THE UTILIZATION OF AEROSPACE CONCEPTS, SUBJECT MATTER, AND ACTIVITIES BY ELEMENTARY TEACHERS

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Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
DOCTOR OF EDUCATION
May, 1997

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PREFACE

The concern of this study has been to investigate the utilization of aerospace concepts, subject matter, and activities by educators who participated in the NEWEST workshop at the NASA Langley Research Center from 1993 to 1995.

There have been many people who have contributed in various ways to the completion of this study. Philippians 4:13 in the King James Version of the Holy Bible states "I can do all things through Christ which strengtheneth me". Therefore, I thank God and His Son Jesus Christ, who are first and foremost in my life.

I would like to thank my parents, the late Howard A. Jones, Sr. and the late Ida P. Jones, for teaching me the value and importance of getting the best and most education available. Even though they are no longer here physically, I will love them always. Thanks also to my sisters, Ella Richardson and Eula Jones; my brothers, the late Howard Jr., Melvin , Earl , Dr. Lloyd, Marvin Sr., Roy , and Milton Jones; my brother-in-law, Horace Richardson, Jr.; my sisters-in-law, Lorraine, Mary Jo, Roberta, Portia, Justine, and Barbara Jones; my aunts, the late Kathleen and Bessie Jones, nieces, nephews, cousins, and other relatives.

I wish to express my sincere appreciation to the members of my committee: Dr. Kenneth Wiggins (Chairman), Dr. Steve Marks (Adviser), Dr. Cecil Dugger, and Dr. Katye Perry. I feel honored to have had the opportunity to work with such a knowledgeable group of people. They are positive role models and mentors.

I am grateful for the consideration of the former workshop participants who were the willing subjects of this study. Their timely responses to the survey made the study possible.

There are numerous individuals who deserve a special thank you for their direct and indirect support and encouragement during this study. They are: Clifton, Alain and Deanna Sheppard, Beth Peneaux, Herminia Spellman, Clinton Adair, Isaiah Spellman, Gerri Polhamus, Iris McPherson, Kay Porter, Anthony Pulley, Charles and Ellen Anderson, the Baskervilles, the Hopes, Jenkins and Jones, Charlene and Caden Samuel, Dr. Marchelle Canright, Dr. Sam Massenberg, Andre Barnes, the late Dr. Wendolyn Maxwell, the Coppedges, Virginia Hicks, Elsie Edwards, Roger Hathaway, Drs. Ronnie and Sandra Proctor, Debbie Gallaway, Larry Bilbrough, Ransom and Mary Jo Ritter, Ruth Wyche, Lisa, Claude, and Mary Owens, Octavia Tripp, Brian Woolfolk, John Jones, Ronnie Johnson, Dr. Randy Hunt, Dr. Doris Grigsby, Wil Robertson, Steve Culivan, Judy Studwell, Karen Wilson, Henry and Marion Coleman, Willie and Marion Trusty, the Prices, Marvin Randolph, the Stiths, Alice Eley, Dr. Ellen Hardwick, Bill Taylor, Dr. Harold Jones, Dr. Raynido Champ, Dr. Lawrence High, the Currys, the Colvins, Mary Bell, Willie Wingfield, the Fields, Gwen Wheatle, Elizabeth Lohrman, Lucy Mason, Liz Allen, Elizabeth Temple, Sarah Peebles, Notie Jones, Sarah Brooks, Vernice Jackson, Rosa Hooper, Doris Hack, Estelle Hairston, Henry and Sadie Rice, William and Mable Johnson, Lillian Collins, John and Carrie Peebles, Isaiah Turner, the Hendersons, Vadellia Gilchrist, Garnett Doggett, Paul, Robert, and Pauline Jackson, Steve Coyle, Anna Keeling, Kellie and Darryl Lee, Gloria and Robbie Clarke, Liz Willcox, Toma Gaches, Col. Glen Nemecek, Karen Miller, Anna Keeling, Debi Jones, Doug Willcox, Dr. Nelson Ehrlich, Pat

Biggs, Dr. Joe Martel, Pete Thomas, Frances Vaughan, Frances Momon, Mildred Gilbert, Dr. Greg Vogt, Jacob Ehrlich, Dr. Robert Brown, Dr. Debi Dyer, Lawrence Gilbert, Colleen Ewing, Brian Smith, Hunt Wellborn, Wade Hubbard, Keone Mohammad, Cheritha and Bonnie Dozier, Janet Pegues, Dr. Eddie Anderson, Kathy Gordon, Lucy and Cleo Dillard, Oreveter Freeman, Jimmy and Mary Daniels, Ronald and Nita Hairston, Dossie and Grover Jones, Linda, Tifany, and Jason Quash, Robert and Barbara Brown, Dr. Marilyn Irving, Esther Mander, Thurston Moon, ST Sanders, Michael Furlough, Joey Sutter, John Ulrich and the Aerospace Professional Development Office Staff, Richard Adams and the OSU Washington, DC office staff, the entire NASA/AESP Team, Kevin Durham and NASA/AESP's Publications Specialists, the UCEP Team, NASA Headquarters Education Division, everyone at 300 North Cordell, First Baptist Church (Freeman, VA), Mount Zion Baptist Church (Stillwater), and especially the NASA Langley Research Center Office of Education.

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CHAPTER I

INTRODUCTION

There are many terms which can be used to describe the professional learning of teachers. The broadest term is staff development, which includes teacher inservice education. Teacher inservice education is defined as programs of planned learning opportunities for faculty members of schools. The primary purpose of teacher inservice education is to improve the performance of individuals who are already assigned to a teaching position (Goens and Clover, 1991). With the new call for education reform, the teacher inservice nomenclature is gradually being phased out and replaced with the term teacher enhancement. The goal of teacher enhancement is the same as teacher inservice education. Teacher enhancement seeks to improve, broaden, and deepen the pedagogical knowledge of teachers (Frechtling, Sharp, Carey, & Vaden-Kiernan, 1995). There are many types of faculty development, teacher inservice education and teacher enhancement activities. However, most of these activities take the form of courses or workshops (Veenman, Van Tulder, & Voeten, 1994).

The history of the educational workshop dates back to the 1930's. The purpose of the workshop at that time was for teachers of a single discipline to come together to discuss common problems. Upon completion of the workshop, the teachers continued to

communicate with each other by letter and from time to time they held more meetings (Helton, 1973).

Today, the educational workshop is an important type of teacher inservice education because it helps them to solve problems that are of a mutual concern. There are several problem-solving techniques provided to the workshop participant. One is to provide individuals with the knowledge and skills to develop new practices. In many instances teacher workshops are used to improve curriculum and instruction (Marks, 1975).

Frechtling, et al (1995) suggest the goals of teacher enhancement workshops should be to increase teacher knowledge, provide teacher renewal and the opportunity for networking, increase leadership and empowerment, change classroom practices and increase student interest and achievement. They reported on the outcomes of several teacher enhancement programs. Some of these were new skills and teaching techniques, transfer of skills to classroom practice and the impact on teacher leadership.

Much attention is now being focused on the professional development of teachers through teacher enhancement workshops (Zumwalt, 1986). One of the objectives of the Education Division of the National Aeronautics and Space Administration (NASA) is to conduct education workshops that focus on education issues, interdisciplinary activities, and teaching practices which use NASA information as a common theme. To help meet this objective, the NASA Educational Workshop for Elementary School Teachers (NEWEST) was designed to give educators an opportunity to update their knowledge and develop new teaching strategies (NASA, 1992). The range of aerospace concepts, subject matter, and activities is captured in the NEWEST itinerary, which is found in Appendix A.

As a part of the prospective NEWEST participant application, teachers are asked to respond to the following essay question: "Outline and describe a plan for using the knowledge and resources you will receive during the workshop with your students, school and/or community" (NASA, 1994, p.3). A follow-up study has not been done in regard to the teachers' responses to this essay item.

The Problem of the Study

The NEWEST workshop has been conducted annually at the NASA Langley Research Center since 1987. However, the extent to which its aerospace concepts, subject matter, and activities are directly utilized in participants' instructional delivery is unknown. One of the values of this study is to fill the void in addressing this missing aspect of the program's impact. Consistent with the aforementioned, the research problem is stated as follows: To what extent do NEWEST participants who were assigned to the NASA Langley Research Center, during the summers of 1993 through 1995, incorporate aerospace concepts, subject matter, and activities, learned from the NEWEST workshop, in their professional communities?

Purpose of the Study

The purpose of this study was to determine the degree to which NEWEST participants who were assigned to the NASA Langley Research Center, during the summers of 1993 through 1995, make use of aerospace concepts, subject matter, and activities, presented in the NEWEST workshop, in their professional communities. This study is not designed to evaluate the effectiveness of the NEWEST workshops. It is designed to collect data on the background of the participants and their utilization of

aerospace concepts, subject matter, and activities, presented in the NEWEST workshop, in their professional communities. To achieve the purpose of the study, the following research questions were raised:

1. What are the demographic characteristics of the NEWEST participants in terms of gender, years of teaching experience, current teaching level, average number of students per class, number of pupils in the school, highest degree earned, educational classroom staffing (number of professionals found in the classroom setting), the number of science courses taken prior to workshop participation, the number of science courses taken after attending NEWEST, and the teacher's participation in previous aerospace workshops?
2. How often have NEWEST concepts and subject matter been incorporated into the workshop participants' classroom instruction? What are some examples of incorporating NEWEST concepts and subject matter into the workshop participants' classroom instruction?
3. How often have the workshop participants utilized NEWEST student hands-on activities in their classroom instruction? What are some examples of utilizing NEWEST student hands-on activities in the workshop participants' classroom instruction?
4. How often have NEWEST workshop participants given special assignments to students in their classrooms based on the NEWEST activities?
5. How have the NEWEST participants made use of the NEWEST concepts, subject matter, and activities outside the classroom? What are some examples of the use of NEWEST concepts, subject matter, and activities outside of the workshop participants' classroom?

6. How do NEWEST participants rate the importance of the following six components of the NEWEST workshop in terms of their professional development: (1) information about current NASA projects, (2) educational activities for the classroom, (3) announcements of NASA educational products and services, (4) field trips, (5) the ability to interact with scientists, and (6) the ability to interact with other educators?
7. Do the workshop participants differ in their responses to research questions one through six when compared on the basis of the following demographic data: (1) gender, (2) years of teaching experience, and (3) current teaching level?

Significance of the Study

The NEWEST workshops have been conducted at the NASA Langley Research Center each summer since 1987. Extensive time and human resources have been used to implement these workshops. Potential NEWEST applicants respond to an essay question which asks them to describe a plan for using the knowledge and resources they will receive during the workshop with their students, school and community. This study should provide follow-up information to the NASA Langley Research Center on the extent to which participants are utilizing the workshop information in their professional communities, as well as the larger educational community.

Assumptions of the Study

The following assumptions were made in this study:

1. The selected NEWEST workshop years of 1993, 1994, and 1995 were assumed to be representative of the previous NEWEST workshops held at the NASA Langley Research Center.

2. It was assumed that participants responded candidly to the survey.

Limitations of the Study

The study depended on the voluntary participation of teachers in completing the survey instrument. Only participants in the 1993, 1994, and 1995 NASA Langley Research Center NEWEST summer workshops were included in this study. Therefore, delayed recall is a limitation of this study. Statistical analyses are limited because of the nominal nature of the data.

Definition of Terms

For the purposes of this study the following definitions will be used:

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

Aerospace Concepts and Subject Matter: Terms used to describe thoughts, ideas, and information about aerospace education.

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

NASA: NASA refers to the National Aeronautics and Space Administration.

NASA Langley Research Center: It refers to a NASA facility located in Hampton, Virginia.

NEWEST: NEWEST refers to the NASA Educational Workshop for Elementary Teachers.

NEWEST Workshop: It refers to an intensive two-week summer educational program which focuses on aerospace concepts, subject matter, and activities which can be utilized by teachers.

Professional Development: An activity or endeavor which provides an opportunity for the professional growth of teachers.

Staff Development, Teacher Inservice, and Teacher Enhancement: Terms used interchangeably to describe planned professional development activities for teachers.

Utilization of NEWEST Aerospace Concepts, Subject Matter and Activities: It refers to the extent to which NEWEST participants use the aerospace concepts, subject matter, and activities, presented in the NEWEST workshop in their professional communities.

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 relevant literature, focusing on the history, development, and purposes of educational workshops, NASA's education programs and

the NEWEST workshop, and selected aerospace studies. 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 SELECTED LITERATURE

Introduction

This chapter contains a review of the literature which is related to the problem. The review of selected literature addresses the following issues:

1. History, Development, and Purpose of Educational Workshops
2. NASA's Education Programs and the NEWEST Workshop
3. Selected Aerospace Studies

History, Development, and Purpose of Educational Workshops

The term "workshop" grew out of the belief that teachers needed to be better prepared. Its history goes back to the summer of 1936 when two commissions, the Commission on the Reorganization of the Secondary School Curriculum and the Commission on the Relation of School and College of the Progressive Education Association, conducted a six-week seminar at Ohio State University. Thirty teachers participated and spent their time addressing issues related to curriculum designs and evaluation. The seminar was so successful that they decided to meet again the following

summer at Sarah Lawrence College in Bronxville, New York. It was during the 1937 summer seminar that the commissions coined the term "workshop" (Ryan and Tyler, 1939).

The Sarah Lawrence Workshop of 1937 was so successful that the General Education Board of the Rockefeller Foundation funded three workshops for the summer of 1938. The Eastern Workshop remained in Bronxville, New York. The other two workshops were the Rocky Mountain Workshop and the Western Workshop. The former was held at Colorado Woman's College in Denver, Colorado and the latter was held at Mills College in Oakland, California. These workshops were chosen because they were the sites where teachers could work directly with various groups and support people to help them to better understand problems, especially in the areas of curriculum and evaluation (Ryan and Tyler, 1939).

Ryan and Tyler (1939, p. 14) point out that the value of the first workshops was the sincere effort to carry certain fundamental principles that had long been neglected in American education. The principles were:

1. A concern for the needs of individual human beings in direct relation to the demands of the community.
2. An insistence upon a rich experience of living as essential to all education, but particularly in the education of teachers.
3. A scientific approach to the understanding of human beings and society that makes full use of modern instruments of evaluation, but views these, not as important in and for themselves, but primarily as helps to achieving

> educational objectives that grow out of a reasoned philosophy of life which human welfare and human happiness are placed uppermost.

At the conclusion of the first three simultaneous workshops, Director Cushman of the Rocky Mountain Workshop indicated that the idea of a workshop certainly merited further study. He added that, "As with all such innovations, there is danger that the name but not the spirit of the workshop will be maintained in our educational practice" (Ryan and Tyler, 1939, p. 37).

The first three workshops held were experimental and they tried many diverse ways for teachers to receive in-service education. A general conclusion was that there were certain teachers who would benefit from the workshop experience.

> These include (a) teachers who are already committed to doing a better job of teaching and, therefore, do not need to be converted; (b) those who have already developed some possible hypotheses with regard to the educational process; (c) those who have some definite ideas as to how to develop these hypotheses; (d) those who have such personal qualities as reasonable intelligence, not necessarily in the highest ten percent but at least above average; industry-for, while there is plenty of recreation in the workshops, there is also a great deal of very hard work; and the ability to cooperate with others (Ryan and Tyler, 1939, p. 40).

