survey were selected from a roster provided by the Tennessee Education Association that listed the coordinators for the years of 1995, 1996, and 1997. A total of 125 educators were selected to serve as coordinators of Tennessee Space Week since 1995. All 125 coordinators were surveyed. Gay (1996) purport that when a survey population is under 500, it is recommended that the entire population be surveyed.

To be selected as a coordinator of Tennessee Space Week, one must be a member-teacher of the Tennessee Education Association. Additionally, a coordinator must have attended a NASA AESP teacher workshop. By having participated in NASA education workshops, briefings and tours, Space Week coordinators are aptly aware of the role NASA has in promoting education in science, mathematics and technology (Charles, 1997).

Sample

The subjects of this study were 125 coordinators for Tennessee Space Week from 1995, 1996, and 1997. Delayed recall was a factor in selecting those particular years. The sample population are public school teachers, from grades K-12, that have been designated by the Tennessee Education Association to be coordinators of Tennessee Space Week in the aforementioned years. This population was chosen because coordinators are representative of Tennessee Space Week teachers. These teachers have an interest in aerospace education and ready access to the Internet. Because of these criteria, it was suggested by the organizers of Tennessee Space Week, that coordinators of TEA Space Week would be a valid working sample for the research undertaken. A total of 222 names were provided by the Tennessee Education Association and were selected to be coordinators of Tennessee Space Week for the years 1995 through 1997. In some instances, coordinators for TEA Space Week have held their titles more than once in four years. To insure that each coordinator-participant was included only once in the survey, coordinators appearing twice in the coordinator's roster for TEA Space Week, were deleted and not sent a survey questionnaire to complete. Therefore, only 125 coordinators of Tennessee Space Week qualified to be included in this research.

Type of Research

A descriptive design was chosen for this research because it enables the researcher to collect data to answer some questions (Gay, 1996) regarding the utilization of NASA and other aerospace Web sites by coordinators of Tennessee Space Week. A survey was

used to ascertain the extent coordinators for Tennessee Space Week utilize NASA and other Internet aerospace Web sites to support the classroom curriculum.

Instrumentation

The survey included 23 questions (Appendix D). The survey was approved by the Institutional Review Board of Oklahoma State University (Appendix B). The survey was developed to gather data regarding eleven research questions. Research questions were written to obtain information on the demographics of the population and factors which influenced their Internet usage. Questions were designed to describe how coordinators of Tennessee Space Week utilize NASA and other aerospace Web sites to augment classroom instruction. Although the responses were mostly multiple choice, some of the questions allowed respondents to provide explanations and comments.

The survey was validated in September, 1997 using a field test involving 15 Tennessee teachers who had participated in Tennessee Space Week for at least four years. These individuals were asked to respond to the survey as if they were research subjects, and to offer criticism and suggestions for improving the survey before it went out to the actual subjects.

Data Collection

The survey was distributed in October, 1997 by e-mail and by United States Postal Service. A total of 125 coordinators of Tennessee Space Week from 1995 through 1997 were selected to receive the survey questionnaire. The packet included: (1) a cover letter written by the Communications Director of the Tennessee Education Association, sponsor

of Tennessee Space Week; (2) a copy of the survey; (3) an addressed and stamped return envelope; and (4) an addressed and stamped postcard. The backs of the addressed stamped postcards were randomly coded using computer generated alphanumeric symbols for follow-up purposes only. No identifying marks were added to the survey to identify research participants.

The participants were asked to complete and return the surveys in the addressed and stamped envelope provided. They were asked to mail the postcard at the same time. The researcher matched the code on the returned postcards with the list of survey participants for follow-up purposes to participants who had not responded. After three weeks, the survey participants who had not responded were sent follow-up letters or e-mail as a reminder for them to complete and return the survey.

No surveys were opened until all participants had responded. As they were opened, each survey was placed in a closed box. No survey responses were read until all envelopes had been destroyed. Therefore, anonymity was assured.

Analysis of Data

Upon receipt of the returned questionnaires, the data were coded and entered into a Microsoft Excel spreadsheet. Frequency counts were tabulated for each question and percentages were computed for the total returned questionnaire population. The responses were analyzed by the researcher. Attention was given to the relationships of individual responses as they related to the research question.

Summary

In summary, this chapter gives a description of the population of the study as well as a descriptive of the type of research undertaken. Chapter III also detailed the instrumentation, data collection, and analysis of research data.

CHAPTER IV

RESULTS OF THE STUDY

Introduction

The first three chapters presented an introduction to the study, a review of selected literature, and a discussion of the design of the study. This chapter presents the data collected during the study and summarizes the results of the analyses of that data.

The population interviewed for the survey was selected from a roster provided by the Tennessee Education Association that listed the coordinators of Tennessee Space Week for the years of 1995, 1996, and 1997. The data was gathered from a survey sent to one-hundred and twenty-five educators assigned by the Tennessee Education Association to be coordinators of Tennessee Space Week for 1995 to 1997. Data is presented according to the research questions listed in Chapter I. The data for research questions' one through eleven are presented using frequencies and percentages of coordinator's responses to items on the survey that are directly related to each research question. The frequencies and percentages are concerned with:

1. the demographic characteristics of the educators that have been assigned to be coordinators of Tennessee Space Week.

2. the integration of NASA and other Internet aerospace Web sites by coordinators within their classroom instruction after attending a NASA or Tennessee Space Week workshop.
3. the usage of aerospace information acquired from NASA or other aerospace Web sites in terms of availability, location of computers connected to the Internet, and how often lesson activities are acquired from the Internet.
4. the difference between the acquisition of aerospace information used in classroom instruction before and after Internet access.
5. the number of special assignments coordinators gave their students before and after acquiring Internet access.
6. the usage of NASA and other aerospace Web sites to supplement the classroom.

Research questions 7 through 11 presents data from the research questions that arose as a result of information requested by the Tennessee Education Association to better assess how coordinators utilize the Internet in classroom instruction. The frequencies and percentages are concerned with:

7. the school classification (rural, suburban or urban) where coordinators teach.
8. the average school and faculty size where coordinators teach.
9. Internet aerospace Web sites, other than NASA Web sites, which coordinators access.
10. the ease of finding aerospace teaching materials from the Internet.
11. the NASA aerospace topics used to acquire information to supplement classroom instruction.

Responses to the Survey

A list of names and addresses of 125 coordinators of Tennessee Space Week from 1995 to 1997 was obtained from the Tennessee Education Association. A survey was mailed to each coordinator during the aforementioned years. Responses were received from 88, or 70 percent of the total mailed.

Characteristics of Coordinators

Research Question Number One

What are the demographic characteristics of the coordinators of Tennessee Space Week in terms of teaching experience, gender, level of highest degree earned, teaching level, and current teaching responsibility?

To obtain supporting data for this question, the following survey questions were used (the question number refer to the number of the corresponding survey question):

1. How long have you been teaching in K-12?
2. What is your gender?
3. What is your highest degree obtained?
4. Which best describes your teaching level?
5. Which best describes your current teaching responsibility?

Data from items one through five are presented in Table 1.

