Commonwealth of Kentucky

EDUCATIONAL BULLETIN

IN-SERVICE CONFERENCES FOR THE IMPROVEMENT OF SCIENCE INSTRUCTION

A TEACHER EDUCATION PROGRAM

Published by
DEPARTMENT OF EDUCATION
ROBERT R. MARTIN
Superintendent of Public Instruction
Frankfort, Kentucky

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IN-SERVICE CONFERENCES FOR THE IMPROVEMENT OF SCIENCE INSTRUCTION

TEACHER EDUCATION REPORTS ON SCIENCE

"Announcing . . . Scholarships for Teachers"
Robert R. Martin
Louise Combs

"Let's Teach Science"
University of Kentucky Conference
Mary Marshall

"Improving Science Instruction"
Eastern Conference
Harry Banks

"Improving Science Teaching"
Morehead Conference
Frank Vittetow

"Science Work Conference"
Western Conference
Ethel Barnard

"Improving Science Teaching"
Murray Conference
Eugene Russell

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Mary Marshall

Division of Teacher Education and Certification
BUREAU OF INSTRUCTION
Kentucky State Department of Education

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FOREWORD

This publication, IN-SERVICE CONFERENCES FOR THE IMPROVEMENT OF SCIENCE INSTRUCTION, is an outgrowth of five regional in-service conferences on the improvement of science instruction sponsored by the Division of Teacher Education and Certification, Bureau of Instruction. The publication has been developed from the five reports prepared by the directors of the five regional conferences. These conferences in which 510 persons participated were made possible by a grant from the National Science Foundation. This support provided impetus for our over-all effort to "advance education in Kentucky." This state-wide enterprise has made it possible to place science in its proper perspective in the total school curriculum.

It is my hope that this publication will be considered a resource book for planning science programs and that it will be used extensively in the local school systems. Furthermore, it contains very significant implications for teacher education programs. The attitude and spirit of cooperation which was reflected in the endeavor in science instruction improvement gives assurance that the advance made in these five regional conferences will be diffused throughout the state in local schools and in teacher education programs. This is my hope. Let us all work together to meet one of the imperative needs of our times.

ROBERT R. MARTIN
Superintendent of Public Instruction

ACKNOWLEDGEMENTS

This record of progress for the improvement of science instruction in Kentucky's schools could not have been possible without the support and cooperation of the local school systems, the staffs of the science and education departments of the teacher education colleges and universities, and of local industries. The importance of the unique contribution of each participant is recognized and a listing of the individual participants was included in the report of each regional work conference. Because of numerous requests, the list of program personnel is again included in this publication.

Finally, the staff of the Division of Teacher Education and Certification expresses very special appreciation to one of its members, Mrs. Mary Marshall for carrying the major responsibility in preparing this publication from the five regional reports which were prepared by the five Consultants on In-Service Teacher Education.

LOUISE COMBS, Director
Division of Teacher Education and Certification

INTRODUCTION

An awakening of a deeper interest in improving science on a state-wide basis had its beginning in the South Eastern conference on the Improvement of Science held at Gainesville, Florida, in the autumn of 1954. A group of six persons from Kentucky participated. This group took the lead back home for planning a state conference on science for the summer of 1955. This conference brought together high school teachers, science teachers, college science teachers, professional education teachers, and administrative and representatives of the State Department of Education. This conference was supported by funds made available from the Governor's emergency fund. One significant outcome was the organization of the Kentucky Science Teachers Association in the spring of 1956, which has cooperated in helping to provide personnel for local and area conferences on science. In the summer of 1956 a second workshop was financed by funds from the Governor's emergency fund. An important follow up of this conference was the appointment of a Steering Committee to work with the staff of the Division of Teacher Education and Certification in studying ways for continuing efforts on a state-wide basis for science improvement. It was out of this effort that the plan for five regional conferences within the state and the summer institute emerged, together with the request to the National Science Foundation. The plans for five In-Service conferences were designed to carry out the purposes for which a National Science Foundation grant was secured. These plans were consistent with the "way of working" followed by the In-Service staff in improving instruction in other areas of the curriculum.

There evolved from the second state conference in the summer of 1956 a belief that including science programs in the elementary grades is basic to any improvement program at the secondary and college levels. A second belief on which planning was done is that a teacher does not work in a vacuum and that her behavior is influenced by her environment. Her teaching environment is determined by the attitude of the administrator, total school faculty, the community, and the local community. These elements were considered in the Kentucky plan. The planning of the conferences took these beliefs into consideration. The content of this bulletin also reflects these beliefs.

The major purposes of this publication are to: (1) provide a record of "a way of working" that has been effective in creating a climate conducive to quality science programs. (2) provide information regarding the growth, trends and processes being used for improving science instruction programs. (3) provide a resource file on suggestions, consultants, and other sources for future planning for science programs. (4) stimulate wide spread development of the understanding of the importance of the role of the school in this scientific age.

Finally, the publication provides a means for wide spread communication to all persons who participated in this endeavor and to all other interested persons.

Plans are under way for a continuing program of communication and cooperation among school systems, colleges, National Science Foundation, the State Department of Education, and the State Study Committee on Science.