According to O'Rourke and Burton (1957, pp. 9-10), Kenneth L. Heaton of the University of Chicago made an early statement of the characteristics of what a workshop was and what a workshop was not. The following list represents what a workshop was:

1. The participant is given an opportunity to make an intensive study of an interest which has arisen out of his experience as a teacher.
2. The participant shares in planning a program of individual and group activities designed to meet his needs and those of his fellow workers.
3. The participant is provided with easy access to the services of various staff members, representing a variety of kinds of assistance.
4. Formal and informal association with other participants of varied background contributes to the participant's thinking on his specific problem, broadens his general professional orientation, and provides opportunity for experiences in co-operative activity.
5. An effort is made to interest the participant in the whole child, the whole school, and the whole community.
6. The participant's total experience as he studies a specific interest or problem tends to prepare him for the solution of other professional problems in the future.
7. Some workshops have been concerned not only with the professional problems of the teacher, but with his life as an individual, efforts have been made to afford opportunities for a balanced living.

The following list represents what a workshop was not:

1. A series of lectures, nor a series of meetings, nor a symposium, nor a conference, nor an institute.

2. A device for orienting new teachers, nor for giving in-service training to beginners, to undertrained recruits. It is of no use for inexperienced personnel.
3. A device for teaching subject matter more easily.
4. It is not a place for listening and absorbing, but for working and producing. Instruction in subject matter belongs properly in courses organized for that purpose.
5. A research situation, though a good deal of research technique may be involved.

Helton (1973) points out that by 1941, workshops were being used for many teacher training programs. A series of workshops sponsored by the Kellogg Foundation was held in Detroit, Michigan. It was called the Michigan Health Project and included many different disciplines. These workshops were more structured than those held in the late 1930's (Otto and others, 1942).

There were some essential characteristics of a workshop during the 1940's as stated by O'Rourke and Burton (1957, pp. 5-6). They are listed below:

1. The overall purpose must be clearly defined.
2. The activity of the workshop must be based upon the problems, needs, and interests of the participants.
3. The specific problems of the participants should be allowed to emerge and be defined without pressure or steering from instructors.
4. Individuals with common problems should form tentative and flexible groups for work.

5. Participants should do the bulk of the work on their own problems, with assistance from staff members on call.
6. The planning and process of the workshop is co-operative and participatory throughout.
7. The personal and social growth of individual participants should be fostered as well as the solution of their professional problems.
8. Evaluation is continuous and exercised on products and processes, not on persons.
9. The length of the session must be adequate.
10. The collection of resource materials of all kinds likely to be of value to participants should be as extensive as finances permit.
11. The instructional staff should represent a wide diversity of personnel.
12. The full-time staff may be based on the ratio of one member for each 12-15 participants. Some of the specialists may be on a part-time basis.
13. The physical facilities should permit varied experiences.

During the 1940's, there were several values or advantages which were derived from teachers participating in workshops. These are listed below:

1. Security of the individual is preserved as he abandons old and familiar practices and develops new ones.
2. Professional knowledge, insight, and skill, especially in cooperative, democratic work, are increased for participants.
3. The personal and social growth of participants is enhanced.

4. A constructive group attack may be made upon local problems; upon new developments in the field.
5. Competent specialized assistance is readily available.
6. Continued professional growth is stimulated.
7. The results in ideas and in materials are immediately useful in real situations.
8. Individual confidence and skill in attacking new problems is developed, together with an attitude of self-evaluation.

An interesting point is that most of the remarks made concerning the benefits of workshops resulted from direct observations of the participants upon return to their classrooms (O'Rourke and Burton, 1957). This represented an early form of a follow-up study.

Workshops continued to grow during the 1940's in popularity and usefulness as a means of teacher in-service. As workshops grew, new purposes for having them were considered. In 1951, Earl C. Kelley wrote The Workshop Way of Learning. He describes in great detail the results of ten years of the Education Workshop at Wayne University. The purposes for workshops, as defined by Kelly are included below:

1. We want to put teachers in situations that will break down the barriers between them so that they can more readily communicate.
2. We want to give teachers an opportunity for personal growth through accepting and working toward a goal held in common with others.
3. We want to give teachers an opportunity to work on problems that are of direct, current concern to them.

4. We want to place teachers in a position of responsibility for their own learning.
5. We want to give teachers experience in a cooperative undertaking.
6. We want teachers to learn methods and techniques which they can use in their own classrooms.
7. We want teachers to have an opportunity, in collaboration with others, to produce materials that will be useful in their teaching.
8. We want teachers to be put in a situation where they will evaluate their own efforts.
9. We want to give teachers an opportunity to improve their own morale (Kelley, 1951, pp. 7-11).

The essential characteristics of workshops, described by O'Rourke and Burton (1957) are similar to the purposes of workshops identified by Kelley (1951). Common themes of both were the attainment of goals, working together cooperatively, and learning how to solve problems. Evaluation was a component of both the essential characteristics and purposes of workshops.

From its inception in 1936, the educational workshop continued to grow as a professional development activity. As time passed, the educational workshop changed in appearance and purpose. Steig and Frederick (1969) promoted the idea that a workshop was one of the many techniques used in in-service teacher education. They characterized a workshop as having participants who discuss professional problems under the guidance of a competent leader.

Workshops are an important component of teacher in-service, staff development, and teacher enhancement. These three terms are now used interchangeably and workshops are a means to achieve their goals. Therefore, the overall goals of the staff development, teacher in-service, and teacher enhancement are closely related to the goals of the education workshop. Workshops are now used extensively for the professional development of teachers (Harris, 1980). Professional development is defined by Ross and Regan (1993, p. 91) "as changes in understandings, affects and actions that increase effectiveness in a role." An inservice education refers to any planned opportunities for teachers to improve their performance in an already assigned position (Harris and others, 1969).

The basis for staff development, teacher in-service, and teacher enhancement is the implementation of school improvement (Borman & Greenman, 1994). Howsam (1976) felt that teachers need lifelong professional development. The teacher's working knowledge is developed during professional development activities (Gersten and others, 1992). Beegle & Edefelt (1977) believed that staff development is necessary for schools to keep pace with the rapid changes taking place in society. Also, staff development is necessary because the primary source of student learning is the teacher (Zumwalt, 1986).

Inservice education or inservice training is considered to be a key aspect of school improvement efforts. Inservice training serves three main purposes:

1. to stimulate the professional competence and development of teachers;
2. to improve school practice; and
3. to implement political agreed-upon innovations in the school (Veenman, et al, 1994, p. 303).

Some key characteristics of good teacher inservice include:

1. opportunities for teachers to develop content and pedagogical knowledge; and
2. improvement in teacher confidence, attitudes, and behavior (Miller, 1994, p. 31).

Gager (1980, p. 5) schematically viewed inservice education as a process by which one "immerses the teacher into an experience that necessitates the use of new, applied skills and leads to reflection about personal learning, followed immediately by examination of professional attitudes, practices, and beliefs, ultimately resulting in improved instruction/curriculum/school structure." He felt that workshops can enable this scheme to be successful. Joyce (1990) supports this idea and believes that teachers can use workshop ideas to change their behavior in the classroom and school.

The term "workshop" has been used since 1936. At the present time, it refers "to a relatively short-term, intensive, problem-focused learning experience that actively involves participants in the identification and analysis of problems and in the development and evaluation of solutions" (Sork, 1984, p. 5). A general purpose of the workshop is to enable people who share a common problem the opportunity to come together to develop and practice new capabilities (Sork, 1984).

The current goals of teacher enhancement are goals of the education workshop. They are to: (1) increase teacher knowledge; (2) provide teacher renewal and the opportunity for networking; (3) increase leadership and empowerment of teachers; (4) change classroom practice; and (5) increase student interest and achievement (Frechtling, et al, 1995).

Marks (1975, p. 16) summarizes the historical perspective of the educational workshop in the following way:

> The development of the educational workshop was a response to teachers in the public schools to improve the curriculum and instruction as partial solutions to the problems of their communities. The early educational workshops were general in nature in order to describe and define the problem-solving techniques used by the individual participants. The rationale that described the problem-solving techniques was significant in defining the basic characteristics of the educational workshop.

NASA's Education Programs and the NEWEST Workshop

The National Aeronautics and Space Administration (NASA) was created by the National Aeronautics and Space Act of 1958. Early NASA education activities were primarily in the area of higher education and focused on the needs of the workforce, graduate study, and research. The early education programs were a part of NASA's Office of Public Affairs. The Education Affairs Division at NASA was created in 1985 and has Elementary and Secondary Programs as one of its Branches. It is presently located at NASA Headquarters in Washington, D. C. (National Research Council, 1994).

NASA's Education Vision is "to promote excellence in America's education system through enhancing and expanding scientific and technological competence" (NASA, 1992, p. 1). At the elementary and secondary level, NASA uses its mission and resources to provide instructional opportunities for teachers. NASA offers teachers a

wide variety of aerospace education opportunities, but many are in the form of education workshops (NASA, 1992). According to former NASA Administrator Richard Truly, at NASA "there is an overarching responsibility to actively support and nurture math and science education" (Covault, 1992, p. 65).

NASA designs its education programs for teachers to enhance their knowledge, skills and experience. NASA's major elementary and secondary teacher enhancement and preparation programs include the:

- Aerospace Education Services Program (AESP)
- Urban Community Enrichment Program (UCEP)
- NASA Educational Workshop for Mathematics, Science and Technology Teachers (NEWMAST)
- NASA Educational Workshop for Elementary School Teachers (NEWEST) (National Research Council, 1994).

While all of NASA's education programs are important, this study deals with the NEWEST workshop.

The NEWEST workshop gives selected teachers the opportunity to spend two weeks during the summer at a NASA Center (NASA, 1994). The NASA Langley Research Center NEWEST workshop began in 1987 (Canright, 1996), and its goal is to give teachers the chance to experience first-hand, research and development activities, while updating their knowledge and developing new interdisciplinary and team-teaching strategies (NASA, 1994).

NEWEST participants must be citizens of the United States, certified teachers with a minimum of five years teaching experience, currently assigned to grades Pre K-6 and a

full time teacher in public or private schools in the United States, the United States territories, Department of Defense Dependant Schools, Department of State Overseas Schools, or Bureau of Indian Affairs Schools. NEWEST participants learn about NASA projects, educational programs, educational materials, aerospace education topics, and visit research and applied science facilities (NASA, 1994)

NEWEST applicants have to summarize their professional background and experience. These include current teaching assignment, formal education, certification, teaching experience, professional activities, and other teaching-related activities (NASA, 1994).

NEWEST applicants have to submit three letters of support and respond to three essay questions. Of particular interest to the researcher is the essay item, "Outline and describe a plan for using the knowledge and resources you will receive during the workshop with your students, school and/or community" (NASA, 1994, p. 3). This essay item represents the basis for this study.

The NASA Langley Research Center has been conducting the NEWEST summer workshop since 1987 (Canright, 1996). A copy of the itinerary for the 1994 NEWEST summer workshop is found in Appendix A. There are six components of the NEWEST summer workshop. They are: (1) information about current NASA projects, (2) educational activities for the classroom, (3) announcements of NASA educational products and services, (4) field trips, (5) the ability to interact with scientists, and (6) the ability to interact with other educators.

In a study which examined the Department of Energy's teacher enhancement workshops, it was reported that high-quality curriculum development may hold the most

promise for improving student achievement and realizing the national math and science goals (United States General Accounting Office, 1994).

The National Research Council stated that the number of teachers who can directly experience high-intensity workshops, supported by NASA, is small. As a result, teachers have a responsibility to pass along their workshop experiences to their colleagues. They said that a proposal on how teachers would do this might play a role in the selection process. They suggested that sharing their workshop experiences would have a multiplier effect on teachers not able to attend the workshops. (National Research Council, 1994)

The NEWEST workshop does provide teachers with high quality curriculum materials. It also asks teachers to submit a proposal as to how they will share their experiences with their students, school and/or community.

Selected Aerospace Studies

The literature review includes doctoral dissertations relating to aerospace workshops and programs. There are five dissertations which are of particular importance to the researcher's study and are documented here. They are Helton (1973), Romero (1973), Marks (1975), Grigsby (1979), and Vogt (1990).

Helton (1973) studied how workshop participants felt about summer aerospace workshops six months after the completion of the workshops. He hypothesized that there was no relationship between how long a workshops lasts and the number of activities that teachers include in lesson plans as a result of their workshop experience.

He randomly selected 500 previous workshop participants from 79 aerospace workshops and had them respond to a questionnaire. He obtained a chi-square value of

16.877 and compared this to the critical chi square at the .05 level which was 12.95. He found that there was a significant difference between how long a workshop lasts and the number of activities that teachers include in lesson plans as a result of the workshop experience.

He found that there was no significant relationship between the duration of a NASA workshop and the number of activities included in lesson plans as a result of the workshop experience. He also found that there was no significant relationship between the duration of a NASA workshop and the extent to which workshop participants shared their workshop experiences with their faculties as a resource person.

Romero (1973) studied the relationship between aerospace education workshops and practices and attitudes of participating teachers. His population consisted of a random sample of 200 subjects who participated in the workshops and 200 subjects who were applicants, but were not selected for the workshops. He administered a questionnaire and opinionnaire to the two groups. He used a chi-square statistical test and found that there was not a significant relationship between workshop participation and teaching a unit dealing with aerospace education. Romero also found that participation in aerospace workshops was not significantly related to teaching aerospace concepts.

Marks (1975) conducted a study on aerospace curriculum and instruction utilization after the completion of an aerospace education workshop in which NASA participated. He used a total of 373 participants in his study, of which 234 returned a questionnaire for data interpretation. He found that after completion of the workshop, 51.3 percent did incorporate aerospace concepts into their teaching, while 43.2 percent

did not. He found that 90.6 percent of the participants felt the workshop was beneficial to teaching methods, while 6.0 percent said the workshop was not beneficial.

Marks used a chi-square statistical test with a level of significance which was set at the .05 level and determined that there were no significant relationships between the incorporation of aerospace concepts into teaching methods and categories of participant characteristics.

Grigsby (1979) did a descriptive analysis of the status and needs for aerospace education in the schools of Oklahoma. She used as her subjects, former participants in the three-week Oklahoma Aerospace Education Workshops held in 1969, 1970, 1971, 1972, 1973, 1975, 1976, and 1977. Her sole source of data was a questionnaire which was mailed to the former workshop participants and superintendents of all independent school districts in Oklahoma. A result of interest to this writer was that the NASA provided education materials were utilized by 78.9 percent of the workshop participants when they returned to their classrooms.

Vogt (1990) examined the effectiveness of NASA educational satellite teleconferences for teacher training. He surveyed 107 site coordinators who participated in the teleconference. One of Vogt's research questions dealt with the issue of whether teachers make use of the content of NASA education satellite teleconferences in the classes they teach. His results showed that 58 percent of the participants made use of the content presented in the teleconference with their students.

Several researchers have studied the relationship between demographic data and the utilization of aerospace concepts. Of the dissertations reviewed by the researcher, only Marks (1975) found a significant relationship between demographic data and the

utilization of aerospace concepts. He found a significant relationship between gender and the number of hours per week that teachers utilized aerospace concepts in their classroom instruction.

The purpose of this study was to determine the degree to which NEWEST participants who were assigned to the NASA Langley Research Center, during the summers of 1993 through 1995, make use of aerospace concepts, subject matter, and activities, presented in the NEWEST workshop, in their professional communities.

As a part of the prospective NEWEST participant application, teachers are asked to respond to the following essay question: "Outline and describe a plan for using the knowledge and resources you will receive during the workshop with your students, school and/or community" (NASA, 1994, p.3). A follow-up study has not been done in regard to the teachers' responses to this essay item. This essay item represents the basis for this study.

Summary

This chapter has reviewed the relevant literature regarding this study. It has examined the history, development, and purpose of educational workshops, NASA's education programs and the NEWEST workshop, and selected aerospace studies.

CHAPTER III

DESIGN AND METHODOLOGY

Introduction

This purpose of this chapter is to describe the procedures used to accomplish the purpose of this study. The purpose of the study was to determine the extent to which NEWEST participants, who were assigned to the NASA Langley Research Center, during the summers of 1993, 1994, and 1995 , make use of aerospace concepts, subject matter, and activities, presented in the workshop, in their professional communities.