TABLE 1

COORDINATORS OF TENNESSEE SPACE WEEK DEMOGRAPHIC CHARACTERISTICS

Demographic Characteristics	Frequency	Percent
Years of Teaching Experience in Grades K-12	0	0.0
1-2 years	6	6.8
3-5 years	74	84.1
11 years and over	88	100.0
Total		
Gender		
Female	52	59.1
Male	36	40.9
Total	88	100.0
Highest Degree Obtained		
Bachelor	31	35.2
Master	54	61.4
Doctorate	0	0.0
Educational Specialist	3	3.0
Total	88	100.0
Current Teaching Level		
Grades K-4	20	22.7
Grades 5-8	26	29.6
Grades 9-12	42	47.7
Total	88	100.0
Current Teaching Responsibilities		
Self Contained	20	22.7
Content Specialist Math	12	13.7
Content Specialist Science	28	31.8
Other	28	31.8
Total	88	100.0

The evidence indicates that the majority, over 84 percent, of coordinators of Tennessee Space Week have been teaching more than eleven years. This suggests that the majority of the coordinators of Tennessee Space Week are veteran teachers having knowledge of the responsibilities required by the Tennessee Education Association to successfully organize educational activities during Tennessee Space Week.

Findings show that 59.1 percent of the coordinators were female and 40.9 percent were male. Only 15.9 percent of coordinators have been teaching between three and ten years. No assumptions are made as to why more teachers from these years have not been given the opportunity of becoming coordinators of Tennessee Space Week. Overall however, it does appear no relationship exists between advanced degrees and the ability to be appointed as a coordinator of Tennessee Space Week.

A large percentage of coordinators, 61.4 percent, have acquired a masters or higher degree. This supports the information obtained from survey question one where more than 84 percent of the teachers responded by stating that they have been teaching more than 11 years. Coordinators are demonstrating a desire to exceed the minimum requirements for teacher certification in Tennessee.

More than half, 54.5 percent, of the coordinators were teachers outside the content areas of mathematics and science. This is indicative of the trend in education to make subjects such as aerospace multidisciplinary. Aerospace education is well suited for integration into other subjects because it incorporates mathematics, science, social studies, and technology. This allows coordinators of Tennessee Space Week to come from disciplines outside science which is how most teachers might equate aerospace as a subject. Data collected from survey question number five, indicates that 22.7 percent of

coordinators teach in a self-contained classroom where all subjects are taught. This percentage gives credence to the impression that teachers feel confidence in taking on the responsibilities of becoming coordinators of Tennessee Space Week although they may not necessarily be specifically assigned as science teachers. In addition, 31.8 percent of coordinators indicated on survey question 5, that they were in teaching responsibilities other than the three categories listed as choices. Other examples cited by coordinators as teaching responsibilities, or positions, included music, social studies, speech, technology, and special education teachers.

Special Workshops by NASA or Tennessee Education Association

Research Question Number Two

Do the numbers of special workshops provided for coordinators by NASA or the Tennessee Education Association parallel the use of acquiring additional information from NASA or other Internet aerospace Web sites?

In order to answer this research question, survey items numbers six and twelve were used (the question number refers to the number of the corresponding survey question):

6. What are the number of special workshops (NEWEST, NEWMAST, Tennessee Space Week, etc.) attended?
12. Do you use the Internet to supplement classroom instruction?

Data from survey item six are presented in Table 2 and data from survey question twelve are presented in Figure 1.

Previous research has indicated a strong correlation among workshop and conference participants in the use of NASA educational materials and publications (Marks, 1975). Tennessee Space Week was conceived by the Tennessee Education Association as an educational program for Tennessee teachers and students. NASA has provided support to Tennessee Space Week since its inception in 1987. The Tennessee Education Association and NASA have provided the support and training to coordinators and teachers to demonstrate how aerospace can be used as a motivational tool to inspire students in learning mathematics, science, and technology.

The data indicates that the majority, 93.2 percent of the coordinators of Tennessee Space Week, has attended at least 1 or more workshops where aerospace was the main theme. Upon closer inspection, one can see that 29.6 percent of the coordinators had attended between 6 to 16 special workshops devoted to aerospace. Surprisingly, however, 50 percent of all coordinators responding to this question stated that they had participated in only 1 to 2 workshops devoted to aerospace. This finding was surprising for three reasons: (1) It could be expected that teachers who have been assigned as Tennessee Space Week coordinators would have a tendency to seek out aerospace workshops to attend, (2) Tennessee Space Week has been in progress since 1987 and therefore, a number of special workshops in aerospace education have been conducted by NASA throughout Tennessee, giving a variety of locations for coordinators to attend

TABLE 2

NUMBER OF SPECIAL NASA OR TENNESSEE SPACE WEEK WORKSHOPS ATTENDED BY COORDINATORS OF TENNESSEE SPACE WEEK

Special Workshops Attended	Frequency	Percent
0 Workshops Attended	6	6.80
1 to 2 Workshops Attended	44	50.00
3 to 5 Special Workshops Attended	12	13.60
6 to 10 Special Workshops Attended	8	9.10
11 to 15 Special Workshops Attended	10	11.40
16 plus Special Workshops Attended	8	9.10
Total	88	100.00

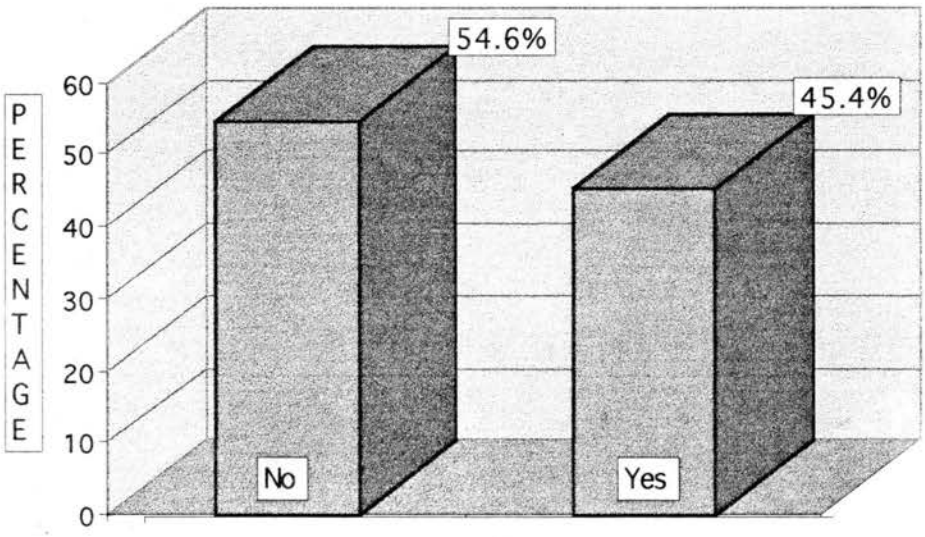

Figure 1. Internet Usage to Supplement Classroom Instruction

aerospace workshops, and (3) The Tennessee State Department of Education appropriates grant money to several universities in Tennessee to conduct aerospace workshops, again providing coordinators more opportunities to attend these workshops.

Survey question number 12 asked if coordinators used the information available on the Internet to supplement classroom instruction, specifically as it is used in the teaching of aerospace. A majority, 54.6 percent, of coordinators responded that they did not. One of the goals of Tennessee Space Week is to encourage coordinators to use aerospace information from NASA Internet Web sites in integrating the curriculum. The data indicates a need for continued emphasis during and Tennessee Space Week workshops to inform coordinators of the benefits of incorporating the information found on the Internet within classroom instruction.

Internet Incorporation with Classroom Instruction

Research Question Number Three

How do coordinators of Tennessee Space Week incorporate the Internet in classroom instruction in terms of availability, location of the computers connected to the Internet, and how often lesson activities are acquired from the Internet?