MARY S. MARSHALL, Consultant
In-Service Teacher Education

LOUISE COMBS, Director
Division of Teacher
Education and Certification

THE KENTUCKY PLAN

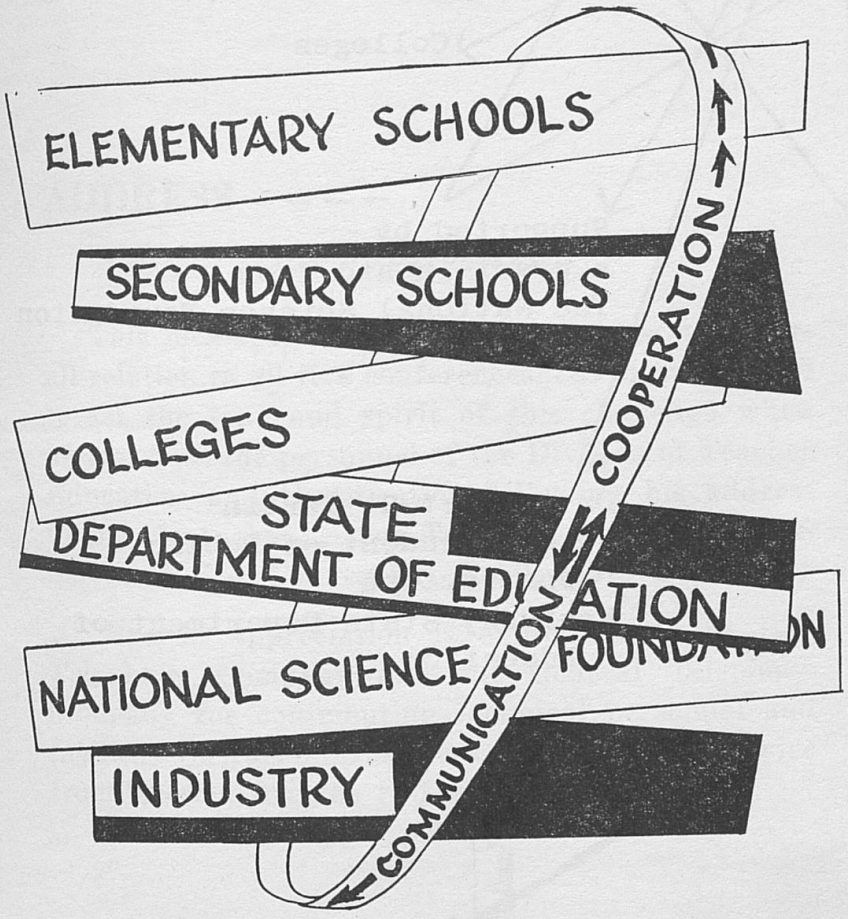
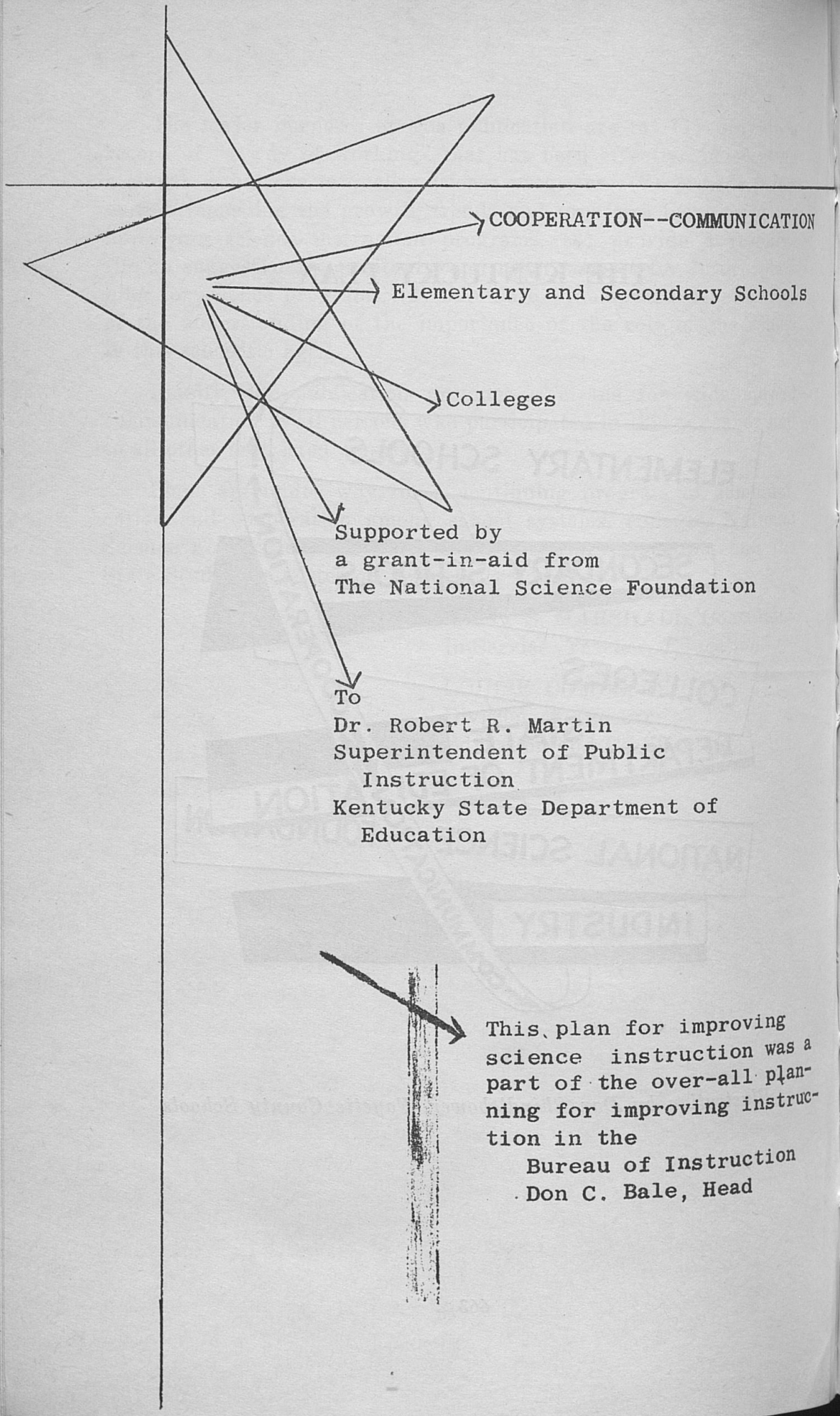


Illustration by Dan Shindlebower, Fayette County Schools



Supported by
a grant-in-aid from
The National Science Foundation

To
Dr. Robert R. Martin
Superintendent of Public
Instruction
Kentucky State Department of
Education

This plan for improving science instruction was a part of the over-all planning for improving instruction in the
Bureau of Instruction
Don C. Bale, Head

ADDRESS – – – –

DR. JOHN MAYOR

This message, as the reader will note has overall relation to all five conferences. Dr. Mayor helped to set the tone and spirit of this challenge when he met with the personnel of the Division of Teacher Education and Certification following his address to the Kentucky Science Teacher's Association during the K.E.A. Convention, April, 1957.