Population

The first NASA Langley Research Center NEWEST workshop was held during the summer of 1987. The NEWEST workshop is two weeks in length, during the summer, and involves 25 teachers. A total of 225 teachers have been selected and participated in the NASA Langley Research Center NEWEST workshop since 1987.

To be selected, the participants must have had at least five years of teaching experience, be citizens of the United States, be certified teachers, and teach full time in public or private schools in the United States, the United States territories, Department of Defense Dependant Schools, Department of State Overseas Schools, or Bureau of Indian

Affairs Schools. Additionally, NEWEST participants must teach elementary school in grades Pre K-6. Canright (1996) states that, nationally, over 2000 teachers apply for NEWEST each year. Of that number, 125 are accepted for participation in a NEWEST workshop at one of five NASA Centers. The NEWEST workshop is managed for NASA by the National Science Teachers Association (NSTA).

Sample

The subjects of this study were all seventy-five NEWEST participants from 1993 to 1995, who were assigned to the NASA Langley Research Center. The NEWEST workshops were conducted during the summers of 1993, 1994, and 1995. The participants are located throughout the United States. They represent public and private schools in both rural and urban settings.

They met the criteria of selection as established by the NEWEST brochure. The criteria is listed in the information regarding the population of this study. The years 1993, 1994, and 1995 were selected because those participants were given graduate credit, for successfully completing the workshop, by Oklahoma State University. Therefore, their addresses were accessible by the researcher, thus enabling the study to be conducted. Also, delayed recall was a factor in selecting those particular years of the NEWEST workshop.

The NEWEST and NEWMAST workshops are conducted at nine NASA Field Centers across the country. The researcher selected the NASA Langley Research Center NEWEST workshop as a pilot study site, with the recommendation that all NEWEST workshops be studied collectively in a future research proposal.

Type of Research

A descriptive type of research design was chosen for this study. It is appropriate since it enables the researcher to collect data to answer some research questions (Gay, 1992) regarding the utilization of aerospace concepts, subject matter, and activities by the NEWEST participants, from 1993 to 1995, who were assigned to the NASA Langley Research Center. Its focus is to describe the workshop participants based on their responses to the survey instrument.

Instrumentation

Berdie and Anderson (1974) point out that a survey is a good method of collecting data. The survey was the sole source of data for this study. The survey instrument was developed to gather data regarding the seven research questions. A consideration in constructing a survey is its validity. Badia and Runyon (1982) refer to validity as whether the measuring instrument does what it is intended to do. To this end, a panel of experts was assembled to validate the survey. The panel of experts included the Chairman and members of the researcher's doctoral advisory committee, an education specialist at NASA Headquarters in Washington, D.C., and a computer specialist at Oklahoma State University. The panel of experts reviewed the survey to determine its validity. Revisions were made based on their recommendations and suggestions. The survey was approved by the Oklahoma State University Institutional Review Board (see Appendix B).

The survey instrument was designed to determine the utilization of aerospace concepts, subject matter, and activities by NEWEST participants from 1993 to 1995, who were assigned to the NASA Langley Research Center.

The survey contained nineteen items. The first ten items consisted of demographic information. Items ten through nineteen gathered specific information regarding the utilization of aerospace concepts, subject matter and activities by the NEWEST participants in their professional communities.

Pilot Study

The survey instrument was piloted with eight teachers who participated in the 1992 NASA Langley Research Center NEWEST workshop. A list of the NASA Langley Research Center NEWEST workshop participants was obtained from the Department of Aviation and Space Science Education at Oklahoma State University. This department provides NEWEST workshop teachers the opportunity to receive three hours graduate credit for their NEWEST workshop participation.

The surveys were distributed by mail during February, 1996. The mailed packet included: (1) a cover letter which explained the purpose of the survey and other pertinent information (2) a copy of the survey (3) an addressed and stamped return envelope and (4) an addressed and stamped postcard. The postcards were coded from 001 to 008. This was done for follow-up purposes only. There were no identifying marks on the survey.

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 two weeks the survey participants who had not responded were sent a follow-up letter as a reminder for them to complete and return the survey.

No envelopes which contained the surveys were opened until all participants had responded. As they were opened the surveys were placed in a closed box. No survey responses were read until all the envelopes had been destroyed. Therefore, anonymity was assured. The information from the piloted survey was used to make further revisions to the survey instrument.

Data Collection

A list of the seventy-five NASA Langley Research Center NEWEST workshop participants, from 1993 to 1995, was obtained from the Department of Aviation and Space Science Education at Oklahoma State University. This Department provides NEWEST workshop teachers with the opportunity to receive three hours of graduate credit for their workshop participation .

The surveys were distributed by mail during March, 1996. The mailed packet included: (1) a cover letter which explained the purpose of the survey and other pertinent information (2) a copy of the survey (3) an addressed and stamped return envelope and (4) an addressed and stamped postcard. The postcards were coded from 001 to 075. This was done for follow-up purposes only. There were no identifying marks on the survey.

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. This was done for follow-up purposes only. After two weeks the survey participants who had not responded were sent a follow-up letter as a reminder for them to complete and return the survey.

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

A copy of the letter is found in Appendix C. A copy of the survey is found in Appendix D. A copy of the coded postcard is found in Appendix E. A copy of the follow-up letter is found in Appendix F.

Analysis of Data

The results of the responses to the survey were presented using descriptive statistics. Frequencies and percentages were reported for analysis of research questions one through six. Chi-square tests were conducted on the data for research question number seven. The chi-square tests were done to test for differences in proportions of responses, which were based on the characteristics of the demographic data. Computations were done using the SAS System. The minimum requirement for statistical significance was set at an experiment-wise error rate of $p<.05$.

In summary, the purpose of this chapter has been to give a general description of the design and methodology of the study. Major areas discussed were descriptions of the population, sample, and survey, and the method of collecting and analyzing the data.

CHAPTER IV

RESULTS OF THE STUDY

The first three chapters presented an introduction to the study, a review of selected literature, and the study's design and methodology. The purposes of this chapter are to present the data collected during the study and to summarize the results of the analyses of that data.

The data were gathered from a survey sent to seventy-five NEWEST participants, from 1993 to 1995, who were assigned to the NASA Langley Research Center. Data will be presented according to the research questions listed in Chapter I. The data for research questions one through six are presented using frequencies and percentages of workshop participants' responses to items on the survey which are directly related to each research question. The frequencies and percentages will be concerned with:

1. the demographic characteristics of the NEWEST workshop participants.
2. the incorporation of NEWEST concepts and subject matter into the workshop participants' classroom instruction. Examples of this incorporation will be given.
3. the incorporation of NEWEST student hands-on aerospace education activities into the workshop participants' classroom instruction. Examples of this incorporation will be given.

4. workshop participants giving special assignments to their students after attending NEWEST.
5. the use of the NEWEST concepts, subject matter, and activities outside the workshop participants' classroom. Examples of this use will be given.
6. the rating of the importance of the following six components of the NEWEST workshop in terms of the participants' professional development: (a) information about current NASA projects, (b) educational activities for the classroom, (c) announcements of NASA educational products and services, (d) field trips, (e) the ability to interact with scientists, and (f) the ability to interact with other educators.

The chi-square statistical test will be used to answer research question seven which is found in Chapter I. It will be used to determine the relationships between the participants' demographic characteristics of gender, years of teaching experience, and current teaching level and:

1. the incorporation of NEWEST concepts and subject matter into the workshop participants' classroom instruction.
2. the incorporation of NEWEST student hands-on aerospace education activities into the workshop participants' classroom instruction.
3. workshop participants giving special assignments to their students after attending NEWEST.
4. the use of the NEWEST concepts, subject matter, and activities outside the workshop participants' classroom.

6. the rating of the importance of the following six components of the NEWEST workshop in terms of their professional development: (a) information about current NASA projects, (b) educational activities for the classroom, (c) announcements of NASA educational products and services, (d) field trips, (e) the ability to interact with scientists, and (f) the ability to interact with other educators.

Information presented in this chapter can be found in the tables. In addition, the researcher has attempted to explain the data presented.

Responses to the Survey

A list of names and addresses of 75 NEWEST workshop participants, from 1993 to 1995, who were assigned to the NASA Langley Research Center, was obtained from the Department of Aviation and Space Science Education at Oklahoma State University. A survey was mailed to each workshop participant.

Responses were received from 47, or 62.7 percent of the total mailed. Three surveys were returned by the post office indicating an inability to locate the intended receivers. Of the 72 surveys assumed delivered, responses were received from 47, or 65.3 percent. The number of surveys returned with responses was equal to the number of follow-up postcards received from the NEWEST participants.

Characteristics of Participants

Research Question Number One

What are the demographic characteristics of the NEWEST participants in terms of gender, years of teaching experience, current teaching level, average number of students per class, number of pupils in the school, highest degree earned, educational classroom staffing (number of professionals found in the classroom setting), the number of science courses taken prior to workshop participation, the number of science courses taken after attending NEWEST, and the teacher's participation in previous aerospace workshops?

To obtain supporting data for this question, items one through ten of the workshop participants' survey were used (see Appendix D). Items one through ten are presented in Table 1.

Findings show that 42 percent of the participants were female and 5 percent were male. The majority of the teachers (19 percent) had taught for 20+ years. This was followed in descending order by 12 percent (11-15 years), 8 percent (16-20 years), 5 percent (8-10 years), 3 percent (6-7 years), and zero percent (0-5 years).

The following data were gathered concerning the educational levels at which the participants were presently working. It was noted that 26 percent were grades K-4 teachers, 19 percent were grades 5-8 teachers, and none were grades 9-12 teachers. In relation to the average number of students per class, 8.9 percent had one to fifteen, 26.7 percent had sixteen to twenty, 37.8 percent had twenty-one to twenty-five, 22.2 percent

TABLE 1

WORKSHOP PARTICIPANTS' DEMOGRAPHIC CHARACTERISTICS

Demographic Characteristics	Frequency	Percent
Gender		
Female	42	89.4
Male	5	10.7
TOTAL	47	100.0
Years of Teaching Experience		
0-5	0	0
6-7	3	6.4
8-10	5	10.6
11-15	12	25.6
16-20	8	17.0
20+	19	40.4
TOTAL	47	100.0
Current Teaching Level		
K-4	26	57.8
5-8	19	42.2
9-12	0	0
TOTAL	45	100.0
Average Number of Students Per Class		
1-15	4	8.9
16-20	12	26.7
21-25	17	37.8
26-30	10	22.2
31-35	1	2.2
35 or More	1	2.2
TOTAL	45	100.0

TABLE I (Continued)

Demographic Characteristics	Frequency	Percent
Number of Pupils in the School		
Less Than 250	4	8.9
251-500	12	26.7
501-750	14	31.1
751-1000	11	24.4
More Than 1000	4	8.9
TOTAL	45	100.0
Highest College Degree Earned		
Bachelor's	13	27.7
Master's	24	51.1
Specialist	8	17.0
Doctorate	2	4.3
TOTAL	47	100.0
Classroom Educational Setting		
Only Myself	34	73.9
One Other Person	10	21.7
Two Other Persons	1	2.2
Three Other Persons	0	0
More Than Three Other Persons	1	2.2
TOTAL	46	100.0
Science Courses Taken Prior to Attending NEWEST		
Zero	0	0
1-2	10	21.7
3-4	15	32.6
5-6	6	13.1
More Than 6	15	32.6
TOTAL	46	100.0

TABLE 1 (Continued)

Demographic Characteristics	Frequency	Percent
Science Courses Taken After Attending NEWEST		
Zero	19	40.5
1-2	15	31.9
3-4	5	10.6
5-6	5	10.6
More Than 6	3	6.4
TOTAL	47	100.0
Prior Aerospace Workshops		
Zero	27	57.5
1	4	8.5
2	5	10.6
3	3	6.4
4	0	0
5 or More	8	17.0
TOTAL	47	100.0

had twenty-six to thirty, 2.2 percent had thirty-one to thirty-five, and 2.2 percent had thirty-five or more.

The participants came from schools of varying sizes. The greatest number of participants (31.1 percent) taught at schools with 501-700 students. The percentage of teachers who taught at schools with less than 250 students was equal to the number of teachers who taught at schools with more than 1000 students.

Participants who responded and had a bachelor's degree made up 27.7 percent of the sample. Approximately 51 percent of the participants had a master's degree, while 17 percent were specialists, and 4.3 percent had earned a doctorate. Findings showed that most of the teachers (73.9 percent) worked in the classroom setting alone. There were 21.7 percent of the participants who worked in their classroom with one other person.

The data showed that all the participants had taken at least one science course prior to NEWEST. One to two courses had been taken by 21.7 percent, 3-4 courses by 32.6 percent, 5-6 courses by 13.1 percent, and 32.6 percent of the participants had taken more than 6 science courses. After completing NEWEST 40.5 percent did not take any more science courses. Thirty-two percent took 1-2 science courses after NEWEST. More than 6 courses were taken by 6.4 percent of the participants after the NEWEST workshop.

Prior to attending NEWEST 57.5 percent of the workshop participants had never attended an aerospace workshop. On the other hand 17 percent had attended 5 or more aerospace workshops. The percentages of participants who had attended 1, 2, or 3 workshops were 8.5, 10.6, and 6.4 respectively.

The Incorporation of NEWEST Concepts and Subject Matter

Research Question Number Two

How often have NEWEST concepts and subject matter been incorporated into the workshop participants' classroom instruction? What are some examples of incorporating NEWEST concepts and subject matter into the workshop participants' classroom instruction?

To investigate the incorporation of aerospace education concepts and subject matter prior to and after attending NEWEST, survey items number eleven and twelve were used (see Appendix D). Survey item eleven is represented by Table 2 and survey question twelve is Table 3.

Table 2 shows that 52.2 percent of the participants were incorporating aerospace activities in their classroom once a week prior to attending NEWEST. Approximately 30 percent of the participants were not doing aerospace activities prior to attending NEWEST. Table 3 reports that after attending NEWEST only 2.3 percent of the participants were not using aerospace activities in their classroom, while 90 percent of the NEWEST participants were using aerospace activities in their classroom two or more times per week.

TABLE 2

THE INCORPORATION OF AEROSPACE EDUCATION
CONCEPTS AND SUBJECT MATTER
PRIOR TO ATTENDING NEWEST

Aerospace Incorporation	Frequency	Percent
Zero Times Per Week	14	30.4
1 Time Per Week	24	52.2
2 Times Per Week	4	8.7
3 Times Per Week	1	2.2
4 Times Per Week	0	0
5 or More Times Per Week	3	6.5
TOTAL	46	100.0

TABLE 3

THE INCORPORATION OF NEWEST AEROSPACE EDUCATION CONCEPTS AND SUBJECT MATTER

Incorporation of NEWEST Aerospace Education Concepts and Subject Matter	Frequency	Percent
Zero Times Per Week	1	2.3
1 Time Per Week	3	7.0
2 Times Per Week	16	37.2
3 Times Per Week	10	23.3
4 Times Per Week	1	2.3
5 or More Times Per Week	12	27.9
TOTAL	43	100.0

The participants were given an opportunity to write any additional comments regarding examples of their incorporation of NEWEST aerospace education concepts and subject matter in their classroom instruction. Examples of some of their comments were:

> Our school has an aerospace theme. We tie in aerospace to all of our teaching in whatever way possible. We talk about animals in space, build Estes rockets, write science fiction books, and take students to Space Camp annually for a three day visit.
>
> We study the history of flight, principles of flight, and current technology.
>
> Examples are the study of flight during our "birds" unit, satellites during our "weather study" unit, the atmosphere during our "environment" unit, and the scientific process during our "experimentation" unit.
>
> Examples are rockets and associated laws (ex. Newton's) and the effects of space on the human body. We also include the space race history, an astronaut database, shuttle information, and the requirements needed to take life into space.
>
> Preparing science kits relating to flight, toys in space, Comet Halley timeline, and airplane activities to be shared and used by teachers within our school district. I have also ordered books and materials to be borrowed for use by teachers and students.
>
> My students study flight, rocketry, and kites.
>
> Of course we do a unit on space, weather, and map reading. Students read, compare, and contrast the planets. We also calculate distances and the sizes of the planets. Our Young Astronauts design paper airplanes, paper rockets, rocket cars, and do experiments on thrust and lift.
>
> I run a space science center and teach an aerospace summer camp.
>
> Bringing in an astronaut, lunar discs, using spacelink, making and flying airplanes.
>
> I volunteer my time and teach aerospace to nursery and elementary school students.
>
> We have built rockets, completed an astronaut trainee program, made gliders, launched rockets, eaten astronaut ice cream, checked out the lunar soil kit and studied flight. I could fill this page easily with other things we have done.

