# AEROSPACE CURRICULUM AND INSTRUCTION UTILIZATION AFTER THE COMPLETION OF AN AEROSPACE EDUCATION WORKSHOP IN WHICH NASA PARTICIPATED

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PREFACE

The concern of this study has been to investigate the utilization of aerospace curriculum and instruction by educators at the completion of an aerospace education workshop.

To the following people who have contributed to the completion of this study, I would like to express my sincere appreciation:

To Dr. Kenneth E. Wiggins, Chairman of my committee, for his enthusiasm, interest, expert advice, and patient counsel which made this task an educational as well as a rewarding experience;

To the other committee members, Dr. Kenneth St. Clair, Dr. L. Herbert Bruneau, and Dr. Alex Ross, for their valuable counsel and direction they provided to the study;

To Leslie and Lucille Marks, my parents, who at all times lived an example for me to follow; and

To my wife, Jan, whose patience, devotion, and love were invaluable during my educational experiences.

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# CHAPTER I

## NATURE OF THE PROBLEM

### Introduction

During recent years, the educational practitioner has realized that the educational workshop has grown increasingly important as an in-service education arrangement to help teachers refine local educational objectives in the perspective of emerging national goals and translate these objectives into effective classroom programs.[1] These educational workshops are thought to be a group of people working together democratically toward the solution of problems of mutual concern. The outcome of the educational workshop reflects the needs of the individuals, the needs of the group, and the needs of the community.

Since the formation of the earliest educational workshops, the workshop participant has been the key factor in regards to the objectives of the workshop. The educational workshop assures members of the group freedom to work because they are concerned about problems which relate to their interest and community welfare. Because of the problem-solving nature of the educational workshop, the participants achieve a greater degree of maturity, independence, and ability to deal with social and educational problems.[2] The overall characteristic of the educational workshop provides the individual participant with educational problem-solving techniques by:

1. preserving the security of the individual as he abandons old and familiar practices and develops new ones.
2. providing professional knowledge, insight, and skill.
3. enhancing personal and social growth.
4. constructing a group attack on local problems.
5. providing competent specialized assistance when needed.
6. stimulating continuous professional growth.
7. realizing the results of new ideas and new materials are immediately useful in real situations.
8. developing individual confidence and skill in attacking new problems.
9. developing better attitudes of self-evaluation.[3]

The most frequent use of the educational workshop is for the improvement of curriculum and instruction. The purpose of the aerospace workshop is to provide, in a non-technical way, knowledge and understanding that teachers need to interpret to their students the age in which we live.[4] A problem exists within aerospace education in that there are teachers and school administrators who are reluctant to accept the challenges of aerospace education. This implies that there must be a great amount of in-service education to produce a desire in teachers and administrators to gain new knowledge, increase understanding, acquire more desirable attitudes, and to strengthen attitudes towards aerospace education.[5] To produce the desired changes toward aerospace education, training activities have been developed and categorized. The categories for aerospace education training are:

1. Articles, Materials, and Services
2. Short Programs

3. Seminars and Conferences

4. Institutes

5. Extension Courses

6. Workshops

Analysis of these methods showed the workshop method the most satisfactory to achieve the objectives of aerospace education.[6]

As the educational workshop emerged to help teachers refine local educational objectives in line with national goals, the scope of the educational workshop reflected the needs of the individual, the needs of the group, and the needs of the community. To develop aerospace curriculum and instruction, the education workshop was found to be the most satisfactory to achieve aerospace education objectives. With the emphasis placed on the individual participant, the aerospace education workshop can accomplish the objectives of aerospace curriculum and instruction. The nature of the aerospace education workshop implies that an evaluation be made at the completion of the aerospace education workshop and an evaluation after a period of time has elapsed.

As the aerospace workshop developed into a systematic program to improve curriculum and instruction, more emphasis was placed on the nature of the workshop participants. The first emphasis was gathering data on the participant's background. This included sex, years of teaching experience, grade level at which the participant teaches, and duration of the aerospace workshop. Later data-gathering devices showed some of the participant's attitudes towards aerospace instruction. Presently, efforts are being made to show how the participant's background and attitudes relate to instruction in the classroom. This study deals with the participant's background in relationship to

aerospace curriculum and instruction utilization after the completion of an aerospace education workshop in which the National Aeronautics and Space Administration (NASA) participated.

## Statement of the Problem

The general problem is: What are the characteristics of the aerospace education workshop participant in relation to curriculum and instruction utilization after the completion of the workshop in which NASA participated?

The purpose of this study is to describe selected aerospace education workshops across the United States. These workshops were conducted during the summer of 1974, and NASA's Space Science Education Project participated in the selected aerospace workshops. The Space Science Education Workshop Follow-Up Survey was designed to collect data on the background of the participant and the usage of aerospace curriculum and instruction in the participant's classroom. The follow-up survey gathers data on sex, present teaching position, teaching level, duration of aerospace workshop, and visits to NASA facilities. This information leads to the following research questions:

1. What is the use of the aerospace curriculum guide in relation to participant characteristics?
2. What is the incorporation of aerospace concepts in relation to participant characteristics?
3. What amounts of aerospace concepts are being taught in relation to participant characteristics?
4. What is the relation of teaching an aerospace unit to participant characteristics?

5. What is the relation of the workshop content difficulty of NASA's presentation to participant characteristics?
6. What relations exist between developing teaching methods and participant characteristics?
7. What relations exist between continuing an aerospace workshop in the future and participant characteristics?

## Significance of the Study

NASA has been actively engaged in aerospace education workshops throughout the United States since the Space Act was signed in 1958 by Congress. To participate in an aerospace workshop, large sums of money, many hours of planning and preparation, and extensive coordination of manpower are needed to successfully train teachers in aerospace education. Therefore, the nature of the aerospace workshop dictates the need for continuous evaluation and post-workshop evaluation so future aerospace workshops will reflect the needs of the classroom teachers and meet the objectives of NASA and aerospace education.

## Assumptions of the Study

To complete this study, the following assumptions will be made:

1. The participants responded to the questionnaire in honesty.
2. The Space Science Education Workshop Follow-Up Survey is a valid way of describing the use of aerospace education by teachers in the classroom.
3. The returned questionnaires are suitable for data interpretation.

## Limitations of the Study

The subjects of the study are limited to selected aerospace education workshops in which NASA's Space Science Education Project participated. The workshops were selected to obtain a geographic representation of the United States.

## Definition of Terms

Aerospace Education. Aerospace education is that branch of general education concerned with communicating knowledge, skills, and attitudes about aerospace activities and the total impact of air and space vehicles upon society. It must be distinguished from those branches of special education known as aeronautical and/or astronautical education which are concerned with training specialized aerospace workers.[7]

Workshop. The workshop is distinguished by an informal structure; emphasis is on practical problems and on planning which allows participants to do things instead of listening or talking.[8]

Space Science Education Project. The Space Science Education Project is a lecture-demonstration program designed to acquaint the educational community and the general public with the role of the National Aeronautics and Space Administration in the exploration of air and space. This program is administered by the Education Programs Division of the Public Affairs Branch of NASA.

Aerospace Curriculum Guide. The aerospace curriculum guide is a book compiled to assist the educator in the planning of a unit or teaching concepts in aerospace education. The aerospace curriculum guide

used by workshop participants was assembled at the national, state, or local levels. The guide is to be used as a resource to serve teachers at all grade levels and in all subject matter areas. It represents a compilation of space-related information to parallel and reinforce the topics and concepts normally taught.

FOOTNOTES

[1]Marilyn Carrol, "A Word About Workshops," Clearing House, XLI (September, 1966), p. 13.

[2]Committee of Regional Studies and Education, Guide for Resource-Use Education Workshops (Washington, D. C., 1951), pp. 1-5.

[3]Mary A. Rourke and William H. Burton, Workshop for Teachers (New York, 1957), p. 11.

[4]Wilma M. Dolezal, "Aerospace Comes of Age," The Texas Outlook, XLVI (June, 1962), p. 16.

[5]Woodson W. Fishback, "Aerospace and the Curriculum," An Introduction to Aerospace Education, ed. Mervin K. Stricker, Jr. (Chicago, 1968), p. 37.

[6]Raymond J. Johnson, "A Survey of Approaches," An Introduction to Aerospace Education, ed. Mervin K. Stricker, Jr. (Chicago, 1968), pp. 229-236.

[7]Aerospace Education Curriculum Guide [K-12] (Oklahoma City, 1971), p. vi.

[8]Ben M. Harris, Supervisory Behavior in Education (New Jersey, 1963), p. 75.

# CHAPTER II

## REVIEW OF SELECTED LITERATURE

The review of the literature will be discussed in three components. These three components are significant in relation to aerospace education by identifying the rationale, characteristics, and implications of educational workshops. The three components are:

1. History and Development of Educational Workshops
2. Aviation and Aerospace Education for Teachers
3. Involvement of the National Aeronautics and Space Administration (NASA) with Aerospace Education

### History and Development of Educational Workshops

At Ohio State University, in the summer of 1936, teachers in science and mathematics held a six-week seminar to discuss the curriculum and evaluation of the secondary school materials.[1] The direct access to research findings was so successful they decided to expand the idea to the next summer of 1937 and call the meeting a "workshop."[2] This educational workshop was held at Sarah Lawrence College, Bronxville, New York. The leadership was provided by the three commissions of the Progressive Education Association--the Commission of the Relation of School and College, the Commission on the Secondary School Curriculum, and the Commission on Human Relations.[3] This new phase in the professional education of teachers brought 126 teachers from all over the

United States. The requirement for admission was that each individual workshop participant have some definite problem on which he was working at his local school. The method used to provide solutions to participant questions and problems was that of consultation, conference, and small group discussion.[4]

In the summer of 1938, with funds from the General Education Board of the Rockefeller Foundation, educational workshops were organized at Sarah Lawrence College, Bronxville, New York; Colorado Woman's College, Denver, Colorado; and Mills College, Oakland, California.[5] The significant characteristic of the 1938 educational workshops was that there were no formal classes or lecture classes. The needs of the individual student, school, and community determined the program. A staff of consultants, fresh from contact with new developments in evaluation, curriculum, guidance, and the study of adolescents, were on hand to serve as needed.[6] The organizers of the 1938 educational workshops felt the value was a sincere effort to carry out certain fundamental principles that had been neglected in American education. These principles were:

1. Concern for the needs of individual human beings in direct relation to the demands of the community

2. 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 help to achieving educational objectives that grow out of a reasoned philosophy of life in which human welfare and human happiness are placed uppermost[7]

At this point, distinctive traits began to identify the educational workshop which were the basis for future educational workshops. The educational workshop was devoted to individual problems, emphasized group problems, and recognized individual and group approaches in providing possible solutions.[8] The proper educational workshop should last five to six weeks, with three weeks as the minimum.[9] In organizing and conducting an educational workshop, the following phases should be observed:

Phase 1. Identification of a problem

Phase 2. Gathering information

Phase 3. Problem-mounting

Phase 4. Organizing information

Phase 5. Follow-up

Phase 6. Evaluation[10]