To obtain supporting data for this question, the following survey questions were used (the question number refers to the number of the corresponding survey question):

9. How many computers are connected to the Internet in your school?
10. Where is the primary computer from which you access NASA or other Internet aerospace Web sites located?

11. How many hours per week do you spend accessing NASA or other Internet aerospace Web sites?

Data from survey items nine, ten and eleven are mentioned in Figure 2, Table 3, and Figure 3.

Over 45.4 percent of coordinators reported using the Internet to supplement classroom instruction (1). This is a valid percent considering that in survey question 9, coordinators were asked to estimate the number of computers in their schools that were connected to the Internet. More than 52 percent of coordinators responded that they had at least 16 or more computers connected to the Internet in their schools (Figure 2). Some coordinators reported still not having Internet access. This finding is surprising given the fact that Tennessee, through the ConnecTen Project has invested time and money in wiring the schools for Internet. An explanation why these schools may not have Internet, could be the possibility that the schools have the capability for the Internet, but computers may not yet be tied into the network.

The data indicates that computers connected to the Internet in Tennessee schools are being installed in central locations such as school libraries, media centers, or computer laboratories. This is being done apparently to facilitate equitable availability to the entire school population. The drawback to this cooperative approach of sharing computers connected to the Internet may be that it limits spontaneous usage of the Internet for research, writing, and extra projects assigned by coordinators to their students. If connectivity to aerospace Web sites were better, increased Internet usage to supplement the classroom curriculum could be expected.

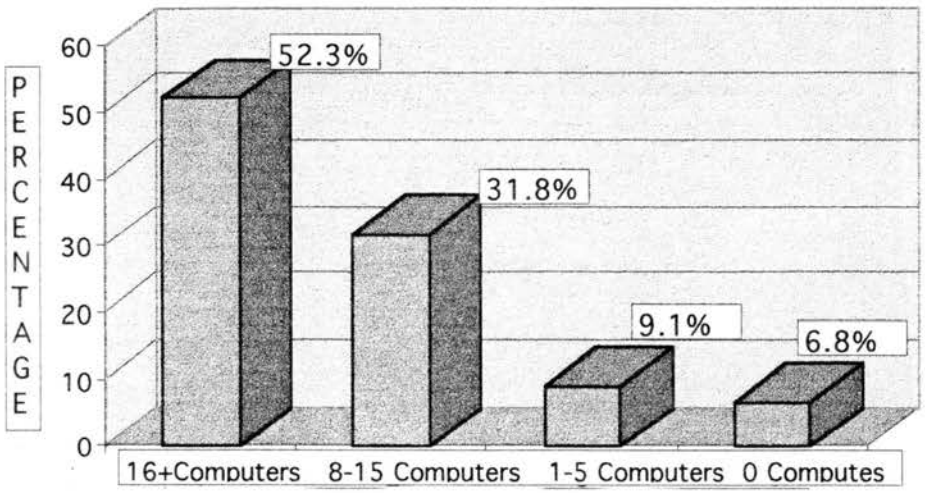

Figure 2. Availability of School Computers Connected to the Internet Where Coordinators Teach

TABLE 3

LOCATION OF COMPUTER WHERE COORDINATORS ACCESS NASA OR OTHER AEROSPACE WEB SITES

Computer Location	Frequency	Percent
Classroom	44	50.0
Main Office	2	2.2
Library/Media Center	28	31.8
Computer Lab	4	4.6
Home	4	4.6
Other	6	6.8
Total	88	100.0

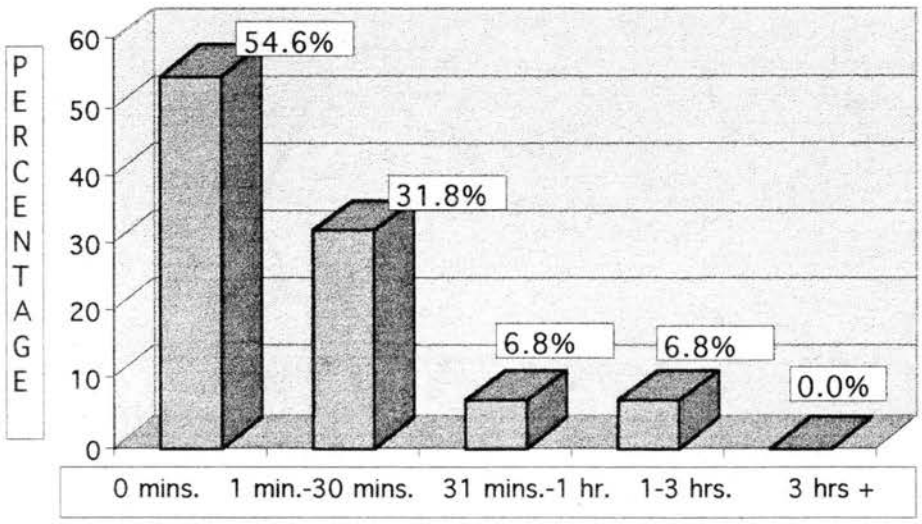

Figure 3. Minutes or Hours Per Week Coordinators Access NASA or Other Internet Aerospace Web Sites

The data indicates that 4.6 percent of coordinators (4 responses), accessed NASA or other aerospace Web sites from home computers (Table 3). However, a review of the responses from those coordinators that used home computers to access the Internet, revealed that they spent 0 minutes per week accessing aerospace Web sites. An explanation why this discrepancy exists, may be that coordinators who accessed NASA or other aerospace Web sites from home, were doing so on a monthly or semi-monthly basis, but not on a weekly basis as the survey question had asked. If this is true, the data collected for survey questions 10 and 11 reflect valid responses.

Less than half, 45.4 percent of coordinators, reported that they spend less than 3 hours per week accessing NASA or other Internet aerospace Web sites (Figure 3). However, this does not infer that coordinators did not access other Web sites on the Internet during an average week to acquire lesson activities.

Aerospace Activities in the Classroom before and after Internet Access

Research Question Number Four

Did coordinators obtain aerospace activities from other sources before having Internet access and identify if lesson activities were acquired from NASA or other aerospace Web sites after Internet access was acquired?

In order to address this research question, the following survey items were used (the question numbers refers to the number of the corresponding survey question):

13. Before you had access to NASA or other Internet aerospace Web sites, did you use aerospace activities within your teaching?

14. How often do you acquire lesson activities or ideas for classroom instruction from NASA or other Internet aerospace Web sites?

Tables 4 and 5 are used to present data from questions thirteen and fourteen.

A slight majority, 52 percent of coordinators, stated that aerospace activities were not applicable in their teaching before having Internet access. The high number of "not applicable" responses infer that some coordinators were not aware of the many possibilities of using aerospace activities to integrate the curricula in a variety of disciplines.

Survey question 14 asked coordinators the number of classroom lesson activities they had acquired from NASA or other Internet aerospace Web sites. Approximately 45 percent reported that they had acquired lesson activities from NASA or other Internet aerospace Web sites to augment classroom instruction 5 or more times a year. However, more than half, 54.6 percent, reported that they had accessed aerospace Web sites fewer than 5 times per year to acquire information to support the curriculum. However, this does not imply that coordinators did not access other Web sites on the Internet to acquire supplementary information for classroom instruction.