Special appreciation is expressed to the Bell Telephone Company and the General Telephone Company for contributing technical personnel and facilities for this unusual presentation by direct wire from **Tuscon, Arizona** to **Lexington, Kentucky.**

THE CHALLENGE OF SCIENCE TO EDUCATION

Dr. John Mayor, Director

Science Teacher Improvement Program

National Science Foundation

Dr. Mayor's address was brought to a general session of the University of Kentucky Conference by direct wire from Tuscon, Arizona by the courtesy of Mr. L. E. Franklin, Southern Bell Telephone Company and Mr. A. F. Boyd of the General Telephone Company.

I am very sorry that I cannot be with you today, and not even next Saturday* as much as I would like to be in Kentucky then. On the other hand this is a great privilege and inspiration to be able to be here in Arizona sunshine, looking out at the fabulous Catalina mountains, and to speak to you in the heart of the Kentucky Bluegrass country.

The fact that I can do this, in itself, places in a very objective form, the most important message for you as you take your first step in the study of great national significance. This message is that we know in 1957 sciences have a much more important place in our lives than ever before and that science in our schools has a new and important place. Science brings to all of us great privileges, but it also brings to all of us new problems and to science teachers new responsibilities and you should approach your problem from the **point of view that the great success in America which has brought us these new problems and new challenges is a part of your doing as teachers and your success as teachers.**

Do not be concerned because some may say the quality of science teaching is poor. This is true only **in the terms of the job that you have to do for the future and not what you may have done in the past.** I hope that you realize in Kentucky that you are a very fortunate group for many reasons. One of these is that you have been singled out from all of the states, in Kentucky to show to the Nation that you have a sound approach to the improvement of science teaching in the one which has been planned for you by your leaders in education and science there.

*Derby Day

To the best of my knowledge the grant which has come to you from the National Science Foundation has two "firsts" associated with it. It is the first grant from the National Science Foundation to a State Department of Education so far as I know, and it is the first grant to a group which is also considering the improvement of science teaching at the elementary level.

Many proposals come to the National Science Foundation and many I know have come to them during the past year from the various states. The concept of your study there in Kentucky first of all sponsored by the State Department of Education and then working with you and top scientists in the state from the University of Kentucky and from the other state colleges and leaders in the Kentucky State Science Teachers Association, in the belief of those interested in the improvement of science teaching in Washington, is the kind of working group from which real solution to the problem can come. Also, I think one of the strengths of your proposal from Kentucky is the fact that you tried with groups of teachers from all levels to set yourself a goal of looking at the science curriculum from kindergarten through grade 12 and that your goal includes making a better science program for general education and a better science program for those who will be the scientific leaders of tomorrow.

Since I represent the American Association for the Advancement of Science which is the great national organization of scientists including some 75,000 members in the United States, I think my best contribution to you would be to emphasize some of the things which scientists want from science teachers at the pre-college level and to which they look to you for leadership. Some of these things are:

(1) Less emphasis on life adjustment and need as it is seen and interpreted by the pupil and more emphasis on the value of the ideas which make our civilization great and on which significant life achievement can be based.

(2) Students better prepared for college and more desire on the part of the more capable to go to college.

(3) At least full recognition for scholarly achievements with athletics and other extra curricular activities.

(4) Less fear of ability grouping. (I think if we are going to do what we must do for all of the students in our schools of science, we probably cannot do this without some form of ability grouping.)

(5) A better school program for the more gifted, say the upper forty percent with an emphasis on the study and scholarship for its own sake and a special effort to create in our boys and girls a love of learning.

(6) Teachers better prepared in the subject in which they teach and in-service programs which help teachers keep up with subject matter. (I know you have such programs in Kentucky.)

(7) Teachers with the status of scholars in their school and community.

Now, I know, with you, this is a big assignment, but I know also that you can accomplish it. One of my favorite Americans is Ralph Waldo Emerson, and I think I would like to quote to you a little bit from his Journal which he wrote some one hundred and thirty-four years ago. In the Journal Ralph Waldo Emerson wrote—he was keeping a sort of diary as he traveled around the country. This is what he wrote: "This country is daily rising to higher comparative importance and attracting the eyes of all of the rest of the world to the development of its embryo greatness." Now we know that the country, America, has already achieved this greatness. I look upon our American educational systems, however, as a great experiment of world wide significance and I think that in American education we are just at the state of embryo greatness. A little later in 1854 Emerson wrote in his journal, "I am here to represent humanity, it is by no means necessary that I live, but it is by all means necessary that I should act rightly." To me you will find, people in Kentucky, this program that you are starting on, represents American education and I do not want to make it seem too difficult for you, but I believe that you can say as Emerson said in that last line, "it is by all means necessary that you act rightly at this time."

The National Science Foundation and other groups in Washington have great confidence in you. We know you can do this. We will be watching. We know as you succeed that you will have much more fun as a teacher and that you will have much greater satisfaction that comes from all teaching. The best of luck in the world to you all.

OBJCTIVES OF THE REGIONAL IN-SERVICE CONFERENCES ON SCIENCE INSTRUCTION – GRADES 1-12

1. To create a better understanding of the importance of science teaching at the local level
2. To develop better communication between in-service and pre-service training for the improvement of science teaching
3. To enable as large a group of participants as possible to be involved in a program for science teaching improvement
4. To evaluate the use of material and methods used for science instruction at the local level in order to provide a basis for continued study at the State-wide Summer Institute.

Planning and Coordinating

by

The Division of Teacher Education

and Certification

Miss Louise Combs, Director

Mr. Sidney Simandle, Assistant Director

Mr. William C. Sanders, Supervisor of Certification

Mrs. Mary S. Marshall, In-Service Consultant

*Mr. Harry Banks, In-Service Consultant

Miss Ethel Barnard, In-Service Consultant

Mr. Eugene Russell, In-Service Consultant

Mr. Frank Vittetow, In-Service Consultant

Each in-service consultant had the responsibility for the coordination and direction of the conferences in cooperation with Regional Planning Committee.