As the basic characteristics were identified, specialization began to take place within the curriculum and instructional development. The Michigan Community Health Project was conducted in seven counties in southwestern Michigan and received financial aid from the W. K. Kellogg Foundation.[11] One specialization within this project was science education. In the summer of 1941, a workshop was held in science education which provided opportunities for teachers to develop their own backgrounds in science programs for their schools and to observe exceptional teachers working with children in a laboratory school. The University of Chicago sponsored the educational workshop with Dr. J. Darrell, director, and was held at Hastings, Michigan.[12] Teachers as participants received college credit for attending courses in biological science, physical science, sociology, and library science as part of the

educational workshop.[13] In the 1941 science education workshop, there were 72 total participants. The 63 women and 9 men represented 12 high school teachers, 23 village elementary school teachers, 36 rural elementary school teachers, and one county school commissioner.[14] Admission to this workshop also required the individual participants to have a problem related to science teaching to be worked on at the education workshop. The following is the number of teachers (left) with a particular problem (right) related to science:

| | |
|---|---|
| 22 | To develop background in science teaching |
| 15 | To organize a science course for a rural school |
| 15 | To organize a science program for the early elementary grades |
| 14 | To work out methods for using local environment in science teaching |
| 3 | To develop usable science demonstrations |
| 3 | To make science of more practical value to all high school students |
| 2 | To develop a topical file for science materials |
| 1 | To select a general science textbook |
| 1 | To develop supplementary laboratory activities in high school physics[15] |

Although specialization and proliferation took place among the different types of educational workshops, they retained their basic emphasis and characteristics. The educational workshop meant a place where work was to be accomplished. The emphasis was upon the production of an end result useful to the participants, personal and social development of the participants, and cooperation of group discussion and work

using democratic methods.[16] The educational workshop established a useful tool for teachers of all subject matter areas and has been defined by the following characteristics:

1. The overall purpose must be clearly defined.
2. Activities of the education workshop must be based upon problems, needs, and interests of the participants.
3. Specific problems should be allowed to emerge and be defined without pressure or steering from the instructors.
4. Individuals should form tentative and flexible groups for work.
5. Participants should do the bulk of the work on their own with assistance from staff members on call.
6. Planning and process is cooperative and participatory.
7. Personal and social growth should be fostered.
8. Evaluation is continuous and exercised on products and process, not on persons.
9. Length of the sessions must be adequate.
10. Collection of resource materials of all kinds should be as extensive as finances permit.
11. Instructional staff should represent a wide diversity of personnel.
12. Full-time staff may be based on the ratio of 1 staff to 12-15 participants.
13. Physical facilities should permit varied experiences.[17]

Using the basic characteristics of the educational workshop as a guide, all activities must undergo a continuous analysis and appraisal

by the members. Examination of the plans, procedures, and products implies that the group improves their problem-solving ability.[18] The constant analysis of the educational workshop should be on a daily, weekly, and monthly basis. The evaluation during the educational workshop must take place on three levels.

Level 1. Mechanics and organization

Length of educational workshop

Time of year

Resource materials

Level 2. Process and staff

Advance planning

Availability of resource people

Neglected areas

Activities of most value

Ways of improving the educational workshop

Level 3. Individual growth

Increase in knowledge

Development of usable plans for teaching, classroom, or supervisory work[19]

At the completion of the educational workshop, an evaluation of the entire workshop should be made. The evaluation is:

1. a continuous process.
2. made in terms of clearly-defined objectives.
3. participation by everyone in the educational workshop.
4. projected into the follow-up activities resulting from the educational workshop.
5. a collection of data related to the objectives.

6. interpretation of data in terms of progress toward objectives.
7. re-planning and magnification of the workshop program.[20]

Another evaluation should take place after a certain period of time has elapsed following the educational workshop. Post-educational workshop activities should include:

1. How to implement plans in the local schools.
2. How to arrange periodic visits by staff, consultants, to carry out plans of the educational workshop.
3. How to exchange information between participants.
4. How to obtain periodic reporting by participants.
5. How to adapt to educational workshop techniques.
6. How to use materials to stimulate wider interest in the community.
7. How to use participants as consultants in other educational workshops.[21]

Post-educational workshop evaluation should also give evidence showing the degree to which the participants have:

1. improved their own teaching as a result of the educational workshop.
2. improved and extended their understanding and attitudes.
3. improved their ability to secure pupil interest.
4. increased their willingness and ability to assume responsibility and exercise initiative.
5. increased their insight into basic problems of education.[22]

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. As specialization into specific subject matter areas took place, more emphasis was placed on the involvement of the individual participant. The essence of the evaluation was to make the educational workshop relevant to the teachers' needs and to insure that the individual participants carried the information learned in the educational workshop back to the classroom and the community.

## Aviation and Aerospace Education for Teachers

Before the space age came into existence, aerospace education was classified as aviation education. The earliest-known efforts to recognize the need for the training of teachers in aviation was Finis E. Engleman who taught an aviation course for teachers at the Kansas City, Missouri, Teachers College in the early 1920's.[23] The earliest-recorded large-scale effort in teacher education occurred at New York University during the 1928 School of Education summer session. The summer courses were supported by the Daniel Guggenheim Fund for the promotion of aeronautics. This was significant in that a course was taught specifically for secondary and elementary school teachers to provide a wide background in aeronautical education.[24] In 1928, Dr. William F. Durand, a professor of engineering at Stanford University, while addressing the annual

meeting of the Superintendents of Schools in Boston, Massachusetts, laid the basis for providing in-service training in aviation education. Dr. Durand made the following points in his speech entitled "The Public Needs Aeronautic Education":

1. Aeronautics stands ready to offer to society and to the cause of human progress a service.
2. The public is divided into two classes insofar as aeronautic services are concerned--those who render the service and those who receive the service.
3. Education for those rendering aeronautical service must be technical, professional, and vocational.
4. For the great public at large, those who receive aeronautical service, the education which is significant is that which will permit them to use wisely and sanely the service offered.
5. There must be developed within the body of society at large something of what is implied in the newly-coined word "airmindedness."[25]

The commercial air line industry also realized the need for aviation education to build confidence in their business. In the late 1920's, Earl W. Hill of the University of Southern California was employed by Western Air Express to help work with schools and colleges to understand the impact that aviation was having on education.[26] Under the leadership of Dr. William A. Wheatly, United Air Lines was a pioneer in establishing a program that gave scholarships for the training of teachers and the development and distribution of aviation materials of instruction for pupils and teachers.[27]

Aviation education during the 1930's was that of curriculum development and implementation into course studies. In February of 1930, the Aeronautical Chamber of Commerce, in cooperation with the Daniel Guggenheim Fund Committee on Elementary and Secondary Education, conducted the First National Conference on Aeronautical Education at St. Louis, Missouri. This was significant in that the first Aircraft Yearbook was published to give current educational activities related to aviation and current aviation developments.[28] As the amount of aviation curriculum increased, the United States Office of Education became interested in aviation education by publishing a work of Robert W. Hambrook entitled "Vocational Training for Aviation Mechanics." This work was a definitive study for vocational schools desiring to introduce aviation studies. The results of this publication led the United States Office of Education in 1936 to publish another of Hambrook's works entitled "Aviation in the Public Schools."[29] In 1938 Congress passed the Civil Aeronautics Act that created the Civil Aeronautics Administration in 1940. The 1938 legislation provided for general development and promotional work for the new aviation system for the nation which resulted in the promotion of aviation education in the United States.[30]

One of the major World War II educational efforts was the preparation of aviation materials and instruction activities for both teachers and students. Government agencies, aviation organizations, publishers, universities, and industry had input into the research. The largest single production of aviation materials was done at the University of Nebraska and the Teachers College, Columbia University. The result was the publishing in 1942 and 1943 of a twenty-volume set of books called the Air-Age Education Series. These materials of instruction, designed

mainly for high school students and instructors, had a significant influence on aviation education.[31] Throughout the 1940's a large number of requests from teachers were sent to the Civil Aeronautics Administration for understandable material for elementary pupils. In response, the Civil Aeronautics Administration negotiated with Stanford University's School of Education for a project that would meet the request from the teachers. The monumental result of the effort was the publishing of a 900-page volume entitled Aviation Education Source Book. This book provided teachers, curriculum consultants, textbook writers, and aviation educators with aviation materials for subject matter areas from kindergarten to the ninth grade. This included social studies, science, language arts, mathematics, art, and music.[32]

The first use of educational workshops for aviation education took place during the mid 1940's. The leadership was provided by the aviation education staff members of the Civil Aeronautics Administration. Working through state departments of public instruction, teacher training institutions, regional or local groups, or teacher institutes, thousands of classroom teachers were given aviation experience and background. By 1948, nearly one hundred teacher-training institutes had plans for helping teachers learn more about how to improve their classroom teaching using aviation education.[33]

By 1952, the leadership of the Civil Aeronautics Administration declined due to a reduction in the budget and staff positions for aviation education programs. To fill this vacuum, the already-established Civil Air Patrol and the National Aviation Education Council emerged as the leaders for aviation education.[34] In the late 1950's, the space age came into existence. The result was a shift to aerospace education

instead of aviation education. The Civil Air Patrol adopted and set forth aerospace education objectives. The Civil Air Patrol's aerospace education objectives include the following:

1. A reading and speaking vocabulary of aerospace terms
2. A knowledge of weather and climate as factors in aerospace operations
3. A knowledge of the physical and biological science as applied in aerospace explorations
4. A general understanding of the structure of aircraft, rockets, missiles, satellites, and space vehicles
5. A familiarization with the aerospace industries
6. An understanding of the social, economic, and political implications of aerospace technology
7. A knowledge of airports, airport services, and the functions of airport personnel
8. An understanding of existing and proposed government services and regulations that facilitate aerospace operations
9. A knowledge of the materials, personnel, and equipment available as resources for aerospace education programs
10. An understanding of the political, economic, social, and educational problems created by aerospace technology
11. A realization that aerospace vehicles have changed traditional concepts of land masses, water barriers, speed, time, and distance
12. A knowledge of career opportunities in science, engineering, and other fields that result from aerospace vehicle development, manufacture, and operation

13. A knowledge of the impact of aerospace progress on international relationships
14. An understanding of the basic scientific and engineering principles inherent in air and space vehicle development, manufacture, and operation[35]

As the Civil Air Patrol became more involved in aerospace education workshops, the programs were patterned after the recommendations of the Aviation Education Committee of the American Association of Colleges for Teacher Education whose objectives were:

1. An adequate reading and speaking vocabulary of aviation
2. A knowledge of the importance of weather and climate to successful aviation
3. General knowledge and understanding of the simple scientific principles of flight
4. An understanding of the place of aviation in peace and war
5. An understanding of the effects of air transportation of various levels of international relationships
6. An introduction of the social, economic, and political implications of current and future aviation development
7. An appreciation of the services rendered by airports
8. A knowledge of available aviation education resources in materials, personnel, and equipment for instructional purposes
9. Providing resulting learning experiences for children through student or directed teaching[36]