TABLE 4

USE OF THE INTERNET TO SUPPLEMENT CLASSROOM INSTRUCTION BY COORDINATORS

Usage of Aerospace Activities Before Internet Access	Frequency	Percent
Yes	36	40.9
No	6	6.8
Not Applicable	46	52.3
Total	88	100.0

TABLE 5

NUMBER OF LESSON ACTIVITIES/IDEAS COORDINATORS ACQUIRED FROM NASA OR OTHER INTERNET AEROSPACE WEB SITES FOR CLASSROOM INSTRUCTION

Number of Times Lesson Activities were Acquired from NASA/Aerospace Web Sites	Frequency	Percent
Less than 5 times per year	48	54.6
50 to 10 times per year	28	31.8
Greater than 10 times per year	12	13.6
Total	88	100.00

Special Assignments Given to Students Before and After Acquiring Internet Access

Research Question Number Five

What were the number of special assignments given by coordinators of Tennessee Space Week before and after acquiring Internet access?

In order to address this research question, the following survey items were used (the question numbers refers to the number of the corresponding survey question):

15. To the best of your recollection and PRIOR to acquiring Internet access, estimate the number of special assignments (e.g. reports, laboratory experiments, summary of observations, laboratory reports, etc.) that you gave students per week.

16 Since acquiring Internet access, estimate the number of assignments (e.g. reports, laboratory experiments, summary of observations, laboratory reports, etc.) that you gave students per week.

17. If assignments are given for utilizing NASA or other Internet aerospace Web sites, how are they regarded as class assignments?

Tables 6, and 7 represents data from survey questions fifteen, sixteen, and seventeen.

The data indicates that many coordinators, over 61 percent, had given special assignments to their students at least one time per week prior to having Internet access Figure 4). This question should be restructured to obtain more specific information about

TABLE 6

NUMBER OF SPECIAL ASSIGNMENTS COORDINATORS GAVE STUDENTS PER WEEK AFTER ACQUIRING INTERNET ACCESS

Number of Special Assignments	Frequency	Percent
0 times per week	9	10.2
1 time per week	38	43.2
2 times per week	15	17.1
3 times per week	12	13.6
4 times per week	8	9.1
5 times per week	6	6.8
Total	88	100.0

TABLE 7

HOW ASSIGNMENTS FROM NASA OR OTHER INTERNET AEROSPACE WEB SITES ARE REGARDED

Classification of Assignments	Frequency	Percent
Required	42	47.8
As Bonus	37	42.0
No Assignments Are Given	9	10.2
Total	88	100.0

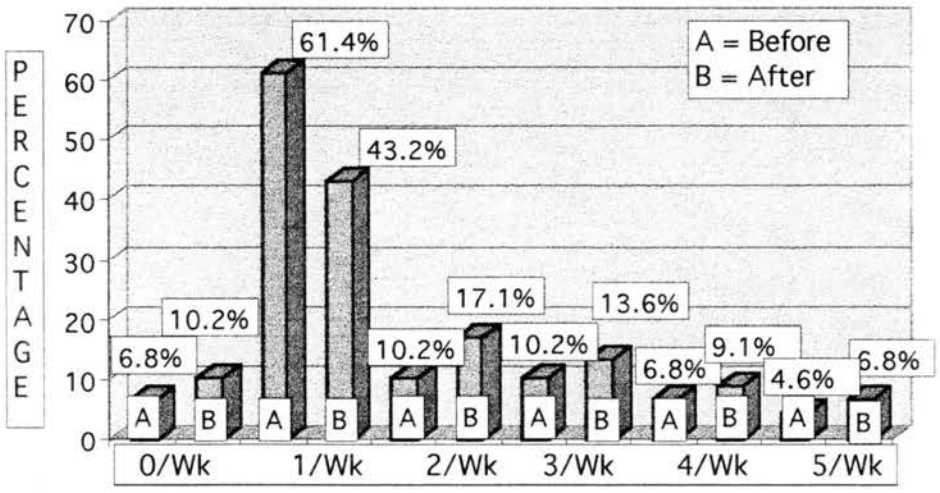

Figure 4. Number of Special Assignments Given Before/After Internet Access Was Acquired

how these assignments were regarded and how assignments were completed since Internet usage was not available.

Survey question 17 asked how special assignments were regarded after Internet was made available to schools. Coordinators reported that nearly half, 47.8 percent, gave required assignments and 42.0 percent of coordinators gave bonus assignments after Interent was acquired. Furthermore, after Internet access was acquired, 89.8 percent (Table 7) of the coordinators reported that they had given assignments requiring students to access the Internet. This was a 23 percent increase in special assignments given to students by coordinators after Internet access was acquired. It is apparent that until more Internet connections are provided for computers in the classroom, there will likely not be a significant increase in the percentage of assignments given to students by coordinators.

The responses from survey questions 15 and 16 that were used to answer research question three validate the perception that Internet or Web-based learning does occur when availability of the Internet is present.

Supplementing the Curriculum Using the Internet

Research Question Number Six

How do coordinators of Tennessee Space Week supplement their classroom curriculum by using NASA or other Internet aerospace Web sites?

To obtain supporting data for this question, the following survey items were used. (the questions' numbers refer to the numbers of the corresponding survey questions):

18. Have you used NASA or other aerospace Web sites to develop original multimedia enhancement products for classroom instruction?
19. If yes, how have you used the products?
22. Are you more likely to find supplementary aerospace teaching ideas and activities on the Internet than from traditional sources such as periodicals and books?

Tables 8 and 9 presents data from survey questions eighteen, nineteen, and twenty-two.

When coordinators were asked if they had developed multimedia enhancement products from their utilization of the Internet, slightly more than 36 percent responded that they had acquired ideas from the Internet to develop enhancement products. An overwhelming majority, 63 percent, reported that they had not utilized the information available from NASA or other Internet Web sites to develop these products. However, it cannot be assumed that coordinators were not accessing other Internet Web sites to develop multimedia products.

More than 37.5 percent of the multimedia enhancement products developed by coordinators were word processing files. Although word processing files are not usually considered multimedia, it could be considered by some coordinators that word processing files are considered a multimedia product when the files are displayed during a lesson when projected on a television monitor which has been interfaced with a computer. during Tennessee Space Week, that coordinators and teachers be trained in the resources that can be adapted from NASA Web sites and incorporated into multimedia products.

TABLE 8

WHETHER MULTIMEDIA PRODUCTS WERE DEVELOPED FROM NASA OR OTHER INTERNET AEROSPACE WEB SITES

Responses	Frequency	Percent
Yes	32	36.4
No	56	63.6
Total	88	100.0

TABLE 9

MULTIMEDIA PRODUCTS DEVELOPED FROM NASA OR OTHER INTERNET AEROSPACE WEB SITES

Examples of Multimedia Products	Frequency	Percent
Presentation Applications	6	18.7
Word Processing Files	12	37.5
Original Lesson Activities	8	25.0
Other	6	18.7
Total	32	100.0

For example, coordinators can be shown how to import graphics from aerospace Web sites that can be used in slideshow applications for classroom instruction.

Thirty-four percent of the coordinators indicated that they were more likely to locate teaching ideas and activities from the Internet than from traditional sources. However, more coordinators, 43.8 percent, felt that there was no clear distinction between using the Internet to locate teaching ideas over traditional sources of acquiring ideas for teaching. It should be noted that only 32 coordinators responded to survey question 22. Nevertheless, the information collected for research question six does indicate that coordinators of Tennessee Space Week are beginning to perceive the benefits of using the Internet as an effective tool to supplement the curricula.