**Mr. Banks now serves as superintendent of the Pikeville School System and Mr. James Brown is serving as In-Service Consultant.*

IMPROVING SCIENCE INSTRUCTION

The regional conferences were held at the following colleges—

Morehead State College
Morehead—April 26-27

Eastern Kentucky State College
Richmond—May 2-3

University of Kentucky
Lexington—May 2-3

Western Kentucky State College
Bowling Green—May 2-3

Murray State College
Murray—May 4-5

Each conference was sponsored by the State Department of Education in cooperation with a local planning committee of the college staff and others.

COOPERATING COLLEGES

In addition to the five host institutions all colleges and universities which prepare teachers contributed to the success of the conferences.

Asbury College
Ashland Junior College
Bellarmine College
Berea College
Bethel College
Bowling Green College of Commerce
Brescia College
Campbellsville College
Caney Junior College
Centre College
Cumberland College
Georgetown College
Kentucky State College
Kentucky Wesleyan College
Lees Junior College
Lindsey Wilson College
Loretto Junior College
Midway Junior College
Nazareth Junior College
Nazareth Senior College
Paducah Junior College
Pikeville College
St. Catharine Junior College
Sue Bennett College
Transylvania College
Union College
University of Louisville
Ursuline College
Villa Madonna College

SYNOPSIS OF THE FIVE PROGRAMS

The following common threads were a consistent part of the planning and operation of the five conferences:

1. Participants from all levels of science teaching

2. Problems and concerns of teachers

3. Program topics for addresses and panels

4. Processes for learning

5. Emerging concepts

6. Recommendations and evaluation

7. Program personnel

8. Regional planning committees

RANGE OF PARTICIPATION

Planning For The Conferences	Representatives From
	15 Colleges
	10 Staff Members of the State Department of Education
	52 Local School Systems

Program Personnel

	14 Colleges of the State
	4 Industries
	40 Local School Systems
	12 Staff Members of the State Department of Education
	1 Staff Representative National U.S. Office of Education
	1 Representative of the National Science Teacher Improvement Program (Dir.)
	1 Staff Member from University of Tennessee
	1 Staff Member from George Peabody College

Total Registered Attendance

Classroom Teachers, Grades 1-12 (Public and Private)	245
Supervisors and Administrators	76
College Staff	100
College Students	55
State Department of Education	15
Industry and others	19
Grand Total	510

PROBLEMS AND CONCERNS OF TEACHERS

In keeping with the invitation to each local system, the teacher nominated as a participant, along with the local superintendent and a science committee, listed the major science instructional concerns and problems and submitted these to the over-all planning committee. Many of these problems were common to all five geographical areas. Some of these were:

What constitutes a good elementary and secondary science program?

What are the latest materials available for teaching science effectively?

What resources are available for enriching science teaching?

What criteria should be used in developing a well balanced program in grades one through 12?

Should science be a basic part of the elementary curriculum?

What is the purpose of science in the elementary curriculum?

What does elementary science contribute to child growth and development?

How can a science program be provided which will be adequate for students of varying abilities?

How can interest in science be created on the part of junior high school students?

How can science experiences which grow out of children's real interests be provided?

How can children be guided into doing research on their own science problems?

What are the broad scientific principles which should provide guidelines for setting up objectives at each grade level?

... 245
... 76
... 100
... 55
... 15
... 19
... 510

PROGRAM TOPICS

Keynote addresses and panel topics were focused on the problems, concerns, and interests of participants. The topics included:

OVER VIEW OF THE PROBLEMS OF SCIENCE INSTRUCTION

- Improvement of Science Instruction in the Elementary School
- Improvement of Science Instruction in the Secondary School

THE SCIENCE TEACHING IMPROVEMENT PROGRAM

TRENDS AND CURRENT PRACTICES IN SCIENCE EDUCATION

- Building Concepts and Vocabulary in Grades One Through 12
- Building Critical Thinking Through Science Teaching
- Materials and Experiences for Teaching Science Effectively
- Scope and Sequence in Science from First Through Twelfth Grade
- The Use of Audio and Visual Materials
- Utilizing Community Resources in a Science Program
- Finding Ways to Tie Science in the Classroom to Every Day Living

CHALLENGES TO PRE-SERVICE TEACHER PREPARATION

THE FORWARD LOOK IN IMPROVING SCIENCE TEACHING

PROCESSES FOR LEARNING

A variety of processes consistent with what modern psychology reveals about how learning takes place and how attitude and behavior are changed were used. Typical of these processes were:

1. Identifying real concerns, needs, and instructional problems of participants
2. Building agenda on basis of concerns, interests, and suggestions of participants
3. Planning cooperatively—democratically
4. Providing lectures as springboard for discussion
5. Using group dynamics as process for exploring ideas of all in group discussion
6. Arranging panel discussions for exchange of viewpoints
7. Experiments to demonstrate the discovery approach
8. Providing for representatives from many groups directly and indirectly interested in Science to share ideas
9. Using audio visual aids—exhibits provided by local systems, colleges and industry
10. In the process of evaluation provision was made for follow-up in the Summer Institute and In-Service programs at all levels during the summer and the coming year.

MYTHS EXPLODED . . . CONCEPTS EMERGED

There is reflected in the Conference reports and evaluations evidence that the following concepts emerged and were generally accepted:

MYTH: That the science program is primarily for those who show promise of becoming scientists.

CONCEPT: Science can help develop educated citizens and help develop people who can live more effectively in a scientific age—science can contribute to the development of all citizens.

MYTH: That science corners and collections of things in the elementary school is science.

CONCEPT: That science is a study of problems that are found wherever children live—study of problems that pop into the curious minds of children as they live and wonder and grow from day to day.

MYTH: That junior high school students are just not interested in science.

CONCEPT: It is the teacher who needs to be motivated so that her knowledge of science and her way of teaching science will become an inspiration which will spark the latent and natural interest junior high school students have in science and their environment.

MYTHS EXPLODED . . . CONCEPTS EMERGED

MYTH: Science teaching as an integral part of the curriculum should begin at the junior high school level.

CONCEPT: Science teaching should begin with the first grade and continue throughout the elementary program as recommended in 1932 in the 31st Yearbook of the National Society for the Study of Education by Gerald Craig and others.