In Grade 4 my students study space and in Grade 5 we study how the human body is affected by space.

We do a space unit and study technology. We also have a Space Club.

We have used cooperative learning strategies a great deal. After NEWEST I expanded my units on space and aviation.

I used the materials obtained at NEWEST when I did a unit on space and the solar system.

Some examples are experiments with gravity, designing airplanes, and the proposed colonization of Mars.

We studied the principles of flight, astronomy, and LANDSAT in ground truthing.

The subject matter dealt with aerodynamics, rockets, and spinoffs.

My class put on an Air Fair for the entire school.

The moon rocks disc now comes to my school. I teach about living in space and the forces of flight.

We make the NASA computer connection to things studied in class.

A twelve week second grade unit on air and flight culminates in an Air Fair.

We have written a unit on living and working in space.

I have taught gifted units on astronomy, physics, technology, the Internet, space shuttle, NASA, Space Camp, radio, cosmology, and theoretical physics.

I did a two week unit with two classes on aerospace - all of it from my NEWEST experience.

I have taught weather information, astronomical events, and current technology.

I developed a multi-disciplined unit on hot air balloons.

Aviation basics, the history of aviation, NASA spin-offs, and shuttle missions have been incorporated in my class.

I have used aerospace education concepts and subject matter to teach literature in my school.

Bernoulli Effects, Rocketry, and Starlab/Astronomy.

I taught a total aerospace unit which lasted an entire year.

Rockets and Astronomy.

Kites and Flight Unit.

We took a trip to the local airport.

The theme for my class is space. We have studied Bernoulli's Principle, air pressure, and wind direction and speed.

Current events - space related NASA activities.

A unit of study on aeronautics, space education, and technology was taught to my class. Topics included navigation, flight principles, and the effects of weather on flight.

Space Science, Astronomy, Planets and Space Exploration.

Unit on Rocketry - Science Fair with a space theme.

We have built kites and airplanes. We have talked about many of the topics I studied during my NEWEST experience.

Principles of Flight.

We have followed the activities of spaceflight crews.

My class experimented with Bernoulli's Principle.

Incorporation of NEWEST Student Hands-On Activities

Research Question Number Three

How often have the workshop participants incorporated NEWEST student hands-on aerospace education activities in their classroom instruction? What are some

examples of incorporating NEWEST student hands-on aerospace education activities in the workshop participants' classroom instruction?

Supporting data for this question were obtained from items thirteen and fourteen on the workshop participants' survey (see Appendix D). Tables 4 and 5 can be compared regarding the frequency of the incorporation of student hands-on aerospace education activities prior to and after participants attended NEWEST.

Prior to attending NEWEST, 37 percent of the participants were not giving their students hands-on aerospace education activities. The teachers who were giving hands-on aerospace activities totaled 43.5 percent of the sample. Thirteen percent were giving the activities two times per week, none were giving them four times per week, and 4.3 percent were giving them five or more times per week (see Table 4).

According to Table 5, after attending NEWEST 35.7 percent of the teachers were giving hands-on aerospace education activities. Only 2.4 percent of the teachers were not giving hands-on activities to their students after attending NEWEST. The data showed that 23.8 percent were giving the activities two times per week and 19.1 percent were giving them five or more times per week.

The participants were given an opportunity to write any additional comments regarding incorporating NEWEST hands-on aerospace education activities in their classroom instruction. Examples of some of their comments were:

> I plan to do a lot with flight.
>
> We had a paper airplane contest, made rockets with film canisters, and constructed hot air balloons.
>
> Research - Spacelink, aerodynamics - natural vs. manmade, exploration - explorers, simple machines - the physics of force.

TABLE 4

THE INCORPORATION OF STUDENT HANDS-ON AEROSPACE EDUCATION ACTIVITIES PRIOR TO ATTENDING NEWEST

Incorporation of Student Hands-On Aerospace Education Activities Prior to Attending NEWEST	Frequency	Percent
Zero Times Per Week	17	37.0
1 Time Per Week	20	43.5
2 Times Per Week	6	13.0
3 Times Per Week	1	2.2
4 Times Per Week	0	0
5 or More Times Per Week	2	4.3
TOTAL	46	100.0

TABLE 5

THE INCORPORATION OF NEWEST STUDENT HANDS-ON AEROSPACE EDUCATION ACTIVITIES

Incorporation of NEWEST Student Hands-On Aerospace Education Concepts	Frequency	Percent
Zero Times Per Week	1	2.4
1 Time Per Week	10	23.8
2 Times Per Week	15	35.7
3 Times Per Week	5	11.9
4 Times Per Week	3	7.1
5 or More Times Per Week	8	19.1
TOTAL	42	100.0

Creating comets, building and launching rockets, planning a space colony.

I do teacher workshops and workshops for university classes using simulations as a teaching strategy, plus hands-on aerospace activities.

Construct sled kites, rocket on a string, star charts.

Experiment with film canister rockets, planet postcards, Venn diagrams of planets, constellation tubes, computing weight on different planets and life spans.

Everything we do is hands-on.

Making a comet, living on the moon, flying airplanes.

Activities relate to the shuttle tiles, spacesuit, and the moon.

I have not done any new ideas from NEWEST. I have only done simulations that I already had developed.

We have built rockets, completed an astronaut trainee program, simulated the space environment, made gliders, studied flight, and launched rockets.

I use the materials in an after school program for the Young Astronaut Club. We meet once a week.

Space Unit, Space Club, Technology.

We have used paper airplanes and balloon rockets on a string. I relate as many activities as possible to the space program.

Rockets, Kites, Airplanes.

We have done the egg drop, flyers, space logos, designing a space colony, and Mission to Planet Earth.

We have done kite building with the third graders.

The activities include meal planning for astronauts, hydroponics, ocean exploration, designing a lunar colony, and designing our own astronaut fitness walking trail.

I teach flight and motion with the after school Science Club and the Air Fair.

We do glider activities, make kites, experiment with the forces of flight, and living in space activities.

Making shuttles, parachutes, balloons.

Balloon rocket, hot air balloons, kites, parachutes, Toys in Space.

We design and fly airplanes, make graphs, and connect the activity to integrating math and science.

I use all of the NASA activities.

We did flight experiments with kites and paper airplanes.

Height-o-meters and rocket building and launching.

Hot air balloons, bubbles, kites.

Toys in Space, field trip to airport, pilot guests, physical and earth science experiments.

We role play with space missions monthly.

My students do activities in rocketry and aerodynamics.

Paper airplanes, kites, cargo drop, building models.

The Science Club does all kinds of aerospace activities.

Biosphere II, Oceanography, AIMS science activities.

We do experiments to demonstrate Bernoulli's Principle.

We use e-mail to contact scientists, study space, light, flight, Apollo missions, and inventions.

Space Science Activities.

We do aerospace activities which are hands-on in nature.

Activities include navigation, paper airplanes, kites, and measuring shadows from season to season.

I spent time doing experiments with air and conducting a field trip to a local airport.

Rocketry Activities.

We will use the activities from NEWEST to choose a topic of interest and explore it.

The students made moon craters, calculated their weight on the moon, and made sundials and observed their shadows.

Rocket building, star study, space shuttle activity room.

We made airplanes and had an airplane race.

Special Assignments Given by NEWEST

Workshop Participants

Research Question Number Four

How often have NEWEST workshop participants given special assignments to students in their classrooms based on the NEWEST activities?

To collect data for this question, items fifteen and sixteen from the workshop participants' survey were utilized (see Appendix D). The data is shown in Table 6 and Table 7. Tables 6 and 7 report data regarding the participants giving students special assignments prior to and after attending NEWEST.

Giving students special assignments prior to and after attending the NEWEST workshop was compared. Prior to attending the NEWEST workshop 36.4 percent of the respondents did not give their students special assignments. Only 11.9 percent did not give special assignments after attending NEWEST. The percentages for both questions were about the same for giving special assignments once a week. A difference was noted in the total percentage of participants who gave two or more special assignments per week. Prior to attending NEWEST, 31.8 percent of the participants gave two or more

TABLE 6

SPECIAL ASSIGNMENTS PRIOR TO ATTENDING NEWEST

Giving Special Assignments Prior to Attending NEWEST	Frequency	Percent
Zero Times Per Week	16	36.4
1 Time Per Week	14	31.8
2 Times Per Week	6	13.6
3 Times Per Week	4	9.1
4 Times Per Week	1	2.3
5 or More Times Per Week	3	6.8
TOTAL	44	100.0

TABLE 7

SPECIAL ASSIGNMENTS AFTER ATTENDING NEWEST

Giving Special Assignments After Attending NEWEST	Frequency	Percent
Zero Times Per Week	5	11.9
1 Time Per Week	13	31.0
2 Times Per Week	13	31.0
3 Times Per Week	5	11.9
4 Times Per Week	3	7.1
5 or More Times Per Week	3	7.1
TOTAL	42	100.0

The Use of NEWEST Concepts, Subject Matter, and Activities Outside the Classroom

Research Question Number Five

How have the NEWEST participants made use of the NEWEST concepts, subject matter, and activities outside the classroom? What are some examples of the use of NEWEST concepts, subject matter, and activities outside of the workshop participants' classroom?

Data supporting this question were obtained from items seventeen and eighteen of the workshop participants' survey (see Appendix D). The data are reported in Table 8 and Table 9.

The data showed that NEWEST participants are assisting their faculty and participating in community activities concerning NEWEST topics. Over 90 percent are assisting their faculty and 72.1 percent are participating in community activities concerning NEWEST topics.

The participants were given an opportunity to write any additional comments regarding having been of assistance to their faculty concerning NEWEST topics by giving talks or acting as a resource person. Examples of some of their comments were:

> I am setting up the primary curriculum for the fourth quarter. We are doing an interdisciplinary theme of flight unit.
>
> I provide resource materials, act as a reference source, help them to access technology, and provide instructional support.
>
> I have helped new teachers become familiar with space education and helped other teachers plan aerospace activities.

TABLE 8

ASSISTANCE TO FACULTY CONCERNING
NEWEST TOPICS

Assistance to Faculty Concerning NEWEST Topics	Frequency	Percent
Yes	42	93.3
No	3	6.7
TOTAL	45	100.0

TABLE 9

PARTICIPATION IN COMMUNITY ACTIVITIES CONCERNING NEWEST TOPICS

Having Participated in Community Activities Concerning NEWEST Topics	Frequency	Percent
Yes	31	72.1
No	12	27.9
TOTAL	43	100.0

I provide resource materials, act as a reference source, help them to access technology, and provide instructional support.

I have helped new teachers become familiar with space education and helped other teachers plan aerospace activities.

Presentations have been given at staff meetings of all four elementary schools and the state science convention. Resources and kits have been developed and organized for loan to teachers and students.

In addition to inservice presentations, I started a Young Astronaut Club.

With the help of other teachers, I turned the gym into a Space Station for children during our Family Math and Science Night.

We had a thematic unit for the entire building and I did the teacher in-service component. I have talked to university level science methods classes and conducted a weekend space theme program at a local library.

I conducted teacher workshops for six hundred teachers in one year at the Science Center.

I encouraged other teachers to apply to the NEWEST workshop.

I have served as a resource person, supplying materials and sharing experiences with faculty and other classes.

I helped with science projects.

I developed units and a bibliography of books available.

I have shared materials and information, given workshops at local science conferences on aerospace science and NEWEST specifically.

I have conducted staff development activities grade wide, school wide, and district wide.

I facilitated Mission 21 at my school, in the district, and at state and national technology conferences.

One on one ideas have been presented to others about flight, space history, shuttle missions, and rocketry.

I have conducted sessions to explain and share materials with teachers in my state and in another state.

I have done seminars and mini-lessons for faculty and major conferences.

I have assisted teachers with classroom space activities and developed an aerospace curriculum for my district.

Space and planetarium discussions have lead to a greater use of integrated learning.

I have done aerospace workshops in eighteen school districts.

I have given several in-service presentations at my school, sharing the knowledge and experiences gained from NEWEST.

At my school and schools around the district, I have given workshops about NASA, NEWEST, and space science.

I have done hands-on workshops in the school and throughout the state.

I have led local workshops on aerospace.

I have described the NEWEST experience to others in my school and encouraged them to apply.

I have done school in-service presentations and served as an aerospace resource person.

I have involved two teachers in teaching hands-on science.

I helped to develop and implement Air Fair Day at my school.

I have helped teachers correlate aerospace with the curriculum.

I have done several school in-service programs regarding information presented during the NEWEST workshop.

I have talked with teachers at my school about inventive thinking, problem solving, and math enrichment.

I have explained NEWEST by showing videos and offering materials and contacts.

I have talked to the faculty and served as a resource for materials.

I have served as a resource person by distributing information and materials.

I have done an in-service, displayed NASA materials, and conducted hands-on aerospace activities with faculty members.

I have provided posters and lesson plans to the first and fourth grade teachers.

I was the Space Science Fair advisor.

The district office has asked me to give workshops to inform the teachers about the exciting study of aerospace science.

I have shared materials and given a workshop for teachers.

I did an assembly presentation to students.

I provided the school faculty with the materials I received at NEWEST.

The participants were given an opportunity to write any additional comments regarding having participated in community activities concerning NEWEST topics by giving presentations to PTA, civic groups, professional conferences, et cetera. Some of their comments were:

We had the moon rocks at the school PTA and also took them to another school.

I have given presentations at various science teachers' conferences.

I have made presentations to the school committee.

I did a NEWEST presentation at the Hoosier Association of Science Teachers of Indiana.

Several service organizations donated money toward our program and we reciprocated by doing programs for them.

I talked to a group of communications people who sponsored my trip to Space Camp after attending NEWEST.

I have talked to the Chamber of Commerce, at the local library and to the Parent's Club.

I volunteer my time for hands-on science workshops at state conferences.

I presented at the Hoosier's Association of Science Teachers with other NEWEST participants.

I have talked with the school board and a local television station about the SAREX Project.

I talked to the PTA at my school.

I did a presentation for the Boy Scouts of America.

I have presented for several PTA groups and at state and national science conferences.

I have done programs for the Children's Museum and the Environmental Center.

I did two teacher workshops in another state.

I spoke at several national science conferences.

I will be speaking at a district level workshop in another part of the state.

I spoke for Fair Night at school for parents and the community.

I have spoken and given presentations at teacher conventions, Parent Night, and local libraries and bookstores.

I showed my slides and gave a speech at Toastmasters.

I conducted a program at the Summer Science Institute at Roper Mountain Science Center in Greenville, South Carolina.

I have done presentations across the county during teacher in-service days.

I did a presentation to a high school group under college supervision to encourage underprivileged children to attend college upon high school graduation.