Frequencies and percentages were used to answer research question seven through eleven. The frequencies and percentages will be concerned with:

7. the school classification (rural, suburban or urban) where coordinators teach.
8. the average school and faculty size where coordinators teach.
9. Internet aerospace Web sites, other than NASA, which coordinators access.
10. the ease of use of finding aerospace teaching materials from the Internet.
11. the NASA aerospace topics used to acquire information to supplement classroom instruction.

The preceeding research questions arose as a result of information requested by the Tennessee Education Association to better assess the demographics of coordinators and how they utilize the Internet in classroom instruction.

School Classification

Research Question Number Seven

What is the classification of the school (rural, suburban or urban) where coordinators teach?

To obtain supporting data for this question, the following survey question was used (the question number refer to the number of the corresponding survey question):

7. Which best describes where you teach?

Data from survey item seven are represented in Table 10.

The responses to the survey revealed that: 61.4 percent of coordinators taught in rural schools, 25.0 percent taught in suburban schools and that 13.6 percent are teaching in urban schools. These findings may be misleading to the extent that some teachers may inadvertently consider a suburban school rural or vice versa. This assumption is made by the researcher because the addresses of the coordinators which were provided by the Tennessee Education Association in order to conduct this research revealed that the majority of the coordinators from 1995 to 1997 had school addresses which were primarily suburban areas within the state of Tennessee.

TABLE 10

AREA WHERE COORDINATORS TEACH; CLASSIFIED AS EITHER RURAL, SUBURBAN OR URBAN

Classification of School	Frequency	Percent
Rural	54	61.4
Suburban	22	25.0
Urban	12	13.6
Total	88	100.0

Average Size of School Faculty and Student Body Where Coordinators Teach

Research Question Number Eight

What is the faculty and student body size of the schools where coordinators teach?

To obtain supporting data for this question, the following survey question was used (the question number refer to the number of the corresponding survey question):

8. What is the faculty and student body enrollment of your school?

Data presented in Table 11 gives average faculty and student sizes of schools where coordinators teach.

This survey question was worded whereby respondents were to place their estimated school faculty size and enrollment size in the space provided adjacent to the question. The totals were then averaged. The results were as follows: the average size of the school faculty where coordinators of Tennessee Space Week taught was forty-two and the average student body enrollment at the schools where coordinators taught was eight hundred and sixty-seven.

Web Sites Accessed By Coordinators

Research Question Number Nine

What are the Internet aerospace Web sites, other than NASA Web sites, that coordinators access in order to acquire information for classroom instruction?

TABLE 11

AVERAGE SCHOOL SIZE WHERE COORDINATORS OF TENNESSEE SPACE WEEK TEACH

Breakdown of Faculty and Student Sizes	Number
Faculty Size	42
Student Enrollment	867

To obtain supporting data for this question, the following survey question was used (the question number refer to the number of the corresponding survey question):

21. Other than NASA Aerospace Web sites, what aerospace Web sites have you accessed to acquire information for lesson activities? Results are based upon 40 responses to survey question 21.

Data from survey item twenty-one are presented in Table 12.

There are numerable aerospace Web sites that coordinators of Tennessee Space Week could access to locate information to supplement classroom instruction. The choices in survey question 21 asked coordinators to mark examples of aerospace Web sites that they have found educationally useful. The following Web sites were given as survey choices: the Federal Aviation Administration (FAA), Civil Air Patrol (CAP), Aircraft Manufacturers, Commercial Airline Carriers, or "Other." The breakdown is as follows: 0 percent did not access the FAA or CAP Web sites, 10 .0 percent marked aircraft manufacturers' Web sites, and 5.0 percent marked commercial airline carrier Web sites. The overwhelming majority, 32 coordinators, responded that they had acquired aerospace information from Web sites not listed as choices in questionnaire item 21. Examples of "Other" Web sites marked by respondents were the Weather Channel and electronic news magazines on aviation.

TABLE 12

EXAMPLES OF AEROSPACE WEB SITES OTHER THAN NASA WEB SITES ACCESSED BY COORDINATORS

Classification of School	Frequency	Percent
Federal Aviation Administration	0	0.0
Civil Air Patrol	0	0.0
Aircraft Manufacturers	4	10.0
Commercial Airline Carriers	2	5.0
Other	34	85.0
Total	40	100.0

Methods of Acquiring Aerospace Information

Research Question Number Ten

Are coordinators more likely to find supplementary aerospace teaching ideas and activities on the Internet than in traditional sources such as periodicals and books? (the question number refer to the number of the corresponding survey question): Results are based upon 32 responses to survey question 22.

22. Are you more likely to find supplementary aerospace teaching ideas and activities on the Internet than in traditional sources such as periodicals and books?

Data from survey question twenty-two are presented in Table 13.

The resulting data indicates the following: 34.3 percent of the total respondents stated that they were more likely to locate teaching ideas and activities from the Internet, 21.9 percent stated that access of information from the Internet made no difference as to whether or not teaching ideas were acquired from the Internet than from traditional sources, and 43.8 percent said that there was no clear distinction when deciding where to access additional teaching ideas and activities for classroom instruction.

It should be noted that because of the small sample size of the total number of coordinators who responded to this question, no assumptions can be made as to the validity of how coordinators of Tennessee Space Week are likely to judge the ease of using the Internet to supplement the curriculum.

TABLE 13

RESPONSES OF COORDINATORS STATING THAT SUPPLEMENTARY AEROSPACE TEACHING IDEAS/ACTIVITIES ARE EASIER TO ACQUIRE FROM THE INTERNET THAN FROM TRADITIONAL SOURCES

Classification of School	Frequency	Percent
Yes	11	34.3
No	7	21.9
No Clear Distinction	14	43.8
Total	32	100.0

Aerospace Topics Integrated within Classroom Instruction

Survey Question Number Eleven

What are the NASA aerospace topics which coordinators have integrated within their classroom instruction? (the question number refer to the number of the corresponding survey question): Results are based upon 32 responses to survey question 23.

23. What are the NASA aerospace topics which you have used to acquire information to supplement classroom instruction?

Data from survey item twenty-three are presented in Table 14.

Coordinators responding to the question reported the following: 28.1 percent used aeronautics as a topic for inclusion in classroom instruction, 47 percent stated that topics such as rocketry and microgravity were used in their teaching, 15.6 percent reported that astronomy was a topic used in classroom instruction, and 9.3 percent included instruction on the topic of Mission to Planet Earth, recently changed to Earth Science Enterprise by NASA.

It would have been beneficial to place this question earlier within the survey where more coordinators could have responded. The respondents' sample size is too small to make any conclusions as to which of the NASA Strategic Enterprises are being used more often in the classroom curriculum of the coordinators of Tennessee Space Week.

TABLE 14

NASA AEROSPACE TOPICS USED BY COORDINATORS TO SUPPLEMENT CLASSROOM INSTRUCTION

Classification of School	Frequency	Percent
Aeronautics	9	28.1
Rocketry, Microgravity	15	47.0
Astronomy	5	15.6
Mission to Planet Earth	3	9.3
Total	32	100.0

Summary

This chapter consists of a presentation of the findings from the survey sent to coordinators of Tennessee Space Week from 1995 to 1997. Frequencies and percentages were compiled from the survey responses to answer the research questions.

The following chapter, Chapter V, presents conclusions and recommendations based on how coordinators of Tennessee Space Week utilize NASA and other Internet aerospace Web sites.