By 1961, the Civil Air Patrol helped organize over 100 aerospace education workshops, in-service meetings, seminars, symposiums, and institutes.[37] During 1968, the Civil Air Patrol participated in varying degrees with 200 colleges, universities, and school systems throughout the nation providing aerospace education experience for teachers in aerospace education workshops.[38]

There are various techniques used for aerospace education training of teachers. The objectives of Articles, Materials, and Services are to provide limited information and guidance and to stimulate interest and motivate further inquiry. The objectives of Short Programs are to provide limited information and to stimulate interest and motivate further inquiry. They last from one to two hours. The objectives of Conferences and Seminars are to provide limited information of the several facets of aerospace and its educational implications and to stimulate interest and motivate further inquiry. These last from two to six hours. The objectives of Institutes are to provide a general introduction to aerospace concepts and the motivational emphasis needed to introduce these concepts into the classroom. These last from six to fifteen hours. The objectives of Extension Courses are to provide a single integrated course which covers the entire scope of aerospace concepts and activities and to familiarize teachers with materials, resources, and teaching techniques needed for the effective introduction of aerospace concepts into the classroom. These last from six to eight weeks--one session per week. The objectives of the workshop are to provide a single integrated course which covers the entire scope of aerospace concepts and activities and to familiarize teachers with the materials, resources, and techniques needed for the effective

introduction of aerospace concepts into the classroom. These last from two to six weeks--three to six hours per day.[39] When comparing the six various approaches to teacher training, the following seven areas were considered:

1. Objectives of the training
2. Sponsor of the training
3. Length and cost of the training
4. Training emphasis and content
5. Related experience activities
6. Availability of course-related materials
7. Response required from teachers[40]

Using these seven areas for comparison, the aerospace education workshop method of teacher training is the most satisfactory to achieve the aerospace education objectives.[41]

The rationale of the aerospace education workshop is to produce a teacher who takes into account the following factors when organizing the aerospace curriculum and instruction:

1. The selection of objectives
2. The selection of appropriate learning experiences
3. The selection and organization of methods and resources to make experiences meaningful and consistent with the objectives
4. The process of evaluating how well the curriculum objectives have been attained
5. To recognize interest, purpose, and experience as factors in child growth and development

6. To provide students with guided experiences which will help them understand the complex age in which they live and to assume responsibility for the improvement of life's conditions
7. To realize the school's responsibility to provide career guidance and education for vocational competence
8. To have an integrated curriculum organized around a major interest
9. To use community resources as aids to learning
10. To accept in-service teacher education as a permanent and integral aspect of curriculum improvement
11. To extend the services of organized education to the adults of the community[42]

The extent the teachers are going to accept and use aerospace curriculum and instruction in their classrooms is not easily identified. The extent of the usage of aerospace materials deals with psychological factors associated with sustained professional growth. The psychological factors associated with sustained professional growth can be summarized with these questions:

1. How sensitive or resistant is the teacher to improving his teaching practices?
2. How flexible is his attitude toward change in terms of his present teaching situation in relation to the learner, facilities, methods, and materials?
3. How intrinsically-motivated is he toward participation in in-service education activities?

4. To what extent does he pursue self-determined goals leading to constructive changes in teaching practices?
5. How objective and cooperative is he toward in-service education suggestions of others?[43]

The existence of aviation education in America emerged as a response from the public and classroom teachers for aviation knowledge and educational materials. In the 1920's, aviation education was mostly taught to teachers in courses at a particular university. The 1930's brought an increase in curriculum development and instructional materials to be implemented into the high school curriculum by the individual teachers. To coordinate the increase in aviation materials and techniques, the United States Office of Education published several aviation curriculum books. More research was done in the 1940's to produce more aviation education materials. Through the Civil Aeronautics Administration, understandable aviation material was developed for elementary and secondary school students. The first aviation education workshop was held in this time period to train teachers to improve their classroom teaching using aviation education. As aviation education became aerospace education, the main leadership of aerospace workshops was provided by the Civil Air Patrol. From recommendations of the Aviation Education Committee of the American Association of Colleges for Teacher Education, objectives for the aerospace education curriculum and aerospace workshop were identified. To achieve the aerospace education objectives, the aerospace workshop was shown to be the most satisfactory. The main purpose of the aerospace education workshop was to provide concepts, activities, materials, resources, and methods to be used in the classroom.

## Involvement of the National Aeronautics and Space Administration

The National Aeronautics and Space Act of 1958 created the National Aeronautics and Space Administration. In this act, Congress declared that the policy of the United States, with respect to aeronautic and space research, was the peaceful exploration for the benefit of all mankind.[44] The Administration, in order to carry out the peaceful purposes of the Act, shall provide for the widest practicable and appropriate dissemination of information concerning the activities and the results of the research.[45] The primary NASA long-range space science objectives are:

1. To develop a scientifically-literate national community
2. To provide assistance in the development of space science enrichment materials for elementary, secondary, and teacher training programs[46]

To accomplish the objectives, NASA--as a scientific agency of the Federal Government--is responsible for providing educational information and resources that will help develop a national understanding of the United States' role in space exploration for peaceful purposes.[47] To distribute educational information, the Education Programs Division of Public Affairs was formed. The Educational Program Division was of maximum service to education by concentrating on activities such as over-all planning, liaison with national and state education agencies and organizations, stimulation of educational research, encouragement of publications, and experimentation with workshops.[48] NASA's educational services include:

1. Publications. NASA has published a considerable number of

highly-regarded general interest publications about NASA programs and projects.

2. Audio-Visual. NASA has produced and/or makes available a number of general interest films and audio tapes concerning the programs and projects.
3. Exhibits. NASA has a limited number of displays which include both models of launch vehicles and spacecraft and background panels with pictures and explanations.
4. Spacemobile. The NASA Spacemobile unit comprises a lecturer and paneled truck, carrying 25 to 30 scale models of NASA spacecraft to illustrate science principles pertinent to space exploration.
5. Speakers. Conducting one of the greatest research efforts in human history, NASA has on staff some of the world's authorities in their respective fields. These staff members give speeches related to their research.
6. Consultation. NASA education officers are available on request to consult on problems related to NASA services and programs.
7. Institutes, Workshops, and Courses. Possibly the most effective educational service provided by NASA is that of assisting in the planning, organizing, and conducting of summer institutes, courses, and workshops which introduce elementary and secondary school teachers to space age developments. These programs attempt to orient those enrolled to the purpose, nature, and social implications of space research and to show them how to adapt what they learn about the space age to their teaching.[49]

The NASA Educational Programs Division based their educational programs on educational services. The educational programs fall into seven categories:

1. Assistance to schools, colleges, and universities in the structuring of space science education through seminars, symposiums, and workshops which provide up-to-date information concerning space exploration for the benefit of mankind
2. Initiation and development of space educational materials for use by teachers and students in the classroom and for teacher training and adult education
3. The Spacemobile personnel which gives lectures and demonstrations of space science activities
4. To assist in state science education programs, working through State Departments of Public Instruction
5. The NASA Awards Program for outstanding high school student scientists
6. Consultation to State Department of Public Instruction as well as schools, colleges, and universities
7. To work closely with the United States Office of Education, the National Science Foundation, the National Academy of Sciences, and other organizations to help implement the space science education programs[50]

The purpose of the NASA aerospace education workshop is to aid each teacher in preparing his students for living in a world dominated by space science and technology.[51] NASA aerospace workshops differ from the aviation education of the Civil Aeronautics Administration in

the 1940's and Civil Air Patrol of the 1950's by placing greater emphasis on presenting space-age developments and providing teachers with space-science-related classroom activities.[52] In developing NASA aerospace education objectives and programs, the educational workshop was employed. The utilization of the aerospace workshop retained the basic characteristics that emerged from and defined the educational workshop.

The first attempt to evaluate the participation of NASA in an aerospace workshop, since they were started in the early 1960's, was made in 1970 by Helton. The principle objective of his study was to discover how the workshop participants felt about the summer aerospace workshop six months later.[53] The first questionnaire was given to 2,007 participants in the summer of 1970. The second questionnaire was sent to 500 former workshop participants in February, 1971. Helton's study produced the following conclusions:

1. There was a significant relationship between the length of the workshop and the number of techniques or activities the teacher includes in lesson plans as a result of the aerospace workshop experience.
2. There was a significant relationship between the duration of NASA personnel at the workshops and the involvement of the teacher as a resource person to his faculty.[54]

The important element of Helton's study was his recommendations for strengthening a similar study.

1. There should be more uniform administration procedures for the instrument. As the number of people involved in preparation and administration of the first questionnaire grew

out of hand, the effectiveness of the project declined.

2. The questionnaire should be simple and easy to follow for quickness and a greater surety of answers. The first questionnaire of this study, due to printer assistance, became a quagmire losing time and data from over 20 workshops.

Since there were no other studies of aerospace workshops, Helton's study became exploratory rather than a definitive piece of research.[55]

On the state level, Miller's purpose was to determine to what extent the stated goals of the Oklahoma Aeronautics Commission were met by the nearly two hundred teachers that were present at the 1969 and 1970 aerospace workshops.[56] Data from all 160 subjects were used to establish that the aerospace education workshops were successful in reaching their stated goals in selected schools in the state of Oklahoma. The goals being:

1. To stimulate a widespread awareness of aerospace education at all levels of the curriculum
2. To develop means to stimulate the teachers' interest in aerospace education
3. To train teachers and administrators in the application of aerospace education in schools
4. To make aerospace education available to students in all grade levels
5. To encourage closer affiliation between educational institutions and aerospace industries
6. To train teachers for a specialized course in aviation at the high school level[57]

Since Miller's study was concerned only with classroom practices and attitudes concerning aerospace education, an expanded study was suggested.[58]

In a report compiled by the Oklahoma State University Research Foundation in the summer of 1972, of fourteen selected aerospace workshops across the United States, basic survey information was gathered.[59] Some selected data is as follows:

1. How did they rate NASA materials used in the workshop?

   54 or 13% said that they were TOO TECHNICAL FOR STUDENTS
   182 or 44% said that they were GOOD FOR MOTIVATING STUDENTS
   153 or 37% said that they were VERY GOOD FOR STUDENT MOTIVATION
   1 or 0% said that they were NOT SPECIFIC ENOUGH

2. Which NASA materials were most valuable as a teaching aid?

   107 or 26% said that PUBLICATIONS were the most valuable
   270 or 66% said that FILMS were the most valuable

3. 200 or 49% said that they have used Aerospace materials in their classrooms.

4. 191 or 46% said they have used Aerospace concepts for classroom enrichment.