I conducted an adult group interactive study about the universe.

Rating the Importance of NEWEST Components for Workshop Participants' Professional Development

Research Question Number Six

How do NEWEST participants rate the importance of the following six

components of the NEWEST workshop in terms of their professional development: (1) information about current NASA projects, (2) educational activities for the classroom, (3) announcements of NASA educational products and services, (4) field trips, (5) the ability to interact with scientists, and (6) the ability to interact with other educators?

To obtain supporting data for this question, item 19 of the workshop participants' survey was utilized (see Appendix D). The data are presented in Table 10.

When asked to rate the importance of information about current NASA projects, 74.4 percent of the participants found it to be very important, 11.6 percent found it to be somewhat important and important, 2.4 found it to be not very important, and none found it to be not important. (Table 10)

The participants reported that educational activities for the classroom was very important (90.7 percent). The other respondents to this rating accounted for less than 10 percent of the sample (Table 11).

The component, announcements of NASA educational products and services, was very important to 46.5 percent of the participants, somewhat important to 34.9 percent and important to 18.6 percent. None of the participants stated that the announcements were not very important or not important (Table 12).

The respondents found field trips to be very important, as 57 percent of them rated them in this manner. Approximately 19 percent stated that the field trips were somewhat important or important. Only four percent listed them as being not very important and none considered them not important (Table 13).

The participants rated the ability to interact with scientists as very important (60.5 percent), somewhat important (27.9 percent) and important (11.6 percent). None of the

TABLE 10

PERCEIVED IMPORTANCE OF INFORMATION
ABOUT CURRENT NASA PROJECTS

NEWEST Component	Frequency	Percent
Information About Current NASA Projects		
Very Important	32	74.4
Somewhat Important	5	11.6
Important	5	11.6
Not Very Important	1	2.4
Not Important	0	0
TOTAL	43	100.0

TABLE 11

PERCEIVED IMPORTANCE OF EDUCATIONAL ACTIVITIES FOR THE CLASSROOM

NEWEST Component	Frequency	Percent
Educational Activities for the Classroom		
Very Important	39	90.7
Somewhat Important	2	4.7
Important	1	2.3
Not Very Important	1	2.3
Not Important	0	0
TOTAL	43	100.0

TABLE 12

PERCEIVED IMPORTANCE OF ANNOUNCEMENTS OF NASA EDUCATIONAL PRODUCTS AND SERVICES

NEWEST Component	Frequency	Percent
Announcements of NASA Educational Products and Services		
Very Important	20	46.5
Somewhat Important	15	34.9
Important	8	18.6
Not Very Important	0	0
Not Important	0	0
TOTAL	43	100.0

TABLE 13

PERCEIVED IMPORTANCE OF FIELD TRIPS

NEWEST Component	Frequency	Percent
Field Trips		
Very Important	24	57.0
Somewhat Important	8	19.1
Important	8	19.1
Not Very Important	2	4.8
Not Important	0	0
TOTAL	42	100.0

participants surveyed responded that the ability to interact with scientists was not very important or not important (Table 14).

In an overwhelming manner, the participants reported that the ability to interact with other educators was very important (79.1 percent). This was followed by somewhat important (16.3 percent) and important (4.6 percent). Not very important and not important were not listed as a rating by any of the respondents regarding the ability to interact with other educators (Table 15).

Several participants wrote unsolicited statements regarding their NEWEST workshop experience. Examples of some of the comments were:

> It was wonderful!
>
> NEWEST provided me an extremely valuable experience. I applied for the NEWEST workshop hoping to gain as much science as possible in a short period of time, trying to build my knowledge. It most definitely offered much. It was an experience I will never forget and would recommend to anyone. Thank you!
>
> NEWEST was the most important activity in which I have ever been involved.
>
> I enjoyed the NEWEST workshop and am trying to pass on the information to others. Thank you!
>
> NEWEST was the best three graduate credits I have ever received.
>
> NEWEST changed my teaching for the better in every way.
>
> The NEWEST workshop was the greatest!

Differences in Workshop Participants' Responses

Research Question Number Seven

Do the workshop participants differ in their responses to the research questions when compared on the basis of the following demographic data: (1) gender, (2) years

TABLE 14

PERCEIVED IMPORTANCE OF THE ABILITY
TO INTERACT WITH SCIENTISTS

NEWEST Component	Frequency	Percent
The Ability to Interact With Scientists		
Very Important	26	60.5
Somewhat Important	12	27.9
Important	5	11.6
Not Very Important	0	0
Not Important	0	0
TOTAL	43	100.0

TABLE 15

PERCEIVED IMPORTANCE OF THE ABILITY
TO INTERACT WITH OTHER EDUCATORS

NEWEST Component	Frequency	Percent
The Ability to Interact With Other Educators		
Very Important	34	79.1
Somewhat Important	7	16.3
Important	2	4.6
Not Very Important	0	0
Not Important	0	0
TOTAL	43	100.0

of teaching experience, and (3) current teaching level?

The chi-square statistical test was used to answer research question seven. It was used to determine the relationships between the participants' demographic characteristics of gender, years of teaching experience, and current teaching level and:

1. the incorporation of NEWEST concepts and subject matter into the workshop participants' classroom instruction.
2. the incorporation of NEWEST student hands-on aerospace education activities into the workshop participants' classroom instruction.
3. workshop participants giving special assignments to their students after attending NEWEST.
4. the use of the NEWEST concepts, subject matter, and activities outside the workshop participants' classroom.
6. the rating of the importance of the following six components of the NEWEST workshop in terms of their professional development: (a) information about current NASA projects, (b) educational activities for the classroom, (c) announcements of NASA educational products and services, (d) field trips, (e) the ability to interact with scientists, and (f) the ability to interact with other educators.

To gather data regarding this question items one, two, and three from the survey were used to determine a relationship with items twelve, fourteen, sixteen, seventeen, eighteen, and nineteen (see Appendix D). The participant characteristics for "gender" (survey item one) were male and female. For "years of teaching experience" (survey item two) the groups were 0-5 years, 6-7 years, 8-10 years, 11-15 years, 16-20 years, and 20+

years. The groups used for current teaching levels (survey item three) were grades K-4, grades 5-8, and grades 9-12. The categories and related groups identified above were used in Tables 16 through 26.

Table 16 reports data reflecting a relationship between the categories of gender, years of teaching experience, and current teaching level and the incorporation of NEWEST concepts and subjects matter into the workshop participants' classroom instruction. The chi-square statistical test, at the .05 level or significance, showed no significant relationships between these categories.

The data shown in Table 17 reflects a relationship between the categories of gender, years of teaching experience, and current teaching level and the incorporation of NEWEST student hands-on activities in the workshop participants' classroom. The chi-square statistical test, at the .05 level of significance, showed no significant relationships between these categories.

Values reflecting a relationship between the categories of gender, years of teaching experience, and current teaching level and workshop participants giving special assignments to students based on the NEWEST activities are given in Table 18. The chi-square statistical test, at the .05 level of significance, showed no significant relationships between these categories.

The relationship between the categories of gender, years of teaching, and current teaching level and workshop participants' use of the NEWEST concepts, subject matter, and activities outside the classroom is reported in Table 19 and Table 20. At the .05 level of significance, the chi-square test found a significant relationship between current teaching level and assistance to faculty (See Table 19). It also found, at the .05 level of

TABLE 16

CHI-SQUARE VALUES REFLECTING RELATIONSHIP BETWEEN DEMOGRAPHIC DEMOGRAPHIC CHARACTERISTICS AND THE INCORPORATION OF NEWEST CONCEPTS AND SUBJECT MATTER INTO THE WORKSHOP PARTICIPANTS' CLASSROOM INSTRUCTION

Dem Char	0 Per Week	1 Per Week	2 Per Week	3 Per Week	4 Per Week	5+ Per Week	DF	Value	Prob.	Lev. of Sig.
Gender										
Female	1*	3	14	8	1	11				
							5	1.479	0.916	N.S.
Male	0	0	2	2	0	1				
Years Teach. Exp.										
0-5	0	0	0	0	0	0				
6-7	0	0	1	2	0	0				
8-10	0	0	1	1	0	2				
							20	21.250	0.383	N.S.
11-15	0	0	9	1	0	2				
16-20	0	1	2	2	1	2				
20+	1	2	3	4	0	6				
Cur. Teach. Level										
K-4	1	1	7	6	1	7				
							5	3.568	0.613	N.S.
5-8	0	2	9	3	0	5				
9-12	0	0	0	0	0	0				

*Data Reported As Frequency

TABLE 17

CHI-SQUARE VALUES REFLECTING RELATIONSHIP BETWEEN DEMOGRAPHIC CHARACTERISTICS AND THE INCORPORATION OF NEWEST STUDENT HANDS-ON ACTIVITIES IN THE WORKSHOP PARTICIPANTS CLASSROOM INSTRUCTION

Dem. Char.	0 Per Week	1 Per Week	2 Per Week	3 Per Week	4 Per Week	5+ Per Week	DF	Value	Prob.	Lev. of Sig.
Gender										
Female	1*	9	13	5	3	7				
							5	1.285	0.936	N.S.
Male	0	1	2	0	0	1				
Years Teach. Exp.										
0-5	0	0	0	0	0	0				
6-7	0	2	1	0	0	0				
8-10	0	1	1	0	0	1				
							20	19.104	0.515	N.S.
11-15	0	2	7	1	1	1				
16-20	0	1	3	0	2	2				
20+	1	4	3	4	0	4				
Cur. Teach. Level										
K-4	1	4	6	3	3	6				
							5	6.881	0.230	N.S.
5-8	0	6	9	2	0	2				
9-12	0	0	0	0	0	0				

*Data Reported As Frequency

TABLE 18

CHI-SQUARE VALUES REFLECTING RELATIONSHIP BETWEEN DEMOGRAPHIC CHARACTERISTICS AND WORKSHOP PARTICIPANTS GIVING SPECIAL ASSIGNMENTS TO STUDENTS BASED ON THE NEWEST ACTIVITIES

Dem. Char.	0 Per Week	1 Per Week	2 Per Week	3 Per Week	4 Per Week	5+ Per Week	DF	Value	Prob.	Lev. of Sig.
Gender										
Female	5*	13	10	5	2	2				
							5	7.282	0.200	N.S.
Male	0	0	3	0	1	1				
Years Teach. Exp.										
0-5	0	0	0	0	0	0				
6-7	2	0	1	0	0	0				
8-10	0	2	2	0	0	0				
							20	23.795	0.251	N.S.
11-15	1	3	1	4	1	1				
16-20	0	3	2	1	1	1				
20+	2	5	7	0	1	1				
Cur. Teach. Level										
K-4	2	6	7	4	1	2				
							5	2.873	0.720	N.S.
5-8	3	7	5	1	2	1				
9-12	0	0	0	0	0	0				

*Data Reported As Frequency

TABLE 19

CHI-SQUARE VALUES REFLECTING RELATIONSHIP BETWEEN DEMOGRAPHIC CHARACTERISTICS AND WORKSHOP PARTICIPANTS' USE OF THE NEWEST CONCEPTS, SUBJECT MATTER, AND ACTIVITIES OUTSIDE THE CLASSROOM (ASSISTANCE TO FACULTY)

Dem. Char.	Yes	No	DF	Value	Prob.	Lev. of Sig.
Gender						
Female	37*	3				
			1	0.402	0.526	N.S.
Male	5	0				
Years Teaching Experience						
0-5	0	0				
6-7	3	0				
8-10	4	0				
			4	3.036	0.552	N.S.
11-15	10	2				
16-20	8	0				
20+	17	1				
Current Teaching Level						
K-4	25	0				
			1	4.236	0.040	.05
5-8	16	3				
9-12	0	0				

*Data Reported As Frequency

TABLE 20

CHI-SQUARE VALUES REFLECTING RELATIONSHIP BETWEEN DEMOGRAPHIC CHARACTERISTICS AND WORKSHOP PARTICIPANTS' USE OF THE NEWEST CONCEPTS, SUBJECT MATTER, AND ACTIVITIES OUTSIDE THE CLASSROOM (COMMUNITY ACTIVITIES)

Dem. Char.	Yes	No	DF	Value	Prob.	Lev. of Sig.
Gender						
Female	29*	9				
			1	2.896	0.089	N.S.
Male	2	3				
Years Teaching Experience						
0-5	0	0				
6-7	0	3				
8-10	4	0				
			4	13.299	0.010	.05
11-15	7	5				
16-20	7	0				
20+	13	4				
Current Teaching Level						
K-4	16	8				
			1	0.622	0.430	N.S.
5-8	14	4				
9-12	0	0				

*Data Reported As Frequency

significance, a significant relationship between years of teaching experience and community activities (See Table 20). This means that these relationships exist beyond chance factor. However, because of the lower than expected cell counts, the computer program used to analyze the data warned that the chi-square statistical test may not be a valid test for the data. None of the other relationships in Table 19 and Table 20 were found to be significant.

Table 21 shows the data reflecting a relationship between gender, years of teaching experience, and current teaching level and how the workshop participants rate the importance of information about current NASA projects as a NEWEST component. The chi-square analysis, at the 0.5 level, showed no significant relationships exist between these categories.

Table 22 shows the data reflecting a relationship between gender, years of teaching experience, and current teaching level and how the workshop participants rate the importance of educational activities for the classroom as a NEWEST component. The chi-square statistical test, at the 0.5 level, showed no significant relationships exist between these categories.

Table 23 shows the data reflecting a relationship between gender, years of teaching experience, and current teaching level and how the workshop participants rate the importance of announcements of NASA educational products and services as a NEWEST component. The chi-square statistical test, at the 0.5 level, showed no significant relationships exist between these categories.