CHAPTER V

SUMMARY, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

The purpose of this study was to determine the extent to which Tennessee Space Week use NASA or other aerospace Web sites to supplement classroom curriculum. Information was gathered to determined:

1. What are the demographic characteristics of the coordinators of Tennessee Space Week in terms of teaching experience, gender, level of highest degree earned, teaching level, and current teaching responsibility?

2. Do the number of special workshops provided for coordinators by NASA or the Tennessee Education Association parallel the use of acquiring additional information from NASA or other Internet aerospace Web sites?

3. How do coordinators of Tennessee Space Week incorporate the Internet in classroom instruction in terms of availability, location of the computers connected to the Internet, and how often lesson activities are acquired from the Internet?

4. Did coordinators obtained aerospace activities from other sources before having Internet access and identify if lesson activities were acquired from NASA or other aerospace Web sites after Internet access was acquired?

5. What were the number of special assignments given by coordinators of Tennessee Space Week before and after acquiring Internet access?

6. How do coordinators of Tennessee Space Week supplement their classroom curriculum by using NASA or other Internet aerospace Web sites?

7. What is the classification of the school (rural, suburban or urban) where coordinators teach?

8. What is the faculty and student body size of the schools where coordinators teach?

9. What are the Internet aerospace Web sites, other than NASA Web sites that coordinators have accessed to acquire information for classroom instruction?

10. Are coordinators more likely to find supplementary aerospace teaching ideas and activities on the Internet than in traditional sources such as periodicals and books?

11. What are the NASA aerospace topics which coordinators have integrated within their classroom instruction?

The subjects of this study were educators which were appointed as coordinators of Tennessee Space Week for the years 1995 to 1997 by the Tennessee Education Association. Names and addresses of these selected coordinators were provided by the Communications Director of the Tennessee Education Association in Nashville, Tennessee.

A total of 88 coordinators was used in this study. The survey was designed to: (1) Collect data on the availability of school computers connected to the Internet where coordinators teach; (2) How information acquired from the NASA and other aerospace Web sites are being used to support the curriculum and; (3) how often the Internet is being

used as a resource in classroom assignments. The study examined the teaching experience, level of highest degree earned, and current teaching responsibility of the coordinators of Tennessee Space Week. The study also determined whether the number of special workshops, like NEWMAST, NEWEST, or Tennessee Space Week Workshops parallel the use of acquiring additional information from NASA or other Internet aerospace Web sites. The research sought to determine if aerospace topics had been acquired for classroom instruction from other sources before Internet access, and what increase if any, occurred in the amount of aerospace topics that were used in the classroom by coordinators after Internet access was acquired.

The approved questionnaire was composed of 23 questions. The questionnaire, accompanied by a letter of explanation, was sent to the coordinators of Tennessee Space Week by U.S. Mail and e-mail on October 4. 1997. A total of 125 coordinators were sent survey questionnaires. Of this total, 88 surveys were returned providing a 70 percent rate of returned responses.

Upon receipt of the questionnaire, the data were coded and entered into a Microsoft Excel spreadsheet that was then transferred to a STATPAK for statistical analysis. Frequency counts were tabulated for each question and percentages were computed for the total returned questionnaire population.

Summary

This study provides information that can help in evaluating the utilization of NASA and other aerospace Web sites by coordinator of Tennessee Space Week. It documents the historical background for the creation of the Internet and how the Internet is becoming

a cornerstone in assisting teachers to employ new educational technologies. The study was undertaken to survey a sample of coordinators of Tennessee Space Week to determine how they are using the information found on NASA and other aerospace Web sites within their classroom. The survey data provides an overview of the effectiveness of the coordinators' use of the Internet as an aerospace resource. Recommendations for improving coordinators' effective use of NASA and other aerospace Web sites are made and topics for further improvements and evaluation of NASA-AESP Space Week workshops are suggested.

Findings

Based on the results of the study, the evidence supports the following attributes and characteristics of coordinators of Tennessee Space Week:

1. Approximately 7 percent of schools where coordinators teach have no Internet access

2. Half the computers connected to the Internet where coordinators teach are located within the classroom.

3. Nearly 32 percent of computers connected to the Internet where coordinators teach are located within the school library or media center.

4. Less than 10 percent of coordinators access the Internet one to three hours per week.

5. A slight majority of 54 percent of coordinators do not use the Internet to supplement the classroom instruction.

6. Approximately 40 percent of coordinators used aerospace activities in their classroom instruction before Internet access.

7. Over half the coordinators acquire lesson activities from NASA or other Internet aerospace Web sites less than 5 times per year.

8. More than 60 percent of coordinators gave special assignments to students One time per week prior to Internet access.

9. An increase of 14 percent of special assignments were given by coordinators to students after Internet access was acquired.

10. Over 89 percent of the special assignments given by coordinators to students were classified as either a required or bonus assignment when using the Internet.

11. Over 60 percent of coordinators have not used the information from the Internet to develop multimedia enhancement products.

12. Of the coordinators that had used multimedia products developed from the Internet, 30 percent have used word processing files as multimedia.

13. More than 43 percent of Coordinators stated that there was no clear distinction between using the Interent over traditional sources to acquire aerospace information.

Conclusions

Based upon the information reported in the survey, evidence supports the following conclusions:

The number of computers connected to the Internet where coordinators teach is presently too small due to determine how successfully the Internet is being used to

augment the classroom curriculum. Two factors that appear to be influencing why more computers are not connected to the Interent are; (1) their accessibility and (2) time limitations coordinators have in using them to locate information to supplement classroom instruction. In those schools where the Internet is being utilized to support the curriculum, signs exists that coordinators are beginning to access and integrate NASA and other Internet aerospace Web sites within their classroom instruction.

Many of the computers connected to the Internet that coordinators use are being installed in central locations such as the school library, media center, or computer laboratory. This is obviously being done to facilitate equitable availability to the entire school population. The disadvantage to this co-operative sharing of computers that are tied into the Internet may be that it limits spontaneous usage of the Internet for research, writing and extra projects that are assigned by coordinators to their students. If connectivity to the NASA and other Internet Web sites was better, increased usage to supplement the classroom curricula could be expected.

The research undertaken determined that the majority of the coordinator of Tennessee Space Week are veteran teachers with knowledge of the responsibilities required by the Tennessee Education Association to successfully organize Tennessee Space Week educational activities. A majority of coordinators, 61 percent, have acquired a masters or higher degree. It is evident that these coordinators are demonstrating a desire to exceed the minimum requirements for teacher certification in Tennessee. It was ascertained that coordinators of Tennessee Space Week covered the gamut of being assigned to self-contained classrooms and to content-specific classrooms where mathematics and science are taught. In addition, 31.8 percent indicated that they were in

teaching positions other than the three categories given as choices in survey question 5. This finding is indicative of the trend in education to make subjects such as aerospace multidisciplinary in allowing educators in different subject areas to integrate the curriculum.

One-half of the coordinators have taken part in at least 1 or 2 special aerospace workshops that were sponsored by either NASA-AESP, Tennessee Space Week or summer aerospace workshops sponsored by the various state universities within Tennessee.

As previously mentioned, the number of computers connected to the Internet which coordinators have access to is not widespread. It is commendable that 45.5 percent of the coordinators do incorporate within their curriculum the information found on NASA and other Internet aerospace Web sites. The depth and magnitude, however, which coordinators are using this information needs to be researched further. When coordinators were asked to explain how they were using NASA and other Internet aerospace Web sites within their classroom, one example cited was requiring students do special assignments whereby accessing the Internet was encouraged.