5. 163 or 40% have taught a "unit" on Aerospace

   25 or 15% of this group have taught a unit on AVIATION
   67 or 41% of this group have taught a unit on SPACE
   67 or 41% of this group have taught a unit on AEROSPACE

6. 46 or 11% said they taught a "course" on Aerospace

   9 or 19% of this group have taught a course on AVIATION
   12 or 26% of this group have taught a course on SPACE
   22 or 47% of this group have taught a course on AEROSPACE

Refinements in the questionnaire produced the "NASA Space Science Education Workshop Survey." This pilot survey was used in the summer of 1973.[60] Some selected data may be reported as follows:

1. Overall, how did they evaluate the NASA materials used in the course?

    47 or 10% TOO TECHNICAL
    180 or 39% GOOD FOR MOTIVATION
    219 or 48% VERY GOOD FOR INFORMATION
    3 or 1% NOT SPECIFIC ENOUGH

2. In their workshop, which NASA materials were most valuable?

    170 or 37% PUBLICATIONS
    264 or 58% FILMS

3. Which service did they think NASA should emphasize more?

    266 or 58% NASA PUBLICATIONS
        128 or 48% Information on projects
        128 or 52% Curriculum guides

    94 or 21% FILMS
        54 or 57% Information on projects
        40 or 43% Subject matter

4. Did their workshop visit a NASA facility?

    168 or 37% YES
    290 or 63% NO

Some selected comments of the workshop participants were:

> I feel it is essential to the success of programs of this type to have a NASA representative present. Having a specialist on hand to answer questions on any space-related topic was one of the most talked-about highlights of the workshop.
>
> The speakers were very good but I believe the most beneficial part of the workshop was the trip to NASA and Houston Airport. The materials received and texts purchased should be more than adequate to incorporate this subject into the curriculum quite adequately.
>
> I think that we need more information on direct applications in the classroom. Some of the material covered has already been presented through the news media.

The Space Act of 1958, which created NASA, gave direction to educational programs on space-related activities. Within NASA's educational programs and services, the educational workshop was employed as a major tool to disseminate aerospace education. The purpose of a NASA aerospace workshop is to aid each teacher in preparing his students for

living in a world dominated by space science and technology. Since NASA's workshops contain the basic characteristics of the educational workshop, aerospace workshop evaluation and post-workshop evaluation began to take place in 1970. Although more continuous data is needed concerning the aerospace education workshop, the few studies have shown the need to respond to the needs of the classroom teachers as well as meet the objectives of aerospace education.

In summary, the review of the literature has shown the significance of the educational workshop in relation to the involvement of NASA in aerospace education workshops. The rationale, implications, and characteristics of the educational workshop are in direct relation to the aerospace education workshop. The limited amount of evaluation and post-evaluation of the aerospace workshop suggests expanded and more continuous updating of data-gathering techniques and procedures for evaluating the aerospace education workshop.

FOOTNOTES

[1]Ryan W. Carson and Ralph W. Tyler, Summer Workshops in Secondary Education (New York, 1939), p. 5.

[2]Ibid.

[3]Ibid.

[4]Ibid., p. 7.

[5]Ibid.

[6]Ibid.

[7]Ibid., p. 14.

[8]Committee on Southern Regional Studies and Education, Guide for Resource-Use Education Workshops (Washington, D. C., 1951), p. 2.

[9]Mary A. O'Rourke and William H. Burton, Workshop for Teachers (New York, 1957), p. 2.

[10]Marilyn Carrol, "A Word About Workshops," Clearing House, XLI (September, 1966), pp. 13-14.

[11]Henry J. Otto et al., Community Workshops for Teachers in the Michigan Community Health Project (Ann Arbor, Michigan, 1942), p. 1.

[12]Ibid., p. 95.

[13]Ibid., p. 96.

[14]Ibid., p. 102.

[15]Ibid., p. 103.

[16]O'Rourke, p. 3.

[17]Ibid., pp. 5-8.

[18]Committee on Southern Regional Studies and Education, p. 3.

[19]Otto, p. 70.

[20]Committee on Southern Regional Studies and Education, pp. 34-35.

[21]Ibid., p. 11.

[22]O'Rourke, p. 71.

[23]Mervin K. Stricker, Jr., "History of Aerospace Education," An Introduction to Aerospace Education, ed. Mervin K. Stricker, Jr. (Chicago, 1968), p. 309.

[24]Ibid., pp. 309-310.

[25]Ibid., p. 310.

[26]Ibid., p. 311.

[27]Ibid.

[28]Ibid.

[29]Ibid.

[30]Ibid., p. 312.

[31]Ibid., p. 313.

[32]Ibid.

[33]Ibid., p. 314.

[34]Ibid.

[35]Ibid., pp. 315-316.

[36]Wilma M. Dolezal, "Aerospace Comes of Age," The Texas Outlook, XLVI (June, 1962), p. 17.

[37]Ibid., p. 16.

[38]Stricker, p. 316.

[39]Raymond J. Johnson, "A Survey of Approaches," An Introduction to Aerospace Education, ed. Mervin K. Stricker, Jr. (Chicago, 1968), p. 234.

[40]Ibid., p. 236.

[41]Ibid.

[42]Woodson W. Fishback, "Aerospace and the Curriculum," An Introduction to Aerospace Education, ed. Mervin K. Stricker, Jr. (Chicago, 1968), pp. 32-34.

[43]Ibid., p. 37.

[44]National Aeronautics and Space Act, as Amended and Related Legislation, The Office of the National Aeronautics and Space Administration (Washington, D. C., July 1, 1969), p. 1.

[45]Ibid., p. 5.

[46]James V. Bernado, NASA's Educational Programs (Washington, D. C., September, 1964), p. 8.

[47]Ibid.

[48]NASA Services to College and University Summer Sessions, National Aeronautics and Space Administration (Washington, D. C., April, 1965), p. 5.

[49]Ibid., pp. 7-11.

[50]Bernado, pp. 8-9.

[51]Ibid., p. 8.

[52]NASA Services to College and University Summer Sessions, p. 12.

[53]Robert Helton, "A Study of Aerospace Education Workshops Which Utilize NASA Materials and Resource Personnel" (unpub. Ed.D. dissertation, Oklahoma State University, 1973), p. 4.

[54]Ibid., p. 79.

[55]Ibid., p. 81.

[56]Jerry Miller, "An Assessment of the Effects of Aerospace Education Workshops Upon the Teaching of Aerospace Education Concepts in Selected Schools in Oklahoma" (unpub. Ed.D. dissertation, Oklahoma State University, 1972), p. 4.

[57]Ibid., pp. 75-77.

[58]Ibid., p. 77.

[59]"A Summary of Selected NASA Aerospace Education Workshops in the Summer of 1972" (unpub. research data, Research Foundation, Oklahoma State University, 1972).

[60]"A Summary of Selected NASA Aerospace Education Workshops in the Summer of 1973" (unpub. research data, Research Foundation, Oklahoma State University, 1974).

# CHAPTER III

# DESIGN AND METHODOLOGY

## Introduction

The purpose of this study is to describe the aerospace workshop, the participant characteristics, and the utilization of aerospace curriculum and instruction. These descriptions were done by having the workshop participants answer a questionnaire at least three months after the completion of an aerospace education workshop in which the National Aeronautics and Space Administration (NASA) participated.

## Description of the Sample

NASA participated in 85 aerospace workshops in the summer of 1974. Of these, 16 workshops were selected to give a geographical representation of the United States. The selected workshops were chosen by Dr. Kenneth Wiggins, director of NASA's Space Science Education Project, Oklahoma State University. A list of selected workshops is found in Appendix C.

The subjects of this study were educators who attended an aerospace education workshop in which NASA participated during the summer of 1974. The names and addresses of the participants were sent to Oklahoma State University by the selected workshop directors or by the Space Science Education Project secretary at the representative NASA facility for that region of the United States. A total of 373 participants were used in

this study. The Space Science Education Workshop Follow-Up Survey was sent to each of the subjects. Out of this group, 234 were returned and suitable for data interpretation. There was a 62.7 percent return from this population.

## Collection of Data

### Construction of the Questionnaire

The follow-up questionnaire was the sole source of data. The process of determining the adequacy of information requested in the follow-up questionnaire included three phases. The first phase was to have the questionnaire reviewed by doctoral students in science education. The second phase included consultation with the Chairman of the writer's doctoral committee. After revisions were made on the basis of suggestions of the previous people, the Space Science Education Workshop Follow-Up Survey was considered a valid way to gather the needed data. The third phase was an in-person visitation and interview by this writer to one (1) percent of the total population after the participant had responded to the questionnaire to assure the reliability of the responses. A summary of the responses by the interviewed participants to the questionnaire is found in Appendix D.

### Design of the Questionnaire

The approved questionnaire was comprised of two sections. The first section was designed to gather data concerning the characteristics of the aerospace education workshop participant. This included sex, primary responsibility of his present position, educational level that he is presently working, length of the aerospace workshop, and whether

the participant visited a NASA facility. These participant characteristics were chosen to meet the needs of the aerospace workshop directors and to facilitate the utilization of aerospace education in the classroom.

The second section was concerned with the curriculum and instruction utilization. This section dealt with use of an aerospace education curriculum guide, incorporating aerospace concepts on a regular basis into teaching methods, rating the level of difficulty of content as presented by NASA, developing better teaching methods, continuing aerospace workshops in the future, and whether fellow workshop participants were using aerospace education materials in their classroom teaching. A copy of the questionnaire is found in Appendix A.

Submission of Questionnaire to Participants

The questionnaire, accompanied by a letter of explanation, was mailed to the participants after November 15, 1974; each respondent was urged to return the completed questionnaire as soon as possible. The rationale for using November 15, 1974, as the mailing date was to ensure that a minimum of three months had elapsed since the participant's summer workshop. A three-month waiting period was used so teachers could adequately plan their fall and spring activities. Each questionnaire was mailed with a stamped, self-addressed envelope for the purpose of an easy return of the completed instrument. A copy of the letter of explanation is found in Appendix B.

## Method of Analyzing Data

The Space Science Education Workshop Follow-Up Survey was answered directly on the questionnaire. Upon receipt of the questionnaire at Oklahoma State University, the questionnaire was coded and placed on data cards for suitable use in an IBM 360/65 computer. By the use of the IBM computer, frequency counts were tabulated for each question and percentages were made for the total returned questionnaire population.

Due to the nominal nature of the data, a Chi-Square statistical procedure was used to determine the relationships that exist within the research questions listed in Chapter I. A significance level of .05 was used.

In summary, the purpose of this chapter has been to give a general description of the design of the study. Major areas discussed were description of the sample, collection of data, scope and validity of the instrument, and method of analyzing the data.

# CHAPTER IV

## RESULTS OF THE STUDY

The concern of the first three chapters has been a general introduction to the study, a review of related literature, and a discussion of the design of the study.

This chapter is a presentation of the findings from the Space Science Education Follow-Up Survey. Data obtained from the questionnaire will be discussed and analyzed.

The data will be presented in two sections. The first section will contain responses to the questionnaire items. Frequencies and percentages will be concerned with:

1. the participant characteristics.
2. the use of an aerospace curriculum guide.
3. the incorporation of aerospace education concepts into teaching methods on a regular basis.
4. the amount of time given to teaching aerospace concepts.
5. the teaching of a unit dealing with aerospace education.
6. the rating of workshop content difficulty of NASA's presentation.
7. the benefit of the workshop in developing teaching methods.
8. the continuing of aerospace education workshops in the future.
9. the use, by fellow workshop participants, of aerospace education materials.