Other emerging concepts accepted by the Conference participants as significant:

CONCEPT: The curriculum reflects the needs and interests of the community. The school needs the understanding and support of the community, if the program for improving the quality of instruction is to be successful.

CONCEPT: The program of improving the quality of science instruction will improve to the degree that teachers improve their skill of cooperation in uniting all forces for the improvement program.

CONCEPT: We learn by interaction—by working together.

CONCEPT: Science teaching can be exciting, interesting, and creative.

RECOMMENDATIONS

The following list is a **partial** compilation of those recommendations—coming from the group reports and post meeting evaluation forms. This partial list has major implication for the In-Service Staff in planning in the near future with cooperating groups for continuing improvement in science teaching.

(1) That representatives from the five work conferences work together toward the compilation of a Guide of Science Study on a state-wide level. (The guide should be organized on levels of elementary, junior high and senior high, including a list of concepts to be developed at each level for the students.)

(2) That colleges provide assistance in the following areas: Field service, consultant service, clinics, area meetings for assisting teachers with special problems.

(3) That a minimum list of equipment needed for effective science teaching be developed by a state-wide committee.

(4) That there be reorganization of courses in some of the preparation programs for science teachers. (Elementary teachers need help in presenting science concepts to the children of this age group. High school teachers need help in understanding how to work with all children on developing each child's potential as an individual and member of an interdependent society.)

(5) That local and regional science workshops be held throughout the state in the near future and that mathematics be included.

RECOMMENDATIONS

(6) That help be provided in workshops, other in-service activities and in pre-service preparation in more closely relating language arts to science teaching.

(7) That a unified approach be made in planning and administering the science program, grades one through twelve.

(8) That the science curriculum be developed to fit the growth pattern of children. (The methods and materials presented for science instruction should not be identical at the elementary, high school, and college levels.)

(9) That the colleges take steps to implement the recommendations for clinics to be held on problems identified by teachers of local systems.

POST MEETING EVALUATION

The planning committee felt that if the Conference really met the objectives outlined, there would be change in behavior of the participants as related to improving science instruction. The committee created an evaluation sheet (see page 737) as a basis for securing evidence from the participants. The evaluation sheet was sent to each participant several weeks after the close of the conferences. The evidence compiled from the post meeting evaluations indicates that participants from all levels of education have made changes and are planning for further change as a result of their conference experiences. The following are typical of replies received from all across the state:

(1) The participants have reported to their administrators, supervisors and other teachers on the proceedings of the Conference.

(2) Planning has been done with PTA and other local service groups for support in improving the science teaching program.

(3) The teachers at all levels are cooperatively evaluating the learning experiences provided for students at all levels, grades one through twelve and college.

(4) New courses of study or guides are being developed cooperatively by the staffs in the local systems.

(5) Plans have been made for total staffs to evaluate the science curriculum through in-service workshops, faculty meetings and committee meetings throughout the year.

These back home activities reflect a change in attitude about the importance of science and the approach for the improvement of science teaching.

From the post meeting evaluation sheets the committee has received valuable ideas and suggestions in regard to just what the participants consider the strengths of these five conferences, the weaknesses and the ways to improve subsequent conferences. The evaluations reflected the following:

Strengths

(1) The inclusion of participants from all grades, one through twelve, and from the colleges which prepare teachers

(2) The way the conferences were planned and organized

(3) The excellent addresses

(4) Materials and demonstrations

(5) The high level interest and enthusiasm on the part of participants

(6) The variety of learning experiences provided

(7) The group discussion periods.

Weaknesses

(1) Conferences too short—should have lasted from three to five days.

(2) More teachers should have been included.

(3) There were not enough lectures.

(4) Too limited time for group discussion.

(5) Too few school administrators included.

Ways to Improve Next Conference

(1) Have more visiting lecturers

(2) Extend the time

(3) More discussion of elementary science

(4) Make tape recordings of each lecture and make a copy available to each participant

(5) Double number of participants

(6) More time for the discussion groups to work together so that each teacher may have his or her concern discussed—groups according to levels of teaching and subject areas as well as "across the board" groups.

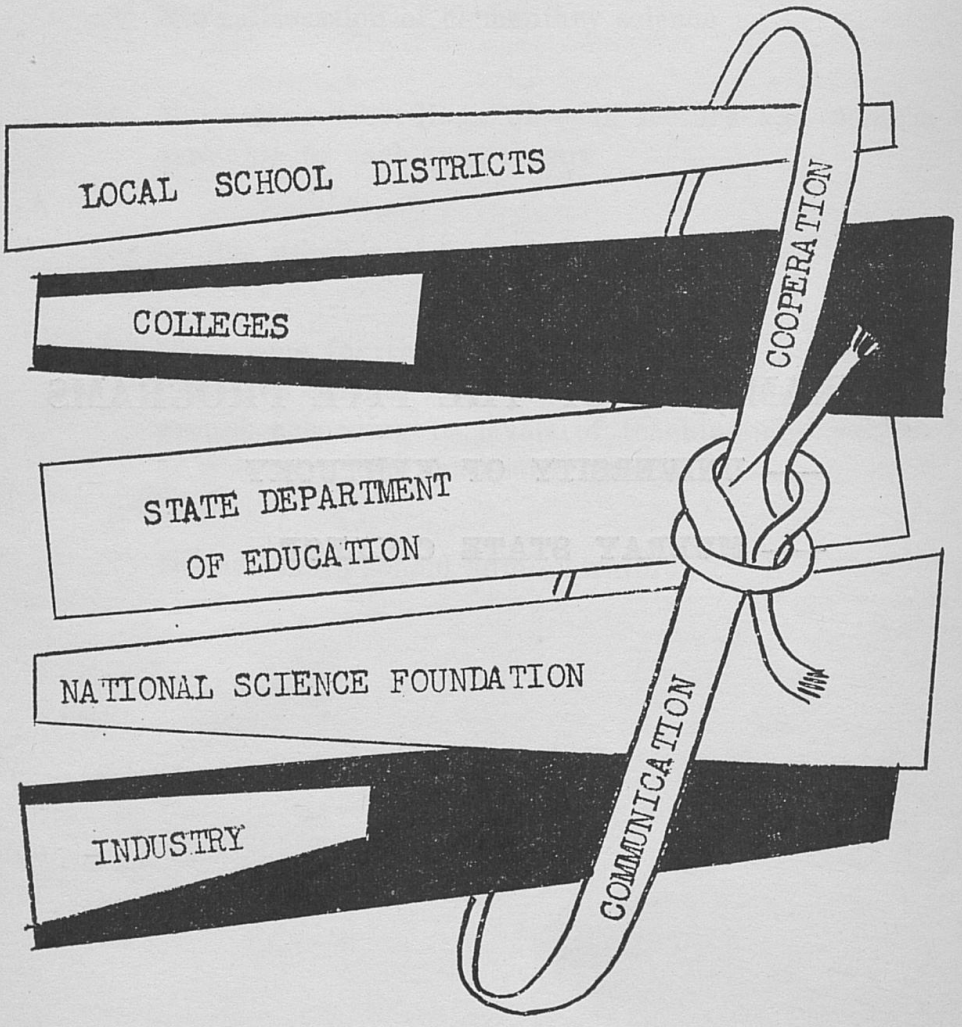
(7) Include more school administrators.