Coordinators of Tennessee Space Week were found to have given special assignments to students before Internet access was acquired within their schools. Special assignments were regarded as extra assignments that were given to students either as required or as bonus. After Internet access was provided within the schools where coordinators taught, a 23 percent increase occurred in the frequency of special assignments given to students by coordinators. This increase seems to indicate that the Internet provided another reference tool; thus, coordinators encouraged students to use

this new technology when researching their special assignments. A reason why little increase in special assignments given to students after Internet access was made available could have been related to the low number of computers or the location of the computers that were connected to the Internet.

Recommendations

Whereas this study has set the precedent for research on how coordinators of Tennessee Space Week utilize NASA and other Internet aerospace Web sites, the research should be continued and expanded in the future. Additional research is necessary to gain a more complete understanding into how coordinators are continuing to use the resources of NASA and other aerospace Web sites within the school curriculum.

In regard to increasing the use of NASA and other Internet aerospace Web sites by coordinators of Tennessee Space Week, the following recommendations are made:

1. NASA-AESP and the Tennessee Education Association should schedule workshops whereby training would be conducted to demonstrate how NASA and other aerospace Web sites could be used to support an integrated curriculum.

2. Coordinators of Tennessee Space Week should be encouraged to participate in aerospace workshops that are sponsored by the Tennessee Department of Education which are held each summer at the University of Memphis, Middle Tennessee State University, University of Tennessee at Knoxville, and East Tennessee State University.

3. NASA-AESP and the Tennessee Education should continue to sponsor aerospace workshops whereby coordinators are to be encouraged to use aerospace activities found on the Internet to motivate students in wanting to learn more in mathematics, science and technology.

4. Coordinators of Tennessee Space Week should become role-models to other Educators where they demonstrate how NASA and other Internet aerospace Web sites can be used to support the school curriculum.

5. Long term follow-up studies should be done to ascertain how coordinators Are using the educational resources found on the Internet to augment the curriculum and determine how successful these resources are being used to integrate the curriculum.

6. More educators should be given the opportunity to become coordinators of Tennessee Space Week. This will allow more opportunities for other teachers to be exposed to the benefits of using aerospace to motivate students' learning.

7. NASA-AESP and Tennessee Space Week workshops should actively publicize the Stephenson-Wydler Act, which mandates that excess government equipment including computers) be made available to educational institutions at little or no cost.

8. The Internet should be more than a "homework tool" whereby assignments are given without specific goals for long-term learning. Internet-based assignments should not be given to students simply because of its current popularity.

In answering the research questions for this study, the researcher was inspired to suggest future research to answer other questions regarding the utilization of NASA and

other aerospace Web sites by coordinators of Tennessee Space Week. These recommendations are as follows:

1. Coordinators' opinions and suggestions should be solicited regarding the types and forms of training which would be most helpful in catering NASA-AESP workshops for TEA Space Week.

2. A study should be done which will yield more detailed information about how aerospace information found on the Internet is being used in the curriculum. The information should be grade-level specific, and elicit real numerical data about how many activities are used in each classroom, the extent to which aerospace is being used to integrate disciplines, and how NASA Internet Web sites are meeting the curriculum needs of educators.

3. Future research should determine if computers used by coordinators have the processing power to decrypt audio and video information found on the Internet since more Web sites in the future will be capable of videoconferencing.

4. Future research should establish whether or not inservice training in educational technology is available at all. It would be useful to know whether the training is mandatory or optional, whether other sources of training are available and are being used, and how coordinators feel about becoming trained to use educational technology. It is important to learn whether coordinators see technology as yet another task being added to their already overfilled schedules, or as a way to expedite and enhance the work they are doing.

5. Future research should examine the relationship between the use of NASA and other aerospace Web sites and the interests, attitudes, and education level of teachers regarding professional development.

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APPENDIXES

APPENDIX A

OSU INSTITUTIONAL REVIEW BOARD

APPROVAL FORM

OKLAHOMA STATE UNIVERSITY
INSTITUTIONAL REVIEW BOARD
HUMAN SUBJECTS REVIEW

Date: 09-09-97 **IRB#:** ED-98-013

Proposal Title: UTILIZATION OF NASA INTERNET AEROSPACE WEBSITES BY TENNESSEE SPACE WEEK TEACHERS

Principal Investigator(s): Steve Marks, William O. Robertson

Reviewed and Processed as: Exempt

Approval Status Recommended by Reviewer(s): Approved

ALL APPROVALS MAY BE SUBJECT TO REVIEW BY FULL INSTITUTIONAL REVIEW BOARD AT NEXT MEETING, AS WELL AS ARE SUBJECT TO MONITORING AT ANY TIME DURING THE APPROVAL PERIOD.
APPROVAL STATUS PERIOD VALID FOR DATA COLLECTION FOR A ONE CALENDAR YEAR PERIOD AFTER WHICH A CONTINUATION OR RENEWAL REQUEST IS REQUIRED TO BE SUBMITTED FOR BOARD APPROVAL.
ANY MODIFICATIONS TO APPROVED PROJECT MUST ALSO BE SUBMITTED FOR APPROVAL.

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Comments, Modifications/Conditions for Approval or Disapproval are as follows:

Signature: _____ Date: September 10, 1997
Chair of Institutional Review Board
cc: William O. Robertson

APPENDIX B

CORRESPONDENCE FROM THE TENNESSEE EDUCATION ASSOCIATION

TEA
TENNESSEE EDUCATION ASSOCIATION
801 SECOND AVENUE, N ◆ NASHVILLE, TN 37201-1099
TELEPHONE: (615) 242-8392 ◆ FAX: (615) 259-4581 ◆ TN WATS: (800) 342-8262 (800) 342-8367

August 11, 1997

William O. Robertson
704 Mathis Drive, S.E.
Huntsville, AL 35803

Dear Bill:

Enclosed you'll find the lists of TSW Coordinators from 1993-1997. I noticed that in a couple of places in your copy, only 1995-1997 Coordinators were mentioned; however, we had them all so here they are.

I've also enclosed a memo from me on TEA letterhead that you are welcome to enclose in your mailing; or if you need something else from me, just give a shout.

Please put me on the mailing list of the survey so I'll know when they are getting into Coordinators' hands. Thanks a bunch.

Sincerely,

Kathy

Kathy Wheeler, Manager
Communications Division

Enclosures

APPENDIX C

SURVEY COVER LETTER

TENNESSEE EDUCATION ASSOCIATION
801 SECOND AVENUE, N ◆ NASHVILLE, TN 37201-1099
TELEPHONE: (615) 242-8392 ◆ FAX: (615) 259-4581 ◆ TN WATS: (800) 342-8262 (800) 342-8367

September 1997

TO: TEA Space Week Coordinators

FROM: Kathy Wheeler, Manager of Communications

RE: Special Survey

Thank you for all you've done to make TSW a continuing success for Tennessee students. Because you've made it so successful, your efforts are appreciated beyond our state borders, and your opinions are viewed as important and credible.

It's for that reason I hope you'll participate in this survey of your use of NASA web sites. The information gathered will be shared with TEA and will help us to refine and improve TSW activities.

You are certainly welcome to contact me if you have questions. And again, please respond to this survey as soon as humanly possible. Thanks.

APPENDIX D

SURVEY INSTRUMENT

Oklahoma State University
Department of Aviation and Space Education

Your participation in this survey will help advance the understanding of how Tennessee Space Week teachers have benefited from having access to the Internet to supplement classroom instruction. Please respond to all questions to the best of your knowledge.