The data in the second section will be presented according to research questions listed in Chapter I. The chi-square statistical analysis will be used to determine the relationships between the participant characteristics and:

1. the use of an aerospace curriculum guide.
2. incorporating aerospace education concepts into teaching methods.
3. amount of teaching time given to the aerospace concepts.
4. the teaching of an aerospace unit.
5. the workshop content difficulty of NASA's presentation.
6. the developing of teaching methods.
7. NASA's participation in an aerospace workshop in the future.

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

## Responses to the Questionnaire

A list of names and addresses of 373 aerospace workshop participants from the summer of 1974 was obtained through NASA's Space Science Education Project - Oklahoma State University. A questionnaire was mailed to each workshop participant. A total of 234 questionnaires were returned. This represented a 62.7 percent return.

To obtain supporting data for the participant characteristics, question items one, two, three, four, and five of the questionnaire were used (see Appendix A). Considered in these items were: the participant's sex, primary responsibility of his present position, educational level at which he is currently working, length of the aerospace workshop he attended, and whether he visited a NASA facility.

Questionnaire data indicated that 41.4 percent of the participants were male, 57.7 percent were female, with 0.9 percent giving no response to item one. In relation to primary responsibility of the participant's present position, 76.5 percent were teachers, 2.6 percent were supervisors of teachers, 2.6 percent were curriculum directors, 2.6 percent were counselors, 0.8 percent were librarians, 5.1 percent were administrators, and 9.8 percent fell in the "other" group. The "other" category was used by participants whose present position was not listed in item two.

The following data were gathered concerning the educational levels at which the participants were presently working. It was noted that 44.5 percent were elementary, 4.3 percent were middle school, 16.2 percent were junior high school, 25.6 percent were senior high school, 0.4 percent were junior college, 6.4 percent were college or university, and 2.6 percent gave no response to item three.

In relation to the length of the aerospace workshop, 1.3 percent were one week, 27.8 percent were two weeks, 37.2 percent were three weeks, 2.6 percent were four weeks, 4.3 percent were five weeks, 23.9 percent were six weeks, 0.4 percent were seven weeks, 0.0 percent were eight weeks, 1.7 percent fell into the "other" group, and 0.8 percent gave no response to item four.

Findings showed that 40.2 percent of the participants visited a NASA facility, 59.4 percent did not, and 0.4 percent did not respond to item five.

A summary of data obtained in questionnaire items one, two, three, four, and five is given in Table I.

TABLE I

RESPONSE OF WORKSHOP PARTICIPANTS TO THE QUESTIONS REGARDING PARTICIPANT CHARACTERISTICS

| Participant Characteristics | Frequency | Percent |
|---|---|---|
| Sex | | |
| Male | 97 | 41.4 |
| Female | 135 | 57.7 |
| No Response | 2 | 0.9 |
| TOTAL | 234 | 100.0 |
| Present Position | | |
| Teacher | 179 | 76.5 |
| Supervisor | 6 | 2.6 |
| Curriculum Director | 6 | 2.6 |
| Counselor | 6 | 2.6 |
| Librarian | 2 | 0.8 |
| Administrator | 12 | 5.1 |
| Other | 23 | 9.8 |
| TOTAL | 234 | 100.0 |
| Present Job Level | | |
| Elementary | 104 | 44.5 |
| Middle School | 10 | 4.3 |
| Junior High School | 38 | 16.2 |
| Senior High School | 60 | 25.6 |
| Junior College | 1 | 0.4 |
| College/University | 15 | 6.4 |
| No Response | 6 | 2.6 |
| TOTAL | 234 | 100.0 |

TABLE I (Continued)

| Participant Characteristics | Frequency | Percent |
|---|---|---|
| Length of Workshop | | |
| One Week | 3 | 1.3 |
| Two Weeks | 65 | 27.8 |
| Three Weeks | 87 | 37.2 |
| Four Weeks | 6 | 2.6 |
| Five Weeks | 10 | 4.3 |
| Six Weeks | 56 | 23.9 |
| Seven Weeks | 1 | 0.4 |
| Eight Weeks | 0 | 0.0 |
| Other | 4 | 1.7 |
| No Response | 2 | 0.8 |
| TOTAL | 234 | 100.0 |
| Visitation to NASA Facility | | |
| Visit | 94 | 40.2 |
| No Visit | 139 | 59.4 |
| No Response | 1 | 0.4 |
| TOTAL | 234 | 100.0 |

To determine the use of an aerospace education curriculum guide, questionnaire item six was used. Response by the participants showed that 25.7 percent used an aerospace education curriculum guide, 67.5 percent did not, while 6.8 percent did not respond to item six. A summary of data to item six is found in Table II.

TABLE II

RESPONSE OF WORKSHOP PARTICIPANTS TO THE QUESTION REGARDING THE USE OF AN AEROSPACE CURRICULUM GUIDE

| Use of Curriculum Guide | Frequency | Percent |
|---|---|---|
| Yes | 60 | 25.7 |
| No | 158 | 67.5 |
| No Response | 16 | 6.8 |
| TOTAL | 234 | 100.0 |

To investigate the incorporation of aerospace education concepts into teaching methods on a regular basis, and the amount of time given to teaching aerospace concepts, questionnaire item seven was used. Information obtained showed 51.3 percent did incorporate aerospace concepts into their teaching, 43.2 percent did not, while 5.5 percent did not respond to item seven. Of the 120 participants who answered "yes" to item seven, 69 indicated they incorporated aerospace concepts into teaching methods on an average of 0-1 hours per week, 32 said they incorporated aerospace concepts on an average of 1-2 hours per week, 5 said they did on an average of 2-3 hours per week, 13 said they did on an average of 3-4 hours per week, while 1 person did not indicate the amount of time devoted per week. A summary of responses to item seven is found in Table III.

Questionnaire item eight was used to secure data concerning the teaching of a unit dealing with aerospace education. Responses indicate

TABLE III

RESPONSE OF WORKSHOP PARTICIPANTS TO THE QUESTION REGARDING THE INCORPORATION OF AEROSPACE CONCEPTS

| Incorporating Aerospace Concepts | Frequency | Percent |
|---|---|---|
| Yes | 120 | 51.3 |
| No | 101 | 43.2 |
| No Response | 13 | 5.5 |
| TOTAL | 234 | 100.0 |
| Amount of Time Devoted | | |
| 0-1 Hour | 69 | 57.5 |
| 1-2 Hours | 32 | 26.7 |
| 2-3 Hours | 5 | 4.2 |
| 3-4 Hours | 13 | 10.8 |
| No Response | 1 | 0.8 |
| TOTAL | 120 | 100.0 |

that 52.1 percent teach an aerospace unit, 44.5 percent did not, while 3.4 percent gave no response to item eight. Of the 122 participants who answered "yes" to item eight:

57 said they have or are planning a field trip in connection with the unit.

64 said they have or plan to have a resource person in the classroom.

103 said they have used films or plan to use films.

97 said students are using resource materials other than the text.

14 said enough material is in the textbook to teach the unit.

89 said students have or will be engaged in activity units.

Of the 104 participants who answered "no" to item eight:

1 said that students find aerospace education to be non-interesting.

2 said their building principal does not approve of this type of activity.

33 said time and space are not adequate for such a course.

10 said they do not have enough science background.

1 said they have enough time and background but are just not interested.

62 said they plan to teach an aerospace unit in the future.

A summary to questionnaire item eight is found in Table IV.

To rate the content difficulty of NASA's presentation for the use of the participants, questionnaire item nine was used. Findings show that 2.1 percent of the participants thought the presentation was too simple, 6.0 percent thought the presentation was too difficult, 87.2 percent thought the presentation was appropriate, while 4.7 percent did not respond to item nine. Results obtained in questionnaire item nine are found in Table V.

To determine if the participants felt that the aerospace education workshop was beneficial in developing their teaching methods, questionnaire item ten was used. Results indicate that 90.6 percent felt the workshop was beneficial to teaching methods, 6.0 percent said the workshop was not beneficial, while 3.4 percent gave no response to item ten. Table VI shows the results of item ten.

TABLE IV

RESPONSE OF WORKSHOP PARTICIPANTS TO THE QUESTION REGARDING THE TEACHING OF AN AEROSPACE UNIT

| Teaching an Aerospace Unit | Frequency | Percent |
|---|---|---|
| Yes | 122 | 52.1 |
| No | 104 | 44.5 |
| No Response | 8 | 3.4 |
| TOTAL | 234 | 100.0 |
| If "Yes" to Item Eight | | |
| Field Trip | 57 | 46.7 |
| Resource Person | 64 | 52.5 |
| Films | 103 | 84.4 |
| Resource Materials | 97 | 79.5 |
| Textbook | 14 | 11.5 |
| Activity Units | 89 | 73.0 |
| If "No" to Item Eight | | |
| Not Interesting to Students | 1 | 0.9 |
| Principal Does Not Approve | 2 | 1.9 |
| Not Enough Time or Space | 33 | 31.7 |
| Not Enough Science Background | 10 | 9.6 |
| I'm Not Interested | 1 | 0.9 |
| Teach Unit in the Future | 62 | 59.6 |

TABLE V

RESPONSE OF WORKSHOP PARTICIPANTS TO THE QUESTION REGARDING CONTENT DIFFICULTY OF NASA'S PRESENTATION

| Content Difficulty | Frequency | Percent |
|---|---|---|
| Too Simple | 5 | 2.1 |
| Too Difficult | 14 | 6.0 |
| Appropriate | 204 | 87.2 |
| No Response | 11 | 4.7 |
| TOTAL | 234 | 100.0 |

TABLE VI

RESPONSE OF WORKSHOP PARTICIPANTS TO THE QUESTION REGARDING WHETHER THE WORKSHOP WAS BENEFICIAL TO TEACHING METHODS

| Workshop Beneficial | Frequency | Percent |
|---|---|---|
| Yes | 212 | 90.6 |
| No | 14 | 6.0 |
| No Response | 8 | 3.4 |
| TOTAL | 234 | 100.0 |

To secure data on whether to continue aerospace education workshops in the future, questionnaire item eleven was used. Findings show that 98.7 percent said aerospace workshops should be continued in the future, 0.9 percent said aerospace workshops should not be continued, while 0.4 percent did not respond to item eleven. A summary of the results of item eleven is found in Table VII.

TABLE VII

RESPONSE OF WORKSHOP PARTICIPANTS TO THE QUESTION REGARDING WHETHER THE AEROSPACE WORKSHOPS SHOULD BE CONTINUED IN THE FUTURE

| Workshops Continued in the Future | Frequency | Percent |
|---|---|---|
| Yes | 231 | 98.7 |
| No | 2 | 0.9 |
| No Response | 1 | 0.4 |
| TOTAL | 234 | 100.0 |

To obtain knowledge on whether any of the fellow workshop participants were using any of the aerospace education materials in their classroom teaching, questionnaire item twelve was employed. Responses indicate that 51.7 percent were using aerospace materials, 2.1 percent indicated they were not, 38.9 percent did not know, while 7.3 percent gave no response to item twelve. Table VIII shows the results obtained in item twelve.