TWO EXAMPLES OF THE FIVE PROGRAMS

—— UNIVERSITY OF KENTUCKY

—— MURRAY STATE COLLEGE

LET'S TEACH SCIENCE



UNIVERSITY OF KENTUCKY MAY 2-3

"LET'S TEACH SCIENCE"

Regional Work Conference on Science Instruction

Sponsored by

National Science Foundation

College of Education
University of Kentucky
Lexington, Kentucky

May 2-3, 1957

Central In-Service Region
Division of Teacher Education and Certification
Kentucky State Department of Education

PROGRAM AT A GLANCE

	Thursday	Friday
Morning	9:00—Registration 10:00—General Session Overview–Grades 1-12 11:45—Break 12:00—General Session Dr. John Mayor 12:30—Lunch	9:30—General Session Secondary Schools 12:30—Lunch
Afternoon	1:30—General Session Elem. School 3:00—Break 3:15 to 4:00—Exhibits and Demonstrations	1:00—Group Discussion 2:15—General Session Summary 3:00—Adjourn
Evening	5:45—Social Hour Box Lunch Supper 6:30—Film 7:00—Adjourn	

PROGRAM

College of Education Auditorium
Thursday — 9:00 — 12:00

9:00 Registration

10:00 General Session — Orientation
Presiding — Mrs. Mary S. Marshall
State Department of Education

Greetings — Dr. Robert R. Martin
Superintendent of Public Instruction

Dr. Frank G. Dickey, President
University of Kentucky

Panel Discussion — "Overview of the Problems of Science Instruction — Grades 1-12"

Dr. Lyman Ginger, Chairman	University of Kentucky
Mrs. Alice Strange	Franklin County
Dr. Herbert Riley	University of Kentucky
Dr. Lyle Dawson	University of Kentucky
Dr. Robert Boyer	University of Kentucky
Dr. Paul Ray	Asbury College
Dr. Noah Turpen	Fayette County

Question Periods directed by:
Mr. Sidney Simandle
State Department
Mr. James M. Yonts
Transylvania College
Mr. Howard Lusk
University of Kentucky

12:00 Donovan Hall Cafeteria

Address by: Dr. John Mayor, Director
Science Teaching Improvement Program
(Speaking by direct wire from Tucson, Arizona)

Question Period

12:30 Lunch

TWO DAY SCIENCE WORKSHOP

9:0

10:0

May 2-3, 1957

10:3

11:3

12:0

SCIENCE BUILDING
Room 221

1:3

2:3

MURRAY STATE COLLEGE
Murray, Kentucky

2:5

4:3

Director: Eugene Russell

6:3

THURSDAY

9:00—Registration and Coffee Hour

10:00—Welcome — Dr. Woods
Announcements
Introductions

10:30—Address: What Science Shall We Teach in Elementary Through High School?
Dr. Elsworth Obourn,
Science Specialist
U. S. Office Education
Washington, D. C.

11:30—Discussion

12:00—Lunch

1:30—Panel Discussion: Building Concepts and Vocabulary
Chairman, Dr. Hunter Hancock,
Fred Schultz, B. J. Tillman, Frances Lashbrook, Ardath Canon, Wesley Kemper, Minerva Hill

2:30—Intermission

2:50—Discussion

A. Is there a best sequence in science from first through twelfth grade?

B. How much depth is desirable at each level?

C. What techniques have been most successful in your teaching?

D. What ways can be used to tie science in the classroom to everyday living?

4:30—Free

6:30—Dinner
North Dining Room, Wells Hall

7:45 Address: Building Critical and Quantative Thinking
Dr. Elsworth Obourn

8:45—Discussion

FRIDAY

10:00—Symposium: Materials and Experiences for Teaching Science Effectively
Chairman: Louise Combs
Dr. Lynwood Wren, Mr. W. B. Moser,
Summa — Dr. Obourn

11:00—Discussion and Questions

12:00—Lunch

1:30—Clinics (Divided by levels and subjects)
Miss Rubie Smith, Primary
Miss Lottye Suiter, Elementary
Miss Roberta Whitnah, Jr. High
Dean W. G. Nash,
Mr. R. E. Goodgion, High School

2:30—Forward Look
Dr. Lynwood Wren,
Prof. of Mathematics
George Peabody College

3:00 Adjournment

ADDRESSES

EXCERPTS OF ADDRESSES

PANELS

GROUP DISCUSSIONS

KEYNOTE ADDRESS

Dr. Woodrow Wyatt
University of Tennessee

The Morehead Conference — May 2

The Eastern Conference — May 3

TRENDS, CURRENT PRACTICES IN SCIENCE EDUCATION

Dr. Woodrow W. Wyatt
University of Tennessee

Perhaps the most basic problem in strengthening science education programs in the elementary and secondary schools is that of improving the quality of instruction. There is reason to believe that any directed attempts to effect improvement in these programs will require both additional public support and a more vigorous determination to do something about improving this instruction . . . Good schools are admittedly expensive but not nearly so expensive in the long run as poor ones. However, one must not lose sight of the fact that effectiveness in teaching and monetary reward for effort are often only remotely related. How to account for sudden interest in science and science teachers? Example, conservationist and interest in whooping crane —— What has the whooping crane done for me? It can't be good to eat like turkey and it can't pull a sled . . . .