Circle the letter corresponding to your responses. You may use pen or pencil. Please do not include your name on the survey. Included with the survey questions you will find a self-addressed stamped envelope in which to return the survey at your earliest convenience.

1. How long have you been teaching in K-12?
   a. 1-2 years
   b. 3-5 years
   c. 6-10 years
   d. 11 years and over

2. My gender is:
   a. Female
   b. Male

3. Highest degree obtained:
   a. B.S. (B.A.)
   b. M.S. or MEd.
   e. Ph.D. (Ed.D.)
   f. Ed.S.

4. Which best describes your current teaching level?
   a. Grades K-4
   b. Grades 5-8
   c. Grades 9-12

5. Which best describes your current teaching responsibility?
   a. Self-contained
   b. Content specialist - Math
   c. Content specialist - Science
   d. Other _____

6. Number of special workshops (like NEWEST, NEWMAST, Tennessee Space Week, etc.) attended:
   a. 0
   b. 1-2
   c. 3-5
   d. 6-10
   e. 11-15
   f. 16 plus

7. Which best describes where you teach?
   a. Rural
   b. Suburban
   c. Urban

8. School Size. Please estimate the number of:
   a. Faculty _____

   b. Students _____

9. How many computers are connected to the Internet in your school?
   a. 0
   b. 1-5
   c. 6-15
   d. 16 or more

10. The primary computer from which you access NASA or other aerospace Web sites on the Internet is located in:
   a. Your classroom
   b. Main Office
   c. Library or Media Center
   d. Computer Lab
   e. Home
   f. Other _____

11. How many hours per week do you spend accessing NASA or other aerospace Web sites?
   a. 0 minutes
   b. 1-30 minutes
   c. 31 minutes - 1 hour
   d. 1-3 hours
   e. 3 hours or more

If answer is "0" please disregard the other questions and return the completed survey.

12. Do you use the Internet to supplement classroom instruction?
   a. Yes
   b. No

13. Before you had access to NASA or other aerospace Web sites, did you use aerospace activities in your teaching?
   a. Yes
   b. No
   c. NA

14. How often do you acquire lesson activities or ideas for classroom lessons from NASA or other aerospace Web sites?
   a. Less than 5 times per year
   b. 5-10 times per year
   c. More than 10 times per year

15. To the best of your recollection and PRIOR to acquiring Internet access, estimate the number of special assignments (e.g. reports, laboratory experiments, summary of observations, laboratory reports, etc.) that you gave students per week.

a. 0 times per week
b. 1 time per week
c. 2 times per week
d. 3 times per week
e. 4 times per week
f. 5 or more times per week

16 Since acquiring Internet access, estimate the number of assignments (e.g. reports, laboratory experiments, summary of observations, laboratory reports, etc.) that you gave students per week.

a. 0 times per week
b. 1 time per week
c. 2 times per week
d. 3 times per week
e. 4 times per week
f. 5 or more times per week

17. If assignments are given for utilizing NASA or other aerospace Web sites, how are they regarded as class assignments?

a. As required assignments.
b. Assignments for bonus credit
c. No assignments are given for utilizing aerospace Web sites for supplemental classroom instruction.

18. Have you used NASA or other aerospace Web sites to develop original multimedia enhancement products for classroom instruction?

a. Yes
b. No

If answer is No skip to question 20.

19. If yes, how have you used the products?

a. Creating presentation applications (computer slideshows like Powerpoint®)
b. Creating word processing files
c. Creating original lesson activities
d. Other _____

20. If answer to Question 18 is yes, why?

a. Easier access
b. Information is more current
c. Interactivity
d. It is the current trend
e. Other _____

21. Other than NASA aerospace Web sties, what aerospace Websites have you accessed to acquired information on lesson activities?

a. Federal Aviation Administration and/or Government Websites pertaining to Aeronautics.
b. Civil Air Patrol
c. Aircraft Manufactures
d. Commercial Airline Carriers
e. Other _____

22. Are you more likely to find supplementary aerospace teaching ideas and activities on the Internet than in traditional sources such as periodicals and books?
    a. Yes
    b. No
    c. No clear distinction

23. Circle the NASA aerospace topics which you have used to acquire information to supplement classroom instruction.
    a. Aeronautics
    b. Rocketry, Microgravity, and Human Spaceflight
    c. Astronomy
    d. Mission To Planet Earth

Thank you for taking the time to respond to the survey.

APPENDIX E

CODED POSTCARD AND SURVEY

COVER ENVELOPE

Ms. Christine Cartwright, UNISERV
Tennessee Education Association
801 2nd Ave North
Nashville TN 37201-1099
Attention: Dissertation Survey

5803=2806

TRT 100179

PLEASE DROP THIS POSTCARD IN
THE MAIL WHEN YOU RETURN
YOUR COMPLETED SURVEY.
THANKS!

TRT100179

Ms. Christine Cartwright, UNISERV
Tennessee Education Association
801 2nd Ave North
Nashville TN 37201-1099
Atten: Dissertation Survey

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APPENDIX F

FOLLOW-UP LETTER

TEA

TENNESSEE EDUCATION ASSOCIATION

801 Second Avenue, N • Nashville, TN 37201-1099

TELEPHONE: (615) 242-8392 • FAX: (615) 259-4581 • TN WATS: (800) 342-8262 (800) 342-8367

October 25, 1997

TO: TEA Space Week Coordinators

FROM: Kathy Wheeler, Manager of Communication

RE: Special Survey

On October 5, 1997, you were sent a survey to help the Tennessee Education Association better understand how Tennessee Space Week Coordinators have benefited from having access to the Internet to supplement classroom instruction.

Since anonymity was assured, we have no way of knowing who completed and returned the survey. If you have not completed and returned the survey, please do so as soon as possible.

Thank you for your assistance in this matter. Your cooperation is greatly appreciated.

VITA

William O. Robertson

Candidate for the Degree of

Doctor of Education

Thesis: THE UTILIZATION OF NASA AND OTHER INTERNET AEROSPACE WEB SITES BY COORDINATORS OF TENNESSEE SPACE WEEK

Major Field: Applied Educational Studies

Biographical:

Personal Data: Born in Bastrop, Louisiana, on August 6, 1954, the son of Oren Thomas and Lois Young Robertson.

Education: Graduated from Bonita High School, Bonita, Louisiana in May, 1973; received a Bachelor of Arts degree with certification in Elementary Education from Northeast Louisiana University, Monroe, Louisiana in May, 1978, completed requirements for the degree of Master of Science in Natural and Applied Science in Aviation and Space Education from Oklahoma State University, Stillwater, Oklahoma in July, 1995, completed requirements for the degree of Doctor of Education in Applied Educational Studies with an emphasis in Aviation and Space Education at Oklahoma State University, Stillwater, Oklahoma in May, 1998.

Experience: Employed as a state tourist representative for the Fifth Congressional District of Louisiana, 1977-1979 in Bastrop, Louisiana; elementary math and science teacher in Wilmot, Arkansas, 1979-1980; science teacher for gifted students in the Morehouse Parish School System, Bastrop, Louisiana, 1980-1984; contractor for NASA in the Aerospace Education Services Program, Oklahoma State University, 1985 to present.

Professional Memberships: National Science Teachers Association, National Council of Teachers of Mathematics, International Technology Education Association, Civil Air Patrol, Alabama Science Teachers Association, Alabama Aerospace Teachers Association, Tennessee Science Teachers Association and The Planetary Society.