TABLE VIII

RESPONSE OF WORKSHOP PARTICIPANTS TO THE QUESTION REGARDING WHETHER FELLOW WORKSHOP PARTICIPANTS WERE TEACHING AEROSPACE EDUCATION

| Fellow Participants Teaching Aerospace Education | Frequency | Percent |
|---|---|---|
| Yes | 121 | 51.7 |
| No | 5 | 2.1 |
| Do Not Know | 91 | 38.9 |
| No Response | 17 | 7.3 |
| TOTAL | 234 | 100.0 |

The participants were given an opportunity to write any additional comments. Some of the selected comments were:

> The workshop I took was excellent! I cannot possibly measure the benefit I received both in up-to-date information and enthusiasm for teaching science. We've put together an entire Aerospace Unit at our school including the building and launching of model rockets, studies of G-forces including an egg drop from a plane via local pilot etc. Interest in science has really zoomed!
>
> The most interesting and enlightening workshops I have ever been involved in.
>
> Although time does not permit the teaching of an actual unit, I have used a "club" approach--doing additional activities during recess time with interested students. I have used appropriate lessons in the curriculum guide as well as extra ideas presented during the workshop. It was a fantastic experience and I recommend it highly to my colleagues.
>
> The workshop was one of the most valuable I have ever experienced. I feel that every classroom teacher should attend, as the materials and concepts are interesting and useful at every grade level.

> I teach lower primary and, though I can't do a whole unit, I plan to use a number of concepts gained in the workshop which I took for my own background information.
>
> The presentation made by the NASA speaker was excellent. He brought many audio-visual materials and appropriate teaching units.

## Research Question Number One

What is the use of an aerospace curriculum guide in relation to participant characteristics?

To obtain supporting data for this question, items one, two, three, four, five, and six of the questionnaire were used. To determine the relationships between participant characteristics and the use of an aerospace curriculum guide, the chi-square statistical test was used. The participant characteristics were grouped according to the categories of:

1. sex.
2. present position.
3. present job level.
4. length of workshop.
5. visitation to NASA facility.

Some of the participant characteristics were combined according to similar characteristics to meet the chi-square test requirements.

The participant groups used for "Sex" were male and female. The three groups used for "Present Position" were teachers, supervisor of teachers-curriculum directors-librarians, and administrators-counselors. The four groups used for "Present Job Level" were elementary, middle school-junior high school, senior high school, and junior college-college/university. The duration of the aerospace workshop was grouped

into periods of 1-2 weeks, 3-4 weeks, 5-6 weeks, and 7-8 weeks. The final grouping considered whether the participant had or had not visited a NASA facility.

For the chi-square statistical test, a level of significance was set at the .05 level. Critical values were obtained from the standard chi-square tables with appropriate degrees of freedom. Analysis showed no relationship between the use of an aerospace curriculum guide and the different categories of participant characteristics. A summary of these results is found in Table IX.

## Research Question Number Two

What is the incorporation of aerospace concepts in relation to participant characteristics?

In order to secure information for this question, items one, two, three, four, five, and seven of the questionnaire were employed. The chi-square statistical test was used to determine if any relationships existed. The participant groups used for "Sex" were male and female. Since teachers do the teaching, only that group was selected from the "Present Position" category. The four groups used for "Present Job Level" were elementary, middle school-junior high school, senior high school, and junior college-college/university. The "Length of Workshop" was grouped into 1-2 weeks, 3-4 weeks, 5-6 weeks, and 7-8 weeks periods. The final grouping considered a visit and non-visit to a NASA facility.

The chi-square level of significance was set at the .05 level. Findings show that there exists no significant relationships between the incorporation of aerospace concepts into teaching methods and the different participant characteristic categories. Given in Table X is a summary of these results.

TABLE IX

CHI-SQUARE VALUES REFLECTING RELATIONSHIP BETWEEN PARTICIPANT CHARACTERISTICS AND THE USE OF AN AEROSPACE CURRICULUM GUIDE

| Participant Characteristic | Yes | No | $X^2$ | DF | Critical Value | Level of Sig. |
|---|---|---|---|---|---|---|
| Sex | | | | | | |
| Male | 24* | 69 | | | | |
| | | | 0.1 | 1 | 3.84 | N.S. |
| Female | 34 | 89 | | | | |
| Present Position | | | | | | |
| Teacher | 48 | 123 | | | | |
| Supervisor-Curriculum Director-Librarian | 3 | 9 | | | | |
| | | | 0.3 | 2 | 5.99 | N.S. |
| Administrator-Counselor | 5 | 10 | | | | |
| Present Job Level | | | | | | |
| Elementary | 32 | 64 | | | | |
| Middle School-Junior High School | 11 | 34 | | | | |
| | | | 2.9 | 3 | 7.82 | N.S. |
| Senoir High School | 13 | 44 | | | | |
| Junior College-College/University | 3 | 12 | | | | |
| Length Of Workshop | | | | | | |
| 1-2 Weeks | 18 | 46 | | | | |
| 3-4 Weeks | 24 | 59 | | | | |
| | | | 0.7 | 3 | 7.82 | N.S. |
| 5-6 Weeks | 16 | 48 | | | | |
| 7-8 Weeks | 0 | 1 | | | | |
| Visitation To NASA Facility | | | | | | |
| Visit | 19 | 65 | | | | |
| | | | 1.6 | 1 | 3.84 | N.S. |
| No Visit | 41 | 93 | | | | |

*Data reported as frequency

TABLE X

CHI-SQUARE VALUES REFLECTING RELATIONSHIP BETWEEN PARTICIPANT CHARACTERISTICS AND THE INCORPORATION OF AEROSPACE EDUCATION CONCEPTS ON A REGULAR BASIS

| Participant Characteristics | Yes | No | $X^2$ | DF | Critical Value | Level of Sig. |
|---|---|---|---|---|---|---|
| Sex | | | | | | |
| Male | 48* | 43 | | | | |
| | | | 0.3 | 1 | 3.84 | N.S. |
| Female | 72 | 56 | | | | |
| Present Position | | | | | | |
| Teachers | 99 | 78 | 2.4 | 1 | 3.84 | N.S. |
| Present Job Level | | | | | | |
| Elementary | 54 | 48 | | | | |
| Middle School-Junior High School | 29 | 18 | | | | |
| | | | 1.7 | 3 | 7.82 | N.S. |
| Senior High School | 30 | 25 | | | | |
| Junior College-College/University | 5 | 2 | | | | |
| Length Of Workshop | | | | | | |
| 1-2 Weeks | 36 | 29 | | | | |
| 3-4 Weeks | 47 | 38 | | | | |
| | | | 1.1 | 3 | 7.82 | N.S. |
| 5-6 Weeks | 37 | 27 | | | | |
| 7-8 Weeks | 0 | 1 | | | | |
| Visitation To NASA Facility | | | | | | |
| Visit | 49 | 39 | | | | |
| | | | 0.1 | 1 | 3.84 | N.S. |
| No Visit | 71 | 61 | | | | |

*Data reported as frequency

## Research Question Number Three

What amounts of aerospace concepts are being taught in relation to participant characteristics?

To secure evidence for this question, items one, two, three, four, five, and the second part of question seven of the questionnaire were used. The participant groups used for "Sex" were male and female. Since teachers do the teaching, only the group of teachers was used as a group out of the "Present Position" category. The four groups used for "Present Job Level" were elementary, middle school-junior high school, senior high school, and junior college-college/university. The "Length of Workshop" was grouped into periods of 1-2 weeks, 3-4 weeks, 5-6 weeks, and 7-8 weeks. The final grouping considered a visit and non-visit to a NASA facility.

The chi-square statistical test, at the .05 level of significance, showed a significant relationship existed between the groups of male and female in relation to the amount of aerospace concepts incorporated into teaching methods. There also existed a significant relationship within the group of teachers in relation to the amount of aerospace concepts incorporated into teaching methods. This indicates that these relationships exist beyond chance factors. The remaining categories of participant characteristics showed no significant relationships existed. A summary of these results is found in Table XI.

TABLE XI

CHI-SQUARE VALUES REFLECTING RELATIONSHIP BETWEEN PARTICIPANT CHARACTERISTICS AND THE AVERAGE TIME OF THE INCORPORATION OF AEROSPACE CONCEPTS PER WEEK

| Participant Characteristic | 0-1 | 1-2 | 2-3 | 3-4 | $X^2$ | DF | Critical Value | Level of Sig. |
|---|---|---|---|---|---|---|---|---|
| Sex | | | | | | | | |
| Male | 20* | 15 | 2 | 10 | | | | |
| | | | | | 11.3 | 3 | 7.82 | .05 |
| Female | 48 | 17 | 3 | 3 | | | | |
| Present Position | | | | | | | | |
| Teachers | 60 | 26 | 3 | 9 | 80.2 | 3 | 7.82 | .05 |
| Present Job Level | | | | | | | | |
| Elementary | 35 | 12 | 3 | 2 | | | | |
| Middle School-Junior High School | 16 | 9 | 0 | 3 | | | | |
| | | | | | 13.6 | 9 | 16.92 | N.S. |
| Senior High School | 15 | 9 | 1 | 5 | | | | |
| Junior College-College/University | 2 | 2 | 0 | 3 | | | | |
| Length Of Workshop | | | | | | | | |
| 1-2 Weeks | 21 | 8 | 2 | 5 | | | | |
| 3-4 Weeks | 29 | 12 | 2 | 2 | | | | |
| | | | | | 5.1 | 9 | 16.92 | N.S. |
| 5-6 Weeks | 18 | 12 | 2 | 5 | | | | |
| 7-8 Weeks | 1 | 0 | 0 | 0 | | | | |
| Visitation To NASA Facility | | | | | | | | |
| Visit | 29 | 11 | 3 | 5 | | | | |
| | | | | | 1.5 | 3 | 7.82 | N.S. |
| No Visit | 39 | 31 | 2 | 8 | | | | |

*Data reported as frequency

## Research Question Number Four

What is the relation of teaching an aerospace unit to participant characteristics?

To gather data dealing with this question, items one, two, three, four, five, and eight of the questionnaire were utilized. Out of the category for "Sex," male and female groups were used. Here again, only the teachers group was used from the "Present Position" category. The four groups used for "Present Job Level" were elementary, middle school-junior high school, senior high school, and junior college-college/university. The groups used for the "Length of Workshop" were 1-2 weeks, 3-4 weeks, 5-6 weeks, and 7-8 weeks. The final grouping considered a visit and a non-visit to a NASA facility.

At the .05 level of significance, the chi-square statistical test found a significant relationship within the group of teachers and the teaching of a unit dealing with aerospace education. This means that this relationship exists beyond chance factors. The remaining categories of participant characteristics showed no significant relationships. Table XII reports these findings.

## Research Question Number Five

What is the relation of the workshop content difficulty of NASA's presentation to participant characteristics?

To gather supporting data for this question, items one, two, three, four, five, and nine of the questionnaire were employed. The participant characteristics groups used for "Sex" were male and female. The three groups used for "Present Position" were teachers, supervisor of teachers-curriculum directors-librarians, and administrators-counselors.