Table 24 shows the data reflecting a relationship between gender, years of teaching experience, and current teaching level and how the workshop participants rate the

TABLE 21

CHI-SQUARE VALUES REFLECTING RELATIONSHIP BETWEEN DEMOGRAPHIC CHARACTERISTICS AND HOW WORKSHOP PARTICIPANTS RATE THE IMPORTANCE OF INFORMATION ABOUT CURRENT NASA PROJECTS AS A NEWEST COMPONENT

Dem. Char.	Very Imp.	Some-what Imp.	Imp.	Not Very Imp.	Not Imp.	DF	Value	Prob.	Lev. of Sig.
Gender									
Female	28*	5	4	1	0				
						3	1.154	0.764	N.S.
Male	4	0	1	0	0				
Years Teach. Exp.									
0-5	0	0	0	0	0				
6-7	2	0	1	0	0				
8-10	5	0	0	0	0				
						12	11.265	0.506	N.S.
11-15	8	1	2	1	0				
16-20	7	0	0	0	0				
20+	10	4	2	0	0				
Cur. Teach. Level									
K-4	18	5	2	0	0				
						3	5.689	0.128	N.S.
5-8	13	0	3	1	0				
9-12	0	0	0	0	0				

*Data Reported As Frequency

TABLE 22

CHI-SQUARE VALUES REFLECTING RELATIONSHIP BETWEEN DEMOGRAPHIC CHARACTERISTICS AND HOW WORKSHOP PARTICIPANTS RATE THE IMPORTANCE OF EDUCATIONAL ACTIVITIES FOR THE CLASSROOM AS A NEWEST COMPONENT

Dem. Char.	Very Imp.	Some-what Imp.	Imp.	Not Very Imp.	Not Imp.	DF	Value	Prob.	Lev. of Sig.
Gender									
Female	35*	1	1	1	0				
						3	3.200	0.362	N.S.
Male	4	1	0	0	0				
Years Teach. Exp.									
0-5	0	0	0	0	0				
6-7	3	0	0	0	0				
8-10	4	1	0	0	0				
						12	9.057	0.698	N.S.
11-15	10	0	1	1	0				
16-20	7	0	0	0	0				
20+	15	1	0	0	0				
Cur. Teach. Level									
K-4	23	1	1	0	0				
						3	2.835	0.418	N.S.
5-8	16	0	0	1	0				
9-12	0	0	0	0	0				

*Data Reported As Frequency

TABLE 23

CHI-SQUARE VALUES REFLECTING RELATIONSHIP BETWEEN DEMOGRAPHIC CHARACTERISTICS AND HOW WORKSHOP PARTICIPANTS RATE THE IMPORTANCE ANNOUNCEMENTS OF NASA EDUCATIONAL PRODUCTS AND SERVICES AS A NEWEST COMPONENT

Dem. Char.	Very Imp.	Some-what Imp.	Imp.	Not Very Imp.	Not Imp.	DF	Value	Prob.	Lev. of Sig.
Gender									
Female	18*	12	8	0	0				
						2	2.127	0.345	N.S.
Male	2	3	0	0	0				
Years Teach. Exp.									
0-5	0	0	0	0	0				
6-7	0	2	1	0	0				
8-10	4	1	0	0	0				
						8	8.379	0.397	N.S.
11-15	5	4	3	0	0				
16-20	5	2	0	0	0				
20+	6	6	4	0	0				
Cur. Teach. Level									
K-4	11	10	4	0	0				
						2	0.640	0.726	N.S.
5-8	8	5	4	0	0				
9-12	0	0	0	0	0				

*Data Reported As Frequency

TABLE 24

CHI-SQUARE VALUES REFLECTING RELATIONSHIP BETWEEN DEMOGRAPHIC CHARACTERISTICS AND HOW WORKSHOP PARTICIPANTS RATE THE IMPORTANCE OF FIELD TRIPS AS A NEWEST COMPONENT

Dem. Char.	Very Imp.	Some-what Imp.	Imp.	Not Very Imp.	Not Imp.	DF	Value	Prob.	Lev. of Sig.
Gender									
Female	23*	6	6	2	0				
						3	4.257	0.235	N.S.
Male	1	2	2	0	0				
Years Teach. Exp.									
0-5	0	0	0	0	0				
6-7	1	1	1	0	0				
8-10	4	1	0	0	0				
						12	13.183	0.356	N.S.
11-15	5	3	4	0	0				
16-20	7	0	0	0	0				
20+	7	3	3	2	0				
Cur. Teach. Level									
K-4	12	6	5	2	0				
						3	2.698	0.441	N.S.
5-8	11	2	3	0	0				
9-12	0	0	0	0	0				

*Data Reported As Frequency

importance of field trips as a NEWEST component. The chi-square statistical test, at the 0.5 level, showed no significant relationships exist between these categories.

Table 25 shows the data reflecting a relationship between gender, years of teaching experience, and current teaching level and how the workshop participants rate the importance of the ability to interact with scientists as a NEWEST component. The chi-square statistical test, at the 0.5 level, showed no significant relationships exist between these categories.

Table 26 shows the data reflecting a relationship between gender, years of teaching experience, and current teaching level and how the participants rate the importance of the ability to interact with other educators as a NEWEST component. The chi-square statistical test, at the 0.5 level, showed no significant relationships exist between these categories.

In summary, this chapter has given the results of the study. Data were presented according to the research questions listed in Chapter I. The data for research questions one through six were presented using frequencies and percentages of workshop participants' responses to items on the survey which are directly related to each research question. The frequencies and percentages were concerned with:

1. the demographic characteristics of the NEWEST workshop participants.
2. the incorporation of NEWEST concepts and subject matter into the workshop participants' classroom instruction. Examples of this incorporation were given.
3. the incorporation of NEWEST student hands-on aerospace education activities into the workshop participants' classroom instruction. Examples

TABLE 25

CHI-SQUARE VALUES REFLECTING RELATIONSHIP BETWEEN DEMOGRAPHIC CHARACTERISTICS AND HOW WORKSHOP PARTICIPANTS RATE THE IMPORTANCE OF THE ABILITY TO INTERACT WITH SCIENTISTS AS A NEWEST COMPONENT

Dem. Char.	Very Imp.	Some-what Imp.	Imp.	Not Very Imp.	Not Imp.	DF	Value	Prob.	Lev. of Sig.
Gender									
Female	23*	10	5	0	0	2	0.955	0.620	N.S.
Male	3	2	0	0	0				
Years Teach. Exp.									
0-5	0	0	0	0	0	8	14.012	0.081	N.S.
6-7	0	3	0	0	0				
8-10	4	1	0	0	0				
11-15	7	4	1	0	0				
16-20	6	1	0	0	0				
20+	9	3	4	0	0				
Cur. Teach. Level									
K-4	14	6	5	0	0	2	3.981	0.137	N.S.
5-8	11	6	0	0	0				
9-12	0	0	0	0	0				

*Data Reported As Frequency

TABLE 26

CHI-SQUARE VALUES REFLECTING RELATIONSHIP BETWEEN DEMOGRAPHIC CHARACTERISTICS AND HOW WORKSHOP PARTICIPANTS RATE THE IMPORTANCE OF THE ABILITY TO INTERACT WITH OTHER EDUCATORS AS A NEWEST COMPONENT

Dem. Char.	Very Imp.	Some-what Imp.	Imp.	Not Very Imp.	Not Imp.	DF	Value	Prob.	Lev. of Sig.
Gender									
Female	30*	6	2	0	0				
						2	0.312	0.856	N.S.
Male	4	1	0	0	0				
Years Teach. Exp.									
0-5	0	0	0	0	0				
6-7	3	0	0	0	0				
8-10	4	1	0	0	0				
						8	10.301	0.245	N.S.
11-15	9	1	2	0	0				
16-20	7	0	0	0	0				
20+	11	5	0	0	0				
Cur. Teach. Level									
K-4	19	4	2	0	0				
						2	1.428	0.490	N.S.
5-8	14	3	0	0	0				
9-12	0	0	0	0	0				

*Data Reported As Frequency

of this incorporation were given.

4. workshop participants giving special assignments to their students after attending NEWEST.
5. the use of the NEWEST concepts, subject matter, and activities outside the workshop participants' classroom. Examples of this use were given.
6. the rating of the importance of the following six components of the NEWEST workshop in terms of the participants' professional development: (a) information about current NASA projects, (b) educational activities for the classroom, (c) announcements of NASA educational products and services, (d) field trips, (e) the ability to interact with scientists, and (f) the ability to interact with other educators.

The chi-square statistical test was used to answer research question seven which is found in Chapter I. It was used to determine the relationships between the participants' demographic characteristics of gender, years of teaching experience, and current teaching level and:

1. the incorporation of NEWEST concepts and subject matter into the workshop participants' classroom instruction.
2. the incorporation of NEWEST student hands-on aerospace education activities into the workshop participants' classroom instruction.
3. workshop participants giving special assignments to their students after attending NEWEST.
4. the use of the NEWEST concepts, subject matter, and activities outside the workshop participants' classroom.

6. the rating of the importance of the following six components of the NEWEST workshop in terms of the participants' professional development: (a) information about current NASA projects, (b) educational activities for the classroom, (c) announcements of NASA educational products and services, (d) field trips, (e) the ability to interact with scientists, and (f) the ability to interact with other educators.

CHAPTER V

SUMMARY, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of this study was to determine the degree to which participants, who were assigned to the NASA Langley Research Center, during the summers of 1993 through 1995, make use of aerospace concepts, subject matter, and activities, presented in the NEWEST workshop, in their professional communities.

The subjects of this study were all seventy-five NEWEST participants, from 1993 to 1995, who were assigned to the NASA Langley Research Center. The NEWEST workshops were conducted during the summers of 1993, 1994, and 1995. The participants were located across the United States. They represented public and private schools in both rural and urban settings.

Data was collected by a survey which was mailed to each participant. The survey was designed to collect demographic information and determine the utilization of aerospace concepts, subject matter, and activities by the former NEWEST workshop participants. The approved survey consisted of nineteen items.

The first ten items gathered data concerning the demographic characteristics of the workshop participants. These included gender, number of years teaching experience, current teaching level, average number students per class, number of pupils in the school, highest college degree earned, classroom educational staffing, the number of science courses taken prior to attending NEWEST, the number of science courses taken after attending NEWEST, and the number of aerospace workshops attended prior to attending NEWEST.

Items eleven through nineteen gathered data concerning the incorporation of aerospace education concepts, subject matter, and hands-on activities in the classroom, giving students special assignments, the workshop participants' use of the NEWEST concepts, subject matter, and activities outside the classroom, and rating the importance of selected NEWEST components according to the workshop participants' professional growth needs.

Surveys were mailed to 75 participants and 47 were returned. The return rate was 65.3 percent. The returned data was processed using the SAS System. Upon receiving the surveys, the data was coded for computer computation. Frequency counts and percentages were tabulated for each question. Due to the nominal nature of the data, the chi-square statistical test was used, at the 0.5 significance level, to determine relationships between gender, years of teaching experience, and current teaching level and responses to research questions one through six.

The following research questions were discussed:

1. What are the demographic characteristics of the NEWEST participants in terms of gender, years of teaching experience, current teaching level, average

number of students per class, number of pupils in the school, highest degree earned, educational classroom staffing (number of professionals found in the classroom setting), the number of science courses taken prior to workshop participation, the number of science courses taken after attending NEWEST, and the teacher's participation in previous aerospace workshops?

2. How often have NEWEST concepts and subject matter been incorporated into the workshop participants' classroom instruction? What are some examples of incorporating NEWEST concepts and subject matter into the workshop participants' classroom instruction?
3. How often have the workshop participants utilized NEWEST student hands-on activities in their classroom instruction? What are some examples of utilizing NEWEST student hands-on activities in the workshop participants' classroom instruction?
4. How often have NEWEST workshop participants given special assignments to students in their classrooms based on the NEWEST activities?
5. How have the NEWEST participants made use of the NEWEST concepts, subject matter, and activities outside the classroom? What are some examples of the use of NEWEST concepts, subject matter, and activities outside of the workshop participants' classroom?
6. How do NEWEST participants rate the importance of the following six components of the NEWEST workshop in terms of their professional development: (1) information about current NASA projects, (2) educational activities for the classroom, (3) announcements of NASA educational products

and services, (4) field trips, (5) the ability to interact with scientists, and (6) the ability to interact with other educators?

7. Do the workshop participants differ in their responses to research questions one through six when compared on the basis of the following demographic data: (1) gender, (2) years of teaching experience, and (3) current teaching level?

Findings

Based on the results of the study, there was evidence to support the following findings:

1. The majority of the NEWEST workshop participants were female.
2. Over forty percent of the workshop participants had twenty plus years of teaching experience.
3. Over fifty-seven percent of the workshop participants taught at the K-4 level.
4. Most of the workshop participants had between twenty-one and twenty-five students per class.
5. The majority of workshop participants came from schools with student populations of five hundred or greater.
6. Over fifty percent of the workshop participants have earned a master's degree.
7. Over seventy-three percent of the workshop participants are the only teacher in their classroom educational setting.

8. Most workshop participants had taken more science courses prior to attending NEWEST than after attending NEWEST.
9. The NEWEST workshop was the first aerospace workshop attended by 57.5 percent of the participants.
10. Of those incorporating NEWEST aerospace subject matter and concepts, over ninety percent did an average of two or more times per week.
11. The percentage of workshop participants who did not do hands-on activities decreased from 37 percent prior to attending the workshop to 2.4 percent after attending the workshop.
12. Over seventy percent of the workshop participants used hands-on activities at least twice a week after attending NEWEST, compared to approximately nineteen percent who used them before attending NEWEST.
13. The percentage of workshop participants who did not give their students special assignments decreased from 36.4 percent prior to attending the workshop to 11.9 percent after the workshop.
14. Over fifty-six percent of the workshop participants gave their students special assignments at least twice a week after attending NEWEST, compared to approximately thirty-one percent who gave them before attending NEWEST.
15. Over ninety-three percent of the workshop participants have been of assistance to their faculty concerning NEWEST topics.
16. Over seventy-two percent of the workshop participants have participated in community activities concerning NEWEST topics.

17. Over ninety percent of the workshop participants rated the NEWEST component of "educational activities for the classroom" as "very important".
18. Over seventy-nine percent of the workshop participants rated the NEWEST component of "the ability to interact with other educators" as "very important."
19. Over seventy-four percent of the workshop participants rated the NEWEST component of "information about current NASA projects" as "very important".
20. Over sixty percent of the workshop participants rated the NEWEST component of "the ability to interact with scientists" as being "very important".
21. Fifty-seven percent of the workshop participants rated the NEWEST component of "field trips" as being "very important".
22. Over forty-six percent of the workshop participants rated the NEWEST component of "announcements of NASA educational products and services" as being "very important".
23. None of the workshop participants rated any of the NEWEST components as being "not important".
24. There was not a significant relationship between the demographic characteristics of gender, years of teaching, and current teaching level and the incorporation of NEWEST concepts and subject matter into the workshop participants' classroom instruction. This means that the different

categories of participant demographic characteristics responded in a similar fashion.

25. There was not a significant relationship between the demographic characteristics of gender, years of teaching, and current teaching level and the incorporation of NEWEST student hands-on activities in the workshop participants' classroom instruction. This means that the different categories of participant demographic characteristics responded in a similar fashion.

26. There was not a significant relationship between the demographic characteristics of gender, years of teaching, and current teaching level and giving special assignments to students based on the NEWEST activities. This means that the different categories of participant demographic characteristics responded in a similar fashion.

27. There was not a significant relationship between the demographic characteristics of gender, years of teaching, and current teaching level and the workshop participants assisting faculty. This means that the different categories of participant demographic characteristics responded in a similar fashion.

28. There was not a significant relationship between the demographic characteristics of gender, years of teaching, and current teaching level and the use of NEWEST in community activities. This means that the different categories of participant demographic characteristics responded in a similar fashion.

29. There was not a significant relationship between the demographic characteristics of gender, years of teaching, and current teaching level and how workshop participants rated the importance of information about current NASA projects as a NEWEST component. This means that the different categories of participant demographic characteristics responded in a similar fashion.

30. There was not a significant relationship between the demographic characteristics of gender, years of teaching, and current teaching level and how workshop participants rated the importance of educational activities for the classroom as a NEWEST component. This means that the different categories of participant demographic characteristics responded in a similar fashion.

31. There was not a significant relationship between the demographic characteristics of gender, years of teaching, and current teaching level and how workshop participants rated the importance of importance of announcements of NASA educational products and services as a NEWEST component. This means that the different categories of participant demographic characteristics responded in a similar fashion.

32. There was not a significant relationship between the demographic characteristics of gender, years of teaching, and current teaching level and how workshop participants rated the importance of field trips as a NEWEST component. This means that the different categories of participant demographic characteristics responded in a similar fashion.

33. There was not a significant relationship between the demographic characteristics of gender, years of teaching, and current teaching level and how workshop participants rated the importance of the ability to interact with scientists as a NEWEST component. This means that the different categories of participant demographic characteristics responded in a similar fashion.

34. There was not a significant relationship between the demographic characteristics of gender, years of teaching, and current teaching level and how workshop participants rated the importance of the ability to interact with other educators as a NEWEST component. This means that the different categories of participant demographic characteristics responded in a similar fashion.

The NASA Langley NEWEST workshop is a sample of the larger population of NASA's NEWEST workshops. The findings of this study are not generalizable to the other NASA NEWEST workshops because of regional differences in the implementation of the workshops.

The findings of this study are consistent with the findings of other aerospace studies reviewed by the researcher. The demographic profile of this study is consistent with other aerospace studies reviewed by the researcher. Most of the previous aerospace studies did not find a significant relationship between demographic characteristics and selected research questions. It is important to note that even though there were not any significant relationships established by this study, that in itself is significant.