One of the most reasonable plans for a quick and easy way to bring about better science and mathematics instruction appears to be that of emulating Russia's pattern for producing scientific manpower. Closer examination of these procedures reveals an illusory situation that rejects the ideas of creativeness and freedom. There are, however, salient features in this system which should be subjected to further scrutiny, not for emulation but rather for evaluation and projection into a workable plan for members of a free nation. Any attempts to rationalize the Russian scheme and to justify its existence lead me to recall the case of Eric Zimmer, ex-Nazi, and a German exchange teacher, who visited at the University of Practices for trial in his mother country. After much observation and considerable complaining, Eric concluded that the American schools are indeed in a deplorable state and are badly in need of some German influence. One patient listener rather modestly inquired of Eric if he felt that their obviously superior educational system may be related to the fact that four countries are governing his homeland. The Russian scheme of science education will be

treated more in detail in connection with a comparative study of procedures.

One of the production problems in the general field of science education is related to the extreme emphasis on the need for such specialities as scientists, engineers, and technicians, and the ever-present fear that Russia is fast pulling away from us in output. The very nature of our educational system, our society, and our philosophical goals are inconsistent with Russia's goals which are imposed by the state. Further clouding of this issue is brought about by a lack of reliable information on what is our current output and supply of trained scientific personnel. There are some persons at the recruitment and encouragement level who feel an immediate need for an up-to-date inventory and evaluation of the vigorous drive that has been made to induce people to enter scientific careers. Moreover, this assay has been brought on by what some fear is an outcome of overdoing recruitment. Yet others feel that the research and development advances in natural science, while urgent and sorely needed, has been made at the expense of development of the social sciences. Many clear thinking people have viewed with some trepidation the near standstill in research in the social sciences.

One of the most reasonable plans for developing scientists and for eliminating many of the sources of annoyance in our classes appears to be that of a restricted course of study designed for the few. Here is an idea based on an appeal to the competitive spirit, a survival of the fittest. For those who are familiar with the Report of the Committee of Ten (1893) this plan is logical in that instruction in classics and mathematics is again urged for all, with no time for driver training, vocational home economics, or courses in the History and Upkeep of Roman Band Instruments. Many of our colleagues at the University level will subscribe to this point of view, encouraging those select few who are natively endowed to remain and removing those who are less fortunate to avoid cluttering the path of both bright teacher and bright students. Little that is constructive can be said for the concept of maximum development of each citizen if one accepts the premise that education for the few is a desirable goal.

Most of the attempts at assembly-line production of scientific personnel have centered around the idea that a number of human beings will respond to a given set of circumstances alike and without variation. What appears to be reasonable with respect

to one individual should make conveyor-belt education applicable to any number of situations. Among these techniques we see the television approach and the large lecture sections. While a number of research studies show that there are no significant differences in performance on paper and pencil tests by students instructed by television in comparison with students taught by more conventional procedures, there is evidence of the lack of appeal made by a sincere and thorough teacher whose interest in students must not be restricted. In one research investigation instruction in slide-rule was offered by the television medium, using both control and experimental groups, with the results that no significant difference in performance on tests was observed by either group. However, the television group tended to forget the operations more readily. At this point one must be reminded of the need for controls and the objectivity of the scientific spirit. A true scientist would likely follow the plan of the man whose wife bore twins, and in the true scientific spirit, the couple named one, but not the other — he was saved for a control.

At the center of our involvement lies the fact that interest in teaching is at a dangerously low level. A recent survey of 3400 electrical engineering graudates from 129 colleges shows that they believe the most challenging work is offered by the so-called "glamour" industries: computer and data processing, military equipment electronics, and electronics in general. Chairman Tippo of the Yale University Botany Department states that "we complain of the poor quality of science teaching in the secondary schools, and yet we drain off the cream of the students for university and research positions." As the first and direct contact between the child and the educational system the classroom teacher has a primary responsibility for the educational direction taken by the child, for making him interested in learning, and for presenting information about the world in which the child finds himself.

Most science teachers accept the idea that science could be more functional and meaningful if courses were organized around real problems — those of personal social significance to young people. However, many beginning teachers report that they experience difficulty in translating their compartmentalized science, subject centered as it is, into a problem organization. President Taylor of Sarah Lawrence College suggests "placing the responsibility for learning on the student, rather than on the teacher . . . he suggests that class periods should be used primarily for helping

students define their learning problems and for inspiring them to want to learn rather than for transmitting information which might be directly from books." While this concept is understandably time-worn, most of us in the teaching profession subscribe to Mr. Taylor's point of view . . . we only wish we knew where the handle is so that we too could catch on. The classroom teacher must in some manner acquire the professional know-how although most pre-service education has given little opportunity to practice the function of problem location and solution. In fact most of the science teacher's education for teaching has been a forth-right contradiction of such a teacher role.

In any constructive approach to the problems facing workers in science education we may view our situation as encompassing both immediate and long range problems. Not every student who studies mathematics and science will become a scientist or an engineer. Improved education in the sciences will enable our people to understand better the world in which they live and thus to become more stable, more productive, and better informed citizens. At the same time we are involved in one of the most talked about labor market shortages of our time — the shortage of scientists and engineers. I repeat that this shortage is also one of the poorest documented. A major need in our educational system is an objective and efficient means of identifying at an early age people with aptitude and capacity for science and engineering. A companion problem is that of motivating young people to enter careers in these fields. Science clubs of America asked finalists from 1953-1956 in the National Science Fair the question, "What or who sparked your first interest in science, and how?" Of the 387 teenagers who responded more than one-third felt that their schools and teachers had started them on the scientific path. Typical comments: "My biology instructor, by encouraging me to work on a science project." "My seventh grade science teacher, by making it so vivid." "My advanced biology class sparked my first real interest. In the class we did things on our own." About one-fourth of these talented students paid tribute to the stimulating influence of their homes, parents, and other family members.

At the recent Southern Appalachian Fair I inquired of a boy (who won first place), "Where did you get your idea?" He looked around furtively and replied, "From my brother — he is a mathematician."

The young people estimated the ages at which their science interest started as ranging from 2 to 17, with a broad peak occurring between 8 and 14. Evidently we are proceeding correctly in spreading science throughout the entire school curriculum, and in making children's personal experiences of science and scientists as rewarding as we can.

The National Committee for the Development of Scientists and Engineers was established by the President to "foster the development of more highly qualified technological manpower." In a study relating to meeting the requirements for increased numbers of scientific personnel while preserving a balanced education system, the Committee followed these guiding assumptions:

(1) The number of youth with the capacity for effective careers in science and technology substantially exceeds the number currently entering these fields of study.

(2) The quality and content of educational programs in **elementary** and **secondary** schools exert a powerful influence on the career choices of youth.

(3) High quality education in science and mathematics will be achieved as improved teaching, higher education standards, and increased motivation are achieved in all courses of instruction.

(4) Education programs offered in elementary and secondary schools are responsive, at least in the long run, to the wishes of the public and to the interest in school affairs manifested by citizens.

(5) The goal of educational opportunity to every pupil according to his ability, need and interest requires provision for the exceptionally talented as well as for slow learners and those of average ability.

In connection with a more drastic revision of a rather staid subject — mathematics, I wish to mention briefly the experimental study in progress at the University of Illinois and in the near future to be undertaken in the Oak Ridge High School. A complete revision of the mathematics program, involving Boolean algebra, set theory, and symbolic logic has replaced in large part the more conventional emphasis on computation and manipulation. Attendant upon completion of a secondary school course in this rather revolutionary form of mathematics will come the problem of revising college mathematics courses to remain in phase.

A brief account of what is being done on the part of various agents or agencies involved will perhaps serve to summarize the current efforts in science education. First, the teacher has assumed an increased responsibility for improving the quality of his teaching through his own efforts; he has been given an opportunity to keep up with scientific developments by **attending institutes, seminars, cooperating in industrial programs;** he has sought to improve teaching by **using more widely the services of industry, university,** and **government personnel;** he has become better **informed about career opportunities in science** and has sought to **instill in students an appreciation of science and scientific thinking.**

Some of the local schools have made some definite plans to improve the professional training of teachers and have provided a worthwhile in-service training for those now employed. Some have made community resources available for the science teacher, while others have encouraged scientists, doctors, engineers, and others to help enrich the science course offerings. Others have encouraged sponsorship of such activities as "Science Teachers Day" or a "Science and Mathematics Clinic."

Colleges and universities have assumed responsibility for making science and mathematics courses available to teachers and have encouraged closer working relationships with elementary and secondary science teachers. Other groups sharing in the concern for improving instruction in science include school boards, state departments of education, federal agencies, professional organizations, scientists, professional societies, industry and labor, and citizen groups.

For those who now have effective programs in science education and for whom no change is indicated, let us join in congratulating you and in reminding you to stay with your program lest you be like the two bacteria who found themselves in the blood stream of a horse. They took the right artery at a fork, found themselves in a dark tunnel, returned, took the other turn, and were engulfed by a white corpuscle . . . moral "don't change streams in the middle of a horse."

SPEECHES and EXCERPTS OF SPEECHES

Minnie C. Wyatt

Hazel Nollau

Esther Bossung

W. J. Moore

The Eastern Conference

IMPROVING SCIENCE TEACHING IN THE SENIOR HIGH SCHOOL

Minnie C. Wyatt
Lexington City Schools

In coming before you to talk on the subject of "Improving Science Teaching in the High School," I come not as a teacher who has all the answers but as one who is still searching for the best way to arouse interest, stimulate creative thought and guide the students in such a way that they will remain in science.

I have had the privilege of attending two of the National Science Teachers conventions and most of the ideas I shall advance are ideas that were expressed many times in the lectures and discussion groups there.

TEACHER PREPARATION

If a teacher is to guide the pupils to an understanding of the work in which they live, the teacher's training in the sciences should be broad, but with particular emphasis in the area in which they are teaching. There should be a maximum of science credits required for the proper certification, with the necessary credits in education, English, and the humanities. Many colleges and universities offering fellowships and scholarships to science teachers under the National Science Foundation Program found that a large number of states had as high as 80% of their science teachers unable to enter the graduate courses. The colleges are now working to improve and extend the pre-service and in-service preparation of science teachers at all levels. The science teacher should also hav an interest in scientific development and a knowledge of the relationships between science and society. Add to this an understanding of children and skill in the techniques of teaching and counseling and you will have that teacher all superintendents hope they are getting whenever a new teacher of science is employed.

OBJECTIVES

The day has long passed when, in order to earn a credit in science, the student has to "finish" a certain number of chapters in the text, work a given number of problems, "do" all the experi-

ments required, or collect so many "bugs" or dissect a frog or "do" a project. Now we want to capture their imagination, challenge their curiosity and develop reasoning ability, and train them in the discipline of exact thought.

A recent survey made by the University of Illinois staff reported that children ask more questions about science than any other subject. Science questions predominated two to one. Something seems to happen to them before reaching high school. Probably they lacked guidance, lacked encouragement from parents and adults to take advantages of available opportunities; their schools probably had no science clubs — whatever it was we in high school often have to recapture their interest. We watch for some sign of inquiry on their faces, and we long for such questions as "how did it happen," "why do you do that," "can I make it do that way" etc. Unless we can arouse that interest and make science a part of their living, we will have surely failed them.

Sometimes not all of a class follows the above pattern, and we have the two-fold problem of directing and planning with those who are interested and active and want to learn, while at the same time, trying to develop interest in the others. Add to this a child of high aptitude and ability and in helping him work to capacity, you have a real challenge. At the convention in Cleveland, there were as many ideas about what to do with the gifted child as there were members in the discussion group.

STIMULATING INTEREST

There are several ways we can capture their interest and stimulate their creative imaginations.

First, there is the demonstration. In the beginning of a course, the demonstration can be used to attract attention and arouse questioning. Later, it can be used to create a problem situation, or to visualize processes or show materials and specimens; some demonstrations are