TABLE XII

CHI-SQUARE VALUES REFLECTING RELATIONSHIP BETWEEN PARTICIPANT CHARACTERISTICS AND THE TEACHING OF A UNIT DEALING WITH AEROSPACE EDUCATION

| Participant Characteristics | Yes | No | $X^2$ | DF | Critical Value | Level of Sig. |
|---|---|---|---|---|---|---|
| Sex | | | | | | |
| Male | 48* | 47 | | | | |
| | | | 0.6 | 1 | 3.84 | N.S. |
| Female | 72 | 57 | | | | |
| Present Position | | | | | | |
| Teachers | 105 | 73 | 5.8 | 1 | 3.84 | .05 |
| Present Job Position | | | | | | |
| Elementary | 61 | 40 | | | | |
| Middle School-Junior High School | 25 | 23 | | | | |
| | | | 3.2 | 3 | 7.82 | N.S. |
| Senior High School | 28 | 30 | | | | |
| Junior College-College/University | 6 | 8 | | | | |
| Length Of Workshop | | | | | | |
| 1-2 Weeks | 40 | 27 | | | | |
| 3-4 Weeks | 47 | 40 | | | | |
| | | | 3.1 | 3 | 7.82 | N.S. |
| 5-6 Weeks | 31 | 34 | | | | |
| 7-8 Weeks | 0 | 1 | | | | |
| Visitation To NASA Facility | | | | | | |
| Visit | 45 | 44 | | | | |
| | | | 0.6 | 1 | 3.84 | N.S. |
| No Visit | 76 | 60 | | | | |

*Data reported as frequency

The four groups used for "Present Job Level" were elementary, middle school-junior high school, senior high school, and junior college-college/university. The "Length of Workshop" was divided into the periods of 1-2 weeks, 3-4 weeks, 5-6 weeks, and 7-8 weeks. The "Visitation to NASA Facility" was divided into the groups of a visit and a non-visit.

The chi-square statistical test, at the .05 level, showed that, between the different participant characteristic categories and the rating of workshop content difficulty of NASA's presentation, no significant relationships were found. A summary of these results is found in Table XIII.

## Research Question Number Six

What relations exist between developing teaching methods and participant characteristics?

To secure data for this research question, items one, two, three, four, five, and ten of the questionnaire were used. The participant characteristics groups for "Sex" were male and female. For "Present Position," the group of teachers was used. The four groups used for "Present Job Level" were elementary, middle school-junior high school, senior high school, and junior college-college/university. The four groups for "Length of Workshop" were 1-2 weeks, 3-4 weeks, 5-6 weeks, and 7-8 weeks. The groups used for "Visitation to NASA Facility" were a visit and non-visit.

The chi-square analysis, at the .05 level, showed a significant relationship existed within the group of teachers and the feeling that the workshop was beneficial to their teaching methods. This means that

TABLE XIII

CHI-SQUARE VALUES REFLECTING RELATIONSHIP BETWEEN PARTICIPANT CHARACTERISTICS AND RATING WORKSHOP CONTENT DIFFICULTY OF NASA'S PRESENTATION

| Participant Characteristic | Too Simple | Too Difficult | Appro-priate | $X^2$ | DF | Critical Value | Level of Sig. |
|---|---|---|---|---|---|---|---|
| Sex | | | | | | | |
| Male | 3* | 4 | 84 | | | | |
| | | | | 1.3 | 2 | 5.99 | N.S. |
| Female | 2 | 9 | 119 | | | | |
| Present Position | | | | | | | |
| Teacher | 4 | 12 | 156 | | | | |
| Supervisor-Curriculum Director-Librarian | 0 | 0 | 14 | | | | |
| | | | | 3.1 | 4 | 9.49 | N.S. |
| Administrator-Counselor | 0 | 0 | 17 | | | | |
| Present Job Position | | | | | | | |
| Elementary | 1 | 9 | 90 | | | | |
| Middle School-Junior High School | 3 | 2 | 42 | | | | |
| | | | | 10.6 | 6 | 12.59 | N.S. |
| Senior High School | 0 | 1 | 56 | | | | |
| Junior College-College/University | 1 | 1 | 13 | | | | |
| Length Of Workshop | | | | | | | |
| 1-2 Weeks | 3 | 4 | 57 | | | | |
| 3-4 Weeks | 2 | 6 | 81 | | | | |
| | | | | 3.5 | 6 | 12.59 | N.S. |
| 5-6 Weeks | 0 | 3 | 60 | | | | |
| 7-8 Weeks | 0 | 0 | 1 | | | | |
| Visitation To NASA Facility | | | | | | | |
| Visit | 1 | 5 | 87 | | | | |
| | | | | 1.3 | 2 | 5.99 | N.S. |
| No Visit | 4 | 9 | 117 | | | | |

*Data reported as frequency

this relationship exists beyond chance factors. The remaining categories of participant characteristics showed no significant relationships. Table XIV indicates these findings.

## Research Question Number Seven

What relations exist between continuing an aerospace workshop in the future and participant characteristics?

To obtain supporting data to this question, items one, two, three, four, five, and eleven of the questionnaire were utilized. Male and female groups were used for the category of "Sex." "Present Position" contained the three groups of teachers, supervisor of teachers-curriculum directors-librarians, and administrators-counselors. The four groups used for "Present Job Level" were elementary, middle school-junior high school, senior high school, junior college-college/university. The "Length of Workshop" was divided into periods of 1-2 weeks, 3-4 weeks, 5-6 weeks, and 7-8 weeks. The "Visitation to NASA Facility" was divided into a visit and a non-visit.

At the .05 level of significance, the chi-square test found no significant relationships exist between continuing workshops in the future and participant characteristics. A summary of this data is found in Table XV.

In summary, this chapter has given the results of the study. The results were given in two sections. The first section gave the frequencies and percentages of the responses to each of the items listed on the questionnaire. The second section dealt with the research questions given in Chapter I. These questions were explained and analyzed by the use of the chi-square statistical test.

TABLE XIV

CHI-SQUARE VALUES REFLECTING RELATIONSHIP BETWEEN PARTICIPANT CHARACTERISTICS AND THE FEELING THAT THE WORKSHOP WAS BENEFICIAL TO TEACHING METHODS

| Participant Characteristic | Yes | No | $X^2$ | DF | Critical Value | Level of Sig. |
|---|---|---|---|---|---|---|
| Sex | | | | | | |
| Male | 83* | 9 | | | | |
| | | | 3.3 | 1 | 3.84 | N.S. |
| Female | 127 | 5 | | | | |
| Present Position | | | | | | |
| Teachers | 163 | 13 | 127.8 | 1 | 3.84 | .05 |
| Present Job Level | | | | | | |
| Elementary | 100 | 3 | | | | |
| Middle School-Junior High School | 42 | 4 | | | | |
| | | | 3.9 | 3 | 7.82 | N.S. |
| Senior High School | 54 | 6 | | | | |
| Junior College-College/University | 13 | 1 | | | | |
| Length Of Workshop | | | | | | |
| 1-2 Weeks | 59 | 5 | | | | |
| 3-4 Weeks | 84 | 6 | | | | |
| | | | 0.7 | 3 | 7.82 | N.S. |
| 5-6 Weeks | 63 | 3 | | | | |
| 7-8 Weeks | 1 | 0 | | | | |
| Visitation To NASA Facility | | | | | | |
| Visit | 89 | 5 | | | | |
| | | | 0.2 | 1 | 3.84 | N.S. |
| No Visit | 122 | 9 | | | | |

*Data reported as frequency

TABLE XV

CHI-SQUARE VALUES REFLECTING RELATIONSHIP BETWEEN PARTICIPANT CHARACTERISTICS AND CONTINUING AEROSPACE WORKSHOPS IN THE FUTURE

| Participant Characteristic | Yes | No | $X^2$ | DF | Critical Value | Level of Sig. |
|---|---|---|---|---|---|---|
| Sex | | | | | | |
| Male | 96* | 0 | | | | |
| | | | 1.4 | 1 | 3.84 | N.S. |
| Female | 133 | 2 | | | | |
| Present Position | | | | | | |
| Teacher | 176 | 2 | | | | |
| Supervisor-Curriculum Director-Librarian | 14 | 0 | | | | |
| | | | 0.4 | 2 | 5.99 | N.S. |
| Administrator-Counselor | 18 | 0 | | | | |
| Present Job Level | | | | | | |
| Elementary | 104 | 0 | | | | |
| Middle School-Junior High School | 46 | 1 | | | | |
| | | | 2.3 | 3 | 7.82 | N.S. |
| Senior High School | 59 | 1 | | | | |
| Junior College-College/University | 16 | 0 | | | | |
| Length Of Workshop | | | | | | |
| 1-2 Weeks | 67 | 0 | | | | |
| 3-4 Weeks | 91 | 2 | | | | |
| | | | 2.9 | 1 | 3.84 | N.S. |
| 5-6 Weeks | 66 | 0 | | | | |
| 7-8 Weeks | 1 | 0 | | | | |
| Visitation To NASA Facility | | | | | | |
| Visit | 92 | 2 | | | | |
| | | | 3.0 | 1 | 3.84 | N.S. |
| No Visit | 138 | 0 | | | | |

*Data reported as frequency

# CHAPTER V

# SUMMARY, FINDINGS, AND RECOMMENDATIONS

## Summary

The purpose of this study was to determine the characteristics of the aerospace education workshop participants in relation to curriculum and instruction utilization after the completion of a workshop in which NASA participated. These workshops were conducted during the summer of 1974. These workshops were selected to give a geographical representation of the United States. NASA participated in 85 aerospace workshops in the summer of 1974. Of this number, 16 aerospace workshops were selected for this study.

The subjects of this study were educators who attended an aerospace workshop in which NASA participated during the summer of 1974. Names and addresses of selected workshop participants were compiled at Oklahoma State University. A total of 373 participants were used in this study.

The Space Science Education Workshop Follow-Up Survey was designed to collect data on the background of the participants and the usage of aerospace curriculum and instruction by the participant. The approved questionnaire was comprised of two sections. The first section was designed to gather data concerning the characteristics of the aerospace education workshop participant. This included sex, present position, present job level, length of workshop, and visitation to a NASA facility.

The second section was concerned with the curriculum and instruction utilization. This section dealt with the use of an aerospace education curriculum guide; incorporating aerospace concepts, on a regular basis, into teaching methods; rating the content difficulty of NASA's presentation; developing better teaching methods; continuing aerospace workshops in the future; and whether fellow workshop participants were using aerospace education materials in their classroom teaching.

The questionnaire, accompanied by a letter of explanation, was mailed to the 373 participants after November 15, 1974. A total of 234 participants returned the survey and were suitable for data interpretation.

The Space Science Education Workshop Follow-Up Survey was answered directly on the questionnaire. Upon receiving the questionnaire, the data were coded and placed on data cards for suitable use in an IBM computer. Frequency counts were tabulated for each question and percentages were made for the total returned questionnaire population. Due to the nominal nature of the data, the chi-square statistical test was used to determine relationships between participant characteristics and aerospace curriculum and instruction utilization.