Conclusions

Based on the findings of the study there was evidence to support several conclusions. They are as follows:

- Overall the NEWEST participants rate this teacher enhancement program as very effective as indicated through the positive responses to the study.
- They deemed NEWEST as a very viable teacher enhancement mechanism for their own professional development.
- The findings indicate that NASA's curriculum materials are utilized by these teachers, but more importantly these curriculum materials serve as a means of increasing the nature of hands-on activities in the classroom.
- The NEWEST participants are sharing their workshop experiences with their professional community.

Recommendations

Due to the findings of this study, it is recommended by the author that:

1. NASA continue to fund and support the NEWEST workshop because of the participants' rating as being a very effective teacher enhancement program.
2. NEWEST coordinators actively seek qualified male applicants because students at the elementary level need positive male role models in science. Gender equity in the science classroom is a national issue.

3. NEWEST coordinators continue providing hands-on educational activities for the workshop participants' classroom.
4. NEWEST coordinators continue to stress sharing the experience with others.
5. NEWEST participants continue receiving graduate credit for successfully completing the workshop. This enables teachers to be recognized and respected as they seek professional excellence.
6. Additional long-term follow-up studies on the utilization of aerospace education subject matter, concepts, and hands-on activities by the NEWEST workshop participants should be conducted to further identify how they are used in classroom instruction.
7. The structure of the workshop should continue in its present form while emphasizing more technology activities.

Recommendations for Future Research

1. Determine the degree to which NEWEST participants integrate the aerospace education subject matter, concepts, and hands-on activities into other areas of the curriculum.
2. Compare NEWEST to other NASA supported workshops.
3. Determine the degree of usefulness of materials supplied to NEWEST participants with regard to classroom use.

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APPENDIXES

APPENDIX A

THE 1995 NASA LANGLEY NEWEST

SUMMER WORKSHOP ITINERARY

NASA EDUCATION WORKSHOP FOR ELEMENTARY SCHOOL TEACHERS
SUNDAY, JULY 9, 1995

Theme: NEWEST Orientation - Welcome Reception

4:00 p.m.	NASA Education Overview Langley Education Complex 17 Langley Blvd., B. 1216, Rm. 119	Dr. S. E. Massenberg LaRC, Director of Ed. 45800/MS 400
4:10-4:40	OSU Graduate Credit Application	Richard Adams, Deputy Director Ed. Programs, OSU (202) 453-2991 (FAX) (202) 755-0099
4:40	NEWEST Program Overview • Program Staff Introductions • Program Components and Daily Schedule • Tidewater Area Features	Pete Thomas, Aero. Ed. Specialist 43117 Holly Smith
5:00-5:45	NEWEST Participant Introductions	
6:00	NEWEST Orientation Conclusion	
6:30-8:00	NEWEST Sharing • Visit Hotel Workroom (Comfort Inn)	Dr. Irene Ladd, NSTA NEWEST Coordinator

Updated 7/09/95

NASA EDUCATION WORKSHOP FOR ELEMENTARY SCHOOL TEACHERS
MONDAY, JULY 10, 1995

Theme: Aviation Adventure

7:30-8:00	Briefing at Hotel Workroom during breakfast • Details of day-lunch arrangements • Squadron Assignments • Name Badges • Journals	Irene Ladd Holly Smith
8:00-8:30	Enroute: Patriot Aviation, Inc. Newport News-Williamsburg Airport Newport News, VA 23602	 Wendy Grimm CFI 886-5770
8:30-11:30	Field TRIP: Basic Aeronautics	Wendy Grimm
11:30-12:30	Lunch - Box ($4.00, paid by participant) (Box lunches provided by LaRC cafeteria)	Donis Anders 44910/MS 291
12:30-3:00	Field Trip: General Aviation Orientation	Wendy Grimm
3:00-4:30	Flight in General Aviation aircraft available ($15.00 - Cost paid by NEWEST participant) "agenda will continue for those not flying"	
4:30-5:00	Enroute to NASA LaRC	
5:00-5:30	Debriefing: Journal Entries for day's activities Evaluation of day's activities	Irene Ladd Holly Smith
6:30-8:00	Reception for NEWEST Participants and Staff Pool side or Atrium at Holiday Inn	Irene Ladd

NASA EDUCATION WORKSHOP FOR ELEMENTARY SCHOOL TEACHERS
TUESDAY, JULY 11, 1995

Theme: Dynamics of Flight

8:00-8:45 a.m.	**NEWEST Sharing:** Set up teams 3 South Wight St., B. 1218, Rm. 107 Teams will be assigned squadrons/names Get acquainted and Share impressions of previous day Share impressions with whole group	Holly Smith 44939
8:45-9:00	Break	
9:00-10:05	**Inquiring Minds:** Wings and Things Across the Disciplines (Cooperative integrated activity) Rm. 107	Irene Ladd 44939
10:15-11:00	Simulator Lab (Access list mailed 6/14/95) 24 West Taylor Street, B. 1268A	Sonia Herndon 47494/MS 125B
11:00-11:15	Break	
11:15 - 12:00	**CLASSROOM INQUIRY:** Science of Flt. (Cont.) B. 1218, Rm. 107	Irene Ladd 44939
12:00-1:00	Lunch	
1:00-1:30	**Field Trip:** SD-Spacecraft Dynamics Branch 4B West Taylor Street (B. 1293B)	Bob Miserentino 44318/MS 230
1:45-2:45	**Field Trip:** Wind Tunnel Experiments B. 1216, Rm. 128-129	Maria Hudgins Murray Ritter
2:45-3:00	Break	
3:15-3:45	**Field Trip:** ADYD-Subsonic Aerodynamics Br. 17 West Taylor Street (B. 1212) 14' X 22'	Frank Quinto 45068/MS 286
4:00-4:45	**CLASSROOM INQUIRY:** What's a Portfolio? Authentic Assessment for hands-on, minds-on activities: Sample of student portfolios for review Sample Professional Portfolio for review Designing NEWEST Portfolio Model Rm. 107	Irene Ladd 44939
4:45-5:00	**Reflection:** Evaluation	Holly Smith

NASA EDUCATION WORKSHOP FOR ELEMENTARY SCHOOL TEACHERS
TUESDAY, JULY 11, 1995 (Cont.)

7:00-9:00 p.m.	**Optional Evening Activities** in Hotel Workroom • Review software available to explore • Begin discussing/planning projects for graduate credit/grade and what needs to be completed • Computers available to begin working on projects or explorative activities: Flight Simulator Animation/Macromedia Logo, LEGO Logo, Other	Irene Ladd
8:30-10:00	Star & Moon gazing (Best moon phase is in)	Bob Mack ?

NASA EDUCATION WORKSHOP FOR ELEMENTARY SCHOOL TEACHERS
WEDNESDAY, JULY 12, 1995

Theme: Aeronautics

8:00-8:45 a.m.	**NEWEST Sharing:** (Preassigned team & Portfolio Review Task) 3 South Wight St., B. 1218, Rm. 107	Holly Smith 44939
8:45-9:30	**INQUIRING MINDS:** Altitude Detectives (Rm. 107)	Irene Ladd 44939
9:30-9:45	Break	
9:45-10:30	**Field Trip:** Hangar Tour Flight Operations & Support Div.	Amy Pierro 46663/MS 255A
10:30-11:00	**Group Picture** at NASA LaRC main Gate **Individual flight suit photos** in hangar B. 1244	Fred Jones 43528/MS 425
11:00-12:30	**CLASSROOM INQUIRY:** Flight activities Rm. 223 & hangar ramp.	Harry Verstynen 43875/MS 255A
12:30-1:30	Lunch	
1:30-2:00	Travel to Virginia Air and Space Center (VASC)	
2:15-3:00	**VASC** General Tour Overview (Tickets provided by OEd CEPO, M. Canright)	Danielle Kutchins Pub. Prog. Mgr. 727-0900 X780
3:00-3:30	NASA Langley Teacher Resource Center (TRC) Overview	Melodie Griffin TRC Coord.
3:40-4:00	Depart VASC (Squadrons 2 , 3, 4 & 5)	
3:40-5:00	NASA Langley TRC: Squadron 1 remain for work	Melodie Griffin Holly Smith Irene Ladd
4:00-5:00 p.m.	**Reflection: Portfolio Work** 17 Langley Blvd., B. 1216, MAC Labs - Rm. 114/130	Irene Ladd 48704
7:00-9:00	**Optional Evening Activities** - Hotel Workroom • Flight Simulator available to explore • Computers available to work at hotel • Planning time for project for graduate credit-explore/share ideas	Irene Ladd

NASA EDUCATION WORKSHOP FOR ELEMENTARY SCHOOL TEACHERS
THURSDAY, JULY 13, 1995

Theme: Educational Technology

8:00-8:45	**NEWEST Sharing** (Cooperative teams share portfolios) 3 South Wight St., B. 1218, Rm. 107	Holly Smith 44939
9:00-10:30	**VITS: NSTA/NASA** Connection • Grace Beck, Director, Space, Sci & Technology Division, NSTA • Chief, Elem. & Secondary Education, NASA • Larry Bilbrough, Aerospace Ed. Services Project Officer, NASA • Marilyn Hala, NCTM • Jane Day & Janice Lair - ITEA • Astronaut - Jean-Francois Clervoy, ESA • Linda Heller - NSTA/SSIP • Stanley Jones - NASA HQ • Janine Jones - NSTA	Mary Kosanke 46739/MS 282
10:30-10:45	Travel to 17 Langley Blvd., Bldg. 1216, MAC Labs, Rm. 114 & Rm. 130	
11:00-12:00	**INTERACTIVE DIMENSIONS** • NASA Technology outreach - Educators Video Conferences - SpaceLink	Larry Gilbert AESP/OSU 48704
12:00-1:00	Lunch, On Your Own	
1:00-3:00	**INTERACTIVE DIMENSIONS - continued** Session I: Hands on with SpaceLink (get teachers set up and explore) Session II: Demonstrations & hands on with Electronic Instruction - LCD/overhead w/computer - Laser Disk exploration - Exploring CD programs - Importing photos	Gretchen Gottlich 42303/MS
3:15-4:00	**Classroom Inquiry:** Will it move? Programming Robotics A Smathtec (Science, Mathematics Technology Problem)	Irene Ladd
3:30-3:45	Break, Squadron 2 depart for VASC	Holly Smith
4:00-5:00	**Reflection: Portfolio Work** - Evaluation Mac Lab, Rm. 114 & Rm. 130	Irene Ladd 48704
4:00-5:00	NASA Langley TRC: Squadron 2	Melodie Griffin
7:00-9:00	**Optional Evening Activities** - Hotel Workroom • Work on projects • Explore technology presented today (SpaceLink, Electronic Instruction, Logo & Robotics)	Irene Ladd

NASA EDUCATION WORKSHOP FOR ELEMENTARY SCHOOL TEACHERS
FRIDAY, JULY 14, 1995

Theme: Reach for the Moon

8:00-8:45 a.m.	**NEWEST Sharing** (Cooperative teams share portfolios) 3 South Wight St., B. 1218, Rm. 107	Holly Smith 44939
8:45-9:00	Break	
9:00-9:45	**Inquiring Minds:** Moon Quest Moon Mapping Race to the Moon Observing & charting the Moon Homemade telescope for a closer look Rm. 107	Irene Ladd 44939
9:45-10:00	Break	
10:00-11:00	**LECTURE:** "Possible origins and future of the Moon" Rm. 107	Bob Mack 45988/MS 248
11:00-11:15	Break	
11:15-12:00	Lunar Certification: Rm. 107	Larry Gilbert AESP/44939
12:00-1:00	Lunch on your own	
1:15-2:30	Art & Science of Motorless Flight (Glider Orientation), Rm. 107	Dr. Mamad Takallu 47671/MS 286
2:30-2:45	Break	
2:45-3:45	**CLASSROOM INQUIRY:** Logo Mathematics (Plotting and charting with X & Y coordinates KASA Model for Kids) Rm. 107	Irene Ladd 44939
3:30-4:00	Depart for VASC - Squadron 3	Holly Smith
3:30-3:45	**Reflection : Portfolio Work:** MAC Labs Rm. 114/130	Irene Ladd
4:00-5:00	NASA Langley TRC: Squadron 3	Melodie Griffin
7:00-9:00	**Optional Evening Activities** - Hotel Workroom • Computer available for work • A fun but messy activity: Make an astronaut in full suit to take home	Irene Ladd

NASA EDUCATION WORKSHOP FOR ELEMENTARY SCHOOL TEACHERS
SATURDAY, JULY 15, 1995
(OPTIONAL)

Theme: High Flyers

9:00 a.m.	Depart Hotel for "Virginia Soaring", Emporia, VA	
9:00 - 5:00	VASC (NASA Langley TRC open, call 727-0900 Ext. 757)	
11:00 a.m. - 3 :00 p.m.	Soaring Experience (Rain date 7/16/95) (Estimate $5.00/ride)	Dr. Mamad Takallu 47671/MS 286

SUNDAY, JULY 16, 1995
(OPTIONAL)

Theme: Shootin' the Breeze in Tidewater
NOTE: Must have a group to use van for one of the following trips and a preapproved driver whose name has been submitted to the rental company for driving the vans.

Take in the day up at **Colonial Williamsburg.** While in the area, visit **Jamestown Festival Park** and **Jamestown Island.** Tour the **Yorktown Visitor Center** and dine at the famous Nick's Seafood Restaurant.

or

Begin the day with a Champagne Brunch (11:30 a.m.) at the **Chamberlin Hotel** on Fort Monroe (Hampton) followed by a Hampton Roads (Boat) Cruise and a visit to the **Virginia Living** and **Mariners' Museums**, located in Newport News.

or

Spend the day on the South side. Visit **Virginia Beach & the VA Marine Science Museum.** At the Waterside (Norfolk), take a ferry from Waterside (approx. 50 cents) over to **Portside** (Portsmouth) and visit the historic district. Visit the Tidewater's latest attraction **Nauticus**, The National Maritime Center, One Waterside Drive, Norfolk, VA 23514 (441-1852).