The following research questions were discussed:

1. What is the use of an aerospace curriculum guide in relation to participant characteristics?
2. What is the incorporation of aerospace concepts in relation to participant characteristics?
3. What amounts of aerospace concepts are being taught in relation to participant characteristics?

4. What is the relation of teaching an aerospace unit to participant characteristics?
5. What is the relation of the workshop content difficulty of NASA's presentation to participant characteristics?
6. What relations exist between developing teaching methods and participant characteristics?
7. What relations exist between continuing an aerospace workshop in the future and participant characteristics?

## Findings

Based on the findings of the study, there is evidence to support the following conclusions:

1. The majority of the aerospace workshop participants were female.
2. Over seventy-six percent of the participants were teachers. Supervisors of teachers, curriculum directors, counselors, librarians, and administrators comprised five percent or under of the population.
3. Over forty-four percent of the participants were employed at the elementary level. Junior high school and senior high school level participants comprised sixteen and twenty-five percent of the study population. Middle school, junior college, and college/university each made up approximately six percent or under of the population.
4. Sixty-five percent of the workshops were held for a period of two or three weeks. About twenty-four percent of the workshops were held for a period of six weeks. The periods

of one, four, five, seven, and eight weeks each comprised four percent or under of the total.

5. The majority of the aerospace workshop participants did not visit a NASA facility.
6. In relation to the use of an aerospace curriculum guide, over sixty-seven percent of the participants did not use one. When considering the different participant categories, no significant relationships were found. This implies that the different categories of participant characteristics responded in a similar manner.
7. Over fifty-one percent of the participants were incorporating aerospace education concepts into their teaching on a regular basis. When considering the different participant characteristics, no significant relationships existed. This means that the different categories of participant characteristics responded in a similar fashion.
8. Of those incorporating aerospace concepts, over eighty-four percent of the participants did for an average amount of zero to two hours per week. This represents a relationship beyond chance factors with relation to the group of teachers, and between males and females.
9. Over fifty-two percent of the participants are incorporating a unit on aerospace education. Analysis showed this to be a relationship beyond chance factors among teachers. Of those participants who were teaching an aerospace unit, the majority were using or plan to use a resource person, films, resource materials, and activity

units. Of those participants who are not teaching a unit, the majority plan to teach an aerospace unit in the future.

10. In rating the workshop content difficulty of NASA's presentation, over eighty-seven percent of the participants rated the presentation "appropriate." Analysis showed that the categories of participant characteristics rated the presentation in a similar manner.
11. Over ninety percent of the participants felt the aerospace education workshop was beneficial to their teaching methods. This was shown to be a relationship beyond chance factors among teachers. The remaining categories of participant characteristics showed a similar response.
12. The vast majority of over ninety-eight percent of the participants wanted to see aerospace education workshops continued in the future. Analysis showed the different categories of participant characteristics responded in a similar manner.
13. The majority of the aerospace workshop participants thought their fellow workshop participants were teaching aerospace education.

## Recommendations

While this study has established the relationships of aerospace workshop participant characteristics to aerospace curriculum and instructional utilization, it is hoped that research in this area of education will continue.

In regard to workshop practices, the following recommendations are made:

1. Continue conducting aerospace education workshops across the United States.
2. Provide workshop experiences that include a visit to an aerospace facility.
3. Due to the low enrollment in aerospace education workshops, provide for more college and university participants.
4. Due to the low enrollment in aerospace education workshops, provide for better representation of supervisors of teachers, curriculum directors, and administrators.
5. Provide for advanced aerospace workshops based on the present model.
6. Continue to have NASA participate in aerospace education workshops.
7. Place more stress on classroom activities and teaching methods.

On the basis of the results of this study and personal observations of this writer, the following recommendations are made regarding the workshop participants:

1. In order to promote aerospace education, more classroom visits by the workshop directors after the completion of the workshop should be employed.
2. With the aid of an aerospace curriculum guide, have the workshop participants develop an aerospace activity and/or unit for their classroom.
3. In order to provide better instruction in the aerospace

education workshops, better classification of aerospace classroom activities that are used by teachers should be developed.

Recommendations for future research are:

1. In order to design and describe aerospace education workshops, a more detailed analysis between the different participant characteristic categories should be constructed.
2. A more detailed analysis within each group of participant characteristics should be made to better describe the aerospace education workshop.
3. A mid-school-year and end-of-school-year workshop evaluation should be made, to better meet the needs of the teachers who will participate in an aerospace education workshop.

The purpose of this study has been to describe aerospace education workshops across the United States. This study has described the aerospace curriculum and instruction utilization after the completion of an aerospace education workshop in which NASA participated. This information will help future aerospace education workshops meet the needs of the classroom teachers and meet the objectives of NASA and aerospace education.

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# APPENDIX A

# PARTICIPANT QUESTIONNAIRE

SPACE SCIENCE EDUCATION WORKSHOP

FOLLOW-UP SURVEY

DIRECTIONS: To aid us in understanding the characteristics of the space science education workshop, please respond to all of the statements or questions to the best of your knowledge. After you have completed the survey, please return the survey immediately in the addressed and stamped envelope provided. Names are <u>not</u> needed. Thank you for taking time from your busy schedule to respond to the survey.

1. _____Male _____Female

2. What is your primary responsibility in your present position?

_____Teacher _____Counselor

_____Supervisor of Teachers _____Librarian

_____Curriculum Director _____Administrator

_____Other_____

3. At which of the following educational levels do you presently work?

_____Elementary _____Senior High School

_____Middle School (Official title) _____Junior College

_____Junior High School _____College/University

4. What was the length of your workshop?

_____One Week _____Six Weeks

_____Two Weeks _____Seven Weeks

_____Three Weeks _____Eight Weeks

_____Four Weeks _____Other_____

_____Five Weeks

5. Did your workshop visit a NASA facility?

_____Yes _____No

6. I am now using an aerospace education curriculum guide.

_____Yes _____No

7. I am incorporating aerospace education concepts on a regular basis into my teaching methods.

_____Yes _____No

If "Yes," then please check the average time per week.

_____0-1 Hour

_____1-2 Hours

_____2-3 Hours

_____3-4 Hours

8. I am presently teaching or have taught a unit dealing with aerospace education.

_____Yes _____No

If "Yes," please mark the following blanks that apply.

_____a. I have or am planning a field trip in connection with the unit.

_____b. I have had or plan to have a resource person in the classroom.

_____c. I have used films or plan to use films.

_____d. Students are using resource material other than the text.

_____e. Enough material is in our textbook to teach the unit.

_____f. Students have or will be engaged in activity units.

If "No," please mark the following blanks that apply.

_____a. Students find aerospace education to be non-interesting.

_____b. My building principal does not approve of this type of activity.

_____c. Time and space are not adequate for such a course.

_____d. I do not have enough science background for such a course.

_____e. I have enough time and background but am just not interested.

_____f. I plan to teach an aerospace unit in the future.

9. In general, how would you rate the content of NASA's presentation for your use?

_____Too Simple _____Too Difficult _____Appropriate

10. I feel my aerospace education workshop was beneficial in developing my teaching methods.

_____Yes _____No

11. I would like to see aerospace education workshops continue in the future.

_____Yes _____No

12. To your knowledge, are any of your fellow workshop participants using any of the aerospace education materials in their classroom teaching?

_____Yes _____No _____Do Not Know

Please feel free to make additional comments.

# APPENDIX B

## COVER LETTER TO PARTICIPANTS

October 31, 1974

Dear Aerospace Workshop Participant:

For the past five years, Oklahoma State University has provided personnel and management activities to the National Aeronautics and Space Administration for the Space Science Education Project. One of the most important of these activities has been the space science education summer workshop.

Your participation is requested in a study to aid us in better understanding the characteristics of the space science education summer workshop. Your response to the enclosed short questionnaire will assist us in planning future workshops to better meet the needs of the teachers.

As a participant of a 1974 space science education summer workshop, you are asked to fill out the survey to the best of your knowledge. After you have filled out the survey, please return the survey immediately in the addressed envelope. Postage has been paid.

We sincerely appreciate your cooperation.

Kenneth E. Wiggins
Space Science Education Project Director

Steven K. Marks
Space Science Education Specialist

# APPENDIX C

## LIST OF SELECTED WORKSHOPS

## Selected Workshops

Baldwin-Wallace College, Berea, Ohio

Central Washington State College, Ellensberg, Washington

Kansas State Teachers College, Emporia, Kansas

Kearney State College, Kearney, Nebraska

Louisiana Tech University, Ruston, Louisiana

Nicholls State University, Thibodaux, Louisiana

Northeast Louisiana University, Monroe, Louisiana

Northwest State College, Natchitoches, Louisiana

Pacific College of Fresno, Fresno, California

University of Albuquerque, Albuquerque, New Mexico

University of Hawaii, Honolulu, Hawaii

University of Nevada, Las Vegas, Nevada

University of Redlands, Redlands, California

University of Wisconsin, River Falls, Wisconsin

Washburn University, Topeka, Kansas

Yanton College, Yanton, South Dakota

# APPENDIX D

## QUESTIONNAIRE RESPONSES OF INTERVIEWED PARTICIPANTS

Questionnaire Responses of Interviewed Participants

Item One
3* Female 2 Male

Item Two
5 Teachers

Item Three
3 Elementary 2 Senior High School

Item Four
5 Three Weeks

Item Five
5 No

Item Six
1 Yes 4 No

Item Seven
5 No

Item Eight
2 Yes 3 No

| If "Yes" | | If "No" | |
|---|---|---|---|
| 1 | a. | 0 | a. |
| 2 | b. | 0 | b. |
| 2 | c. | 1 | c. |
| 2 | d. | 1 | d. |
| 0 | e. | 0 | e. |
| 2 | f. | 3 | f. |

Item Nine
5 Appropriate

Item Ten
5 Yes

Item Eleven
5 Yes

Item Twelve
1 Yes 4 Do Not Know

*Data reported as frequency

VITA

Steven Ken Marks

Candidate for the Degree of

Doctor of Education

Thesis: AEROSPACE CURRICULUM AND INSTRUCTION UTILIZATION AFTER THE COMPLETION OF AN AEROSPACE EDUCATION WORKSHOP IN WHICH NASA PARTICIPATED

Major Field: Higher Education

Biographical:

Personal Data: Born in Lincoln, Nebraska, October 16, 1947, the son of Leslie Richard and Lucille May Marks.

Education: Graduated from Roosevelt High School, Emporia, Kansas, in 1966; received the Bachelor of Science in Education degree from Kansas State Teachers College, Emporia, Kansas, with a major in Physical Science in May, 1970; received the Master of Science degree from Kansas State Teachers College, Emporia, Kansas, with a major in Physical Science in August, 1971; attended Oklahoma State University, Stillwater, Oklahoma, from June, 1973, until July, 1975; completed the requirements for the Doctor of Education degree at Oklahoma State University in July, 1975.

Professional Experience: Graduate assistant, Kansas State Teachers College, Emporia, Kansas, 1970-1971; junior high science teacher at Milburn Junior High School, Overland Park, Kansas, 1971-1973; graduate research assistant, Research Foundation, Oklahoma State University, Stillwater, Oklahoma, 1973-1975.