NASA EDUCATION WORKSHOP FOR ELEMENTARY SCHOOL TEACHERS
MONDAY, JULY 17, 1995

Theme: Cooperative Engineering

8:00-8:30	**NEWEST Sharing** (Cooperative teams share portfolios) 3 South Wight St., B. 1218, Rm. 107	Holly Smith 44939
8:30-8:45	Break	
8:45-10:00	**Inquiring Minds:** Experimental Design-A Process Rm. 107	Irene Ladd 44939
10:00-10:15	Break	
10:15-12:00	**INTERACTIVE ACTIVITY:** Kites in the Classroom Dunton Rm. 107	Charles & Joan 47222/MS 437
12:00-1:00	Box lunches ($4.00 from LaRC cafeteria) Fly Kites, adjacent to Reid Conf Ctr.	
1:00-2:15	**INTERACTIVE ACTIVITY:** Hot Air Balloons 14 Langley Blvd., Langley Rm.	Pete Thomas Holly Smith
2:15-3:00	**LAUNCH TIME:** Hot Air Balloons 14 Langley Blvd., B. 1222 Auditorium	Pete Thomas
3:00-3:15	Return to 3 South Wight St., B. 1218, Rm. 107	
3:15-4:00	**Classroom Inquiry:** Lighter Than Air Rm. 107	Irene Ladd 44939
3:15-3:45	Depart for VASC - Squadron 4	Holly Smith
3:45-5:00	NASA Langley TRC: Squadron 4	Melodie Griffin
4:00-5:00	**Reflection: Portfolio Work** 17 Langley Blvd., B.1216, Rms. 114/130 (MAC Labs)	Irene Ladd 48704
7:00-9:00	**Optional Evening Activities** - Hotel Workroom • Technology exploration • SpaceLink exploration • Work on projects for graduate credit	Irene Ladd

NASA EDUCATION WORKSHOP FOR ELEMENTARY SCHOOL TEACHERS
TUESDAY, JULY 18, 1995

Theme: Astronomy

8:00-8:45 a.m.	**NEWEST Sharing** (Coop. teams share portfolio work) 3 South Wight St., B. 1218, Rm. 107 Business: Identify # of boxes wanted for shipping ed. materials Cost per pound vs. UPS Have boxes ready for shipping Thurs. Will take small groups to ship their boxes at own expense.	Irene Ladd 44939
8:45-9:00	Break	
9:00-9:45	**INQUIRING MINDS:** The Mystery of Light Rm. 107	Irene Ladd 44939
10:00-11:00	**INQUIRING MINDS:** "Non-intrusive laser measurements using holography" Rm. 107	Tony Humphries 44601/MS 235A
11:00-11:15	Break	
11:15-12:00	**INQUIRING MINDS:** A Precious Star-our Sun (Sun tracking, observing power, relationship with Earth, Star Clusters) Rm. 107	Irene Ladd 44939
12:15-1:00	Lunch on own	
1:00-2:30	**INQUIRING MINDS:** Small Stuff in Space • Create a meteor and observe behavior • Ellipses and Earth Sun Relationships (create models) • Orbits of meteorites Rm. 107	Irene Ladd 44939
2:30-2:45	Break	
2:45-3:45	KASA-Kids Aerospace, Simulation Activities (Designing an integrated model), Rm. 107	Irene Ladd 44939
3:45-4:00	Depart for VASC - Squadron 5	Holly Smith
4:00-5:00	**Reflection: Portfolio Work** 17 Langley Blvd., B.1216, Rms. 114/130(MAC Labs)	Irene Ladd 48704
4:00-5:00	NASA Langley TRC: Squadron 5	Melodie Griffin
7:00-9:00	**Optional Evening Activities** - Hotel Workroom • Wonder Log and Evaluation to Squadron 5 • Work on projects/reports • Explore technology	Irene Ladd

NASA EDUCATION WORKSHOP FOR ELEMENTARY SCHOOL TEACHERS
WEDNESDAY, JULY 19, 1995

Theme: Space Exploration Initiatives

8:00-8:45	**NEWEST Sharing** (Coop. team sharing Portfolio work) 3 South Wight St., B. 1218, Rm. 107 Take group to mail boxes	Irene Ladd 44939
8:45-9:00	Break	
9:00-9:45	**INQUIRING MINDS:** A Look into Space (With Activities, Telescope and models of deep space probes) Rm. 107	Irene Ladd 44939
9:45-10:00	Break	
10:15-10:45	**Field TRIP:** MD-Composites & Polymers Br. 6A West Taylor Street (B. 1293A)	Bert Cano 43951/MS 226
10:45-11:00	Break	
11:00-12:30	**CLASSROOM INQUIRY:** Model Rockets B. 1218, Rm. 107	Dave Shuster Dick Winning 43336/MS 459
12:30-1:30	Lunch on own	
1:30-2:00	**Field TRIP:** FD-Aerospace Models Section 3B East Durand Street (Bldg. 1238B)	Ellwood Peele 45477/MS 385
2:00-2:30	**Field TRIP:** FD-Electronics Technology Branch 1 East Durand Street (Bldg. 1238)	Stewart Harris 45439/MS 399
2:30-2:45	Break	
2:45-3:15	**Field TRIP:** SD-Landing and Impact Dynamics Br. 2 West Bush Road (Bldg. 1262)	John Tanner 41305/MS 497
3:30-3:45	Break	
3:45-4:45	**Reflection: Portfolio Work** 17 Langley Blvd., B.1216, Rms. 114/130 (MAC Labs)	Irene Ladd 48704
5:00-6:00	**Interactive Activity:** Launch Rockets Travel to Potential Hazardous Test Facility 10 Hunsaker Loop	David Shuster Dick Winning Holly Smith
7:00-9:00	**Optional Evening Activities** - Hotel Workroom • Computer activities/exploration • Work on projects/report for graduate work	Irene Ladd

NASA EDUCATION WORKSHOP FOR ELEMENTARY SCHOOL TEACHERS
THURSDAY, JULY 20, 1995

Theme: Mission To Planet Earth

8:00-8:45 a.m.	**NEWEST Sharing:** (Coop. team sharing Portfolio work) 3 South Wight St., B. 1218, Rm. 107 Take group to mail boxes or UPS them	Holly Smith 44939
8:45-9:30	**INQUIRING MINDS:** Research Design Rm. 107	Irene Ladd 44939
9:30-9:45	Break	
9:45-10:30	**INQUIRING MINDS:** Global Atmospheric Research Topic: Satellite Imagery and Analysis, Rm. 107	Cathy Watson 46122/MS 115
10:30-10:45	Break	
10:45-11:30	**INQUIRING MINDS:** Global Atmospheric Research Topic: Global Tropospheric Experiment B. 1250, Rm. 118	Dr. Jack Fishman 42720/MS 401A
11:30-11:45	Break	
11:45-12:30	**CLASSROOM INQUIRY:** Looking Back at EARTH B. 1218, Rm. 107	Irene Ladd 44939
12:30-1:30	Lunch on own	
1:30-2:15	**Field TRIP:** Mission EarthBound B. 1218, Rm. 107	Bill Orton 259-5989
2:15-2:30	Break	
2:30-3:15	**CLASSROOM INQUIRY:** Sim. Earth-Create your own Environment	Irene Ladd 44939
3:15-3:30	Break	
3:30-4:30	**Field TRIP:** Exploration of Mars Rm. 107	Cary Spitzer 221-8031
4:40-5:30	**Reflection: Portfolio Work** Evaluation, Mac Labs - Rms. 114/130	Irene Ladd 48704
7:00-9:00	**Optional Evening Activities** - Hotel Workroom • Explore Sim. Earth • Explore Hypercard activities for teachers/students • Work on projects/reports	

NASA EDUCATION WORKSHOP FOR ELEMENTARY SCHOOL TEACHERS
FRIDAY, JULY 21, 1995

Theme: Launching Learning with the Standards

8:00-8:30	**NEWEST Sharing** (Cooperative groups share Portfolios) 3 South Wight St., B. 1218, Rm. 107	Holly Smith 44939
8:30-9:15	**NEWEST Reception** Recognition of Presenters Rm. 107	Pete Thomas Holly Smith Irene Ladd
9:15-9:30	Break	
9:30-10:15	**INQUIRING MINDS:** Thematic Unit-A Design Process (Activity implementing begining steps), Rm. 107	Irene Ladd
10:15-10:30	Break	
10:30-12:00	**CLASSROOM INQUIRY:** A unit to Launch the Stds (Walk through steps and create unit. Unit will be devel. from something presented during two week program) Rm. 107	Irene Ladd 44939
12:00-1:00	Lunch on own	
1:00-4:00	**Project Presentations:** Teams or Individuals Share Projects, These will be scheduled during conferences with participants during Portfolio Work Periods. Rm. 107.	Irene Ladd 44939
4:00-5:00	**Debriefing:** Program Wrap Up Teams Share Portfolios Each individual prepares final portfolio for submission, Program Evaluation Mac Lab. Rm. 107.	Pete Thomas 44939
6:30	NEWEST Dinner Banquet @ 35 total Langley Air Force Base Officer's Club "Open Mess" Seafood buffet Guests: To be announced.	Pete Thomas 766-1361

APPENDIX B

OSU INSTITUTIONAL REVIEW

BOARD APPROVAL FORM

OKLAHOMA STATE UNIVERSITY
INSTITUTIONAL REVIEW BOARD
HUMAN SUBJECTS REVIEW

Date: 02-07-96 **IRB#:** ED-96-073

Proposal Title: THE UTILIZATION OF AEROSPACE CONCEPTS, SUBJECT MATTER, AND ACTIVITIES BY ELEMENTARY TEACHERS

Principal Investigator(s): Steven K. Marks, Stanley P. Jones

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.
APPROVAL STATUS PERIOD VALID FOR ONE CALENDAR YEAR 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.

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

Signature:  Date: February 9, 1996

Chair of Institutional Review Board

APPENDIX C

SURVEY COVER LETTER

National
Aeronautics and
Space
Administration

Aerospace Education Services Program

300 Cordell North
Oklahoma State University
Stillwater, Oklahoma 74078-8034
(405) 744-7015
Fax (405) 744-7785

March 1, 1996

Dear Former NEWEST Participant:

For the past five years, Oklahoma State University has provided graduate credit for NASA NEWEST workshop participants. Your participation is requested in a study to aid us in better understanding the characteristics of the NASA NEWEST workshop. Your response to the enclosed short survey will assist us in developing specific assessment plans for future NEWEST workshops.

As a former NEWEST participant, you are asked to fill out the survey to the best of your knowledge. The survey should require no more than 15 minutes of your time. After you have filled out the survey, please return the survey immediately in the addressed and stamped envelope and also return the enclosed addressed and stamped postcard.

The postcard has been coded for follow-up purposes only. The surveys will be removed from the envelopes and placed in a closed box. All the envelopes will be destroyed before the survey responses are read. Therefore, anonymity is assured.

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

Sincerely,

Kenneth E. Wiggins
Director

KEW:law

Enclosure

APPENDIX D

SURVEY INSTRUMENT

Oklahoma State University
Department of Aviation and Space Education

To aid us in better understanding the characteristics of the NEWEST workshop, please respond to all of the statements or questions to the best of your knowledge. Some questions are such that you circle the letter corresponding to your response, while others offer you the opportunity to give examples of your unique experiences. Please do not include your name on the survey. Thank you for taking the time to respond to the survey.

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

2. My number of years teaching experience is:
   a. 0-5
   b. 6-7
   c. 8-10
   d. 11-15
   e. 16-20
   f. 20+

3. My current teaching level is:
   a. K-4
   b. 5-8
   c. 9-12

4. The average number of students per each of my classes is:
   a. 1-15
   b. 16-20
   c. 21-25
   d. 26-30
   e. 31-35
   f. 35 or more

5. The number of pupils in my school is:
   a. less than 250
   b. 251 - 500
   c. 501 - 750
   d. 751 - 1000
   e. more than 1000

6. My highest college degree earned is:
   a. Bachelor's
   b. Master's
   c. Specialist
   d. Doctorate

7. My classroom educational staffing (e.g. degreed teacher, teacher's aide, teacher's assistant) includes:
   a. only myself
   b. one other person
   c. two other persons
   d. three other persons
   e. more than three other persons

8. Prior to attending NEWEST, the number of science courses (e.g. biology, chemistry, physics, geology, earth science, astronomy, meteorology, oceanography, physical science, etc.) I completed was:
   a. zero
   b. 1 - 2
   c. 3 - 4
   d. 5 - 6
   e. more than 6

9. The number of science courses (e.g. biology, chemistry, physics, geology, earth science, astronomy, meteorology, oceanography, physical science, etc.) I have taken since my participation in the NEWEST workshop is:
   a. zero
   b. 1 - 2
   c. 3 - 4
   d. 5 - 6
   e. more than 6

10. The number of aerospace workshops I attended prior to attending NEWEST was:
   a. zero
   b. 1
   c. 2
   d. 3
   e. 4
   f. 5 or more

11. To the best of my recollection, I incorporated aerospace education concepts and subject matter in my classroom instruction prior to attending NEWEST on an average of:
   a. zero 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

12. I am incorporating NEWEST aerospace education concepts and subject matter in my classroom on an average of:
   a. zero 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

Examples of incorporating NEWEST aerospace education concepts and subject matter in my classroom instruction are:

_____

_____

_____

_____

13. To the best of my recollection, I incorporated student hands-on aerospace education activities in my classroom prior to attending NEWEST on an average of :
    a. zero 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

14. I am incorporating NEWEST student hands-on aerospace education activities (e.g. Mission to Planet Earth, aeronautics, human exploration and development of space, space science, and space technology) in my classroom instruction on an average of:
    a. zero 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

Examples of incorporating NEWEST student hands-on activities in my classroom instruction are:

_____

_____

_____

_____

15. To the best of my recollection, prior to attending the NEWEST workshop I gave my students special assignments (e. g. reports, laboratory experiments, summary of observations, laboratory reports, etc.) on an average of:
    a. zero 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 attending the NEWEST workshop I give my students special assignments (e.g. reports, laboratory experiments, summary of observations, laboratory reports, etc.) on an average of:
    a. zero 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. Since my NEWEST experience, I have been of assistance to my faculty concerning NEWEST topics by giving talks or acting as a resource person.
    a. yes
    b. no

    If yes, please give examples.

    _____

    _____

    _____

    _____

18. Since my NEWEST experience, I have participated in community activities concerning NEWEST topics by giving presentations to PTA, civic groups, professional conferences, et cetera?
    a. yes
    b. no

    If yes, please give examples.

    _____

    _____

    _____

    _____

19. Please rate the importance of each of the following NEWEST workshop components according to your professional growth needs, where 1=very important, 2=somewhat important, 3=important, 4=not very important, and 5=not important.

    _____ information about current NASA projects

    _____ educational activities for the classroom

    _____ announcements of NASA educational products and services

    _____ field trips

    _____ the ability to interact with scientists

    _____ the ability to interact with other educators

Thank You

APPENDIX E

CODED POSTCARD

RECEIVED
MAR 1 1 1996
Aviation & Space Education

PM
06 MAR
1996

Dr. Kenneth Wiggins
300 Cordell North
Oklahoma State University
Stillwater, OK 74078-8034

Please drop this postcard in the mail when you return your completed survey.

Thanks!

93211

APPENDIX F

FOLLOW-UP LETTER

National
Aeronautics and
Space
Administration

Aerospace Education Services Program

300 Cordell North
Oklahoma State University
Stillwater, Oklahoma 74078-8034
(405) 744-7015
Fax (405) 744-7785

March 26, 1996

Dear Former NEWEST Participant:

On March 1, 1996, you were sent a survey to help us better understand the characteristics of the NASA NEWEST workshop.

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.

Sincerely,

Kenneth E. Wiggins
Director

KEW:law

VITA

Stanley Poindexter Jones

Candidate for the Degree of

Doctor of Education

Thesis: THE UTILIZATION OF AEROSPACE CONCEPTS, SUBJECT MATTER, AND ACTIVITIES BY ELEMENTARY TEACHERS

Major Field: Applied Educational Studies

Biographical:

Personal Data: Born in South Hill, Virginia, July 24, 1956, the son of Howard Alphonso, Sr. and Ida Pearl Jones.

Education: Graduated from Brunswick Senior High School, Lawrenceville, Virginia in 1974; received the Bachelor of Science degree from Virginia State University, Petersburg, Virginia, with a major in Biology in May, 1977; received the Master of Science degree from Oklahoma State University, Stillwater, Oklahoma, with a major in Natural and Applied Science in May, 1993. Completed the requirements for the Doctor of Education degree at Oklahoma State University in May, 1997.

Professional Experience: High school mathematics teacher at Ferguson High School, Newport News, Virginia, 1978-1980; high school science teacher at Denbigh High School, Newport News, Virginia, 1978-1981; middle school science teacher at Hines Middle School, Newport News, Virginia, 1981-1984; high school science teacher at Denbigh High School, Newport News, Virginia, 1984-1988; Aerospace Education Specialist, Oklahoma State University, Stillwater, Oklahoma, 1988 to present.

Professional Memberships: Association for Supervision and Curriculum Development, Engineering Society of the Virginia Peninsula, International Technology Education Association, National Alliance of Black School Educators, National Council of Teachers of Mathematics, National Science Teachers Association, National Space Society, National Technical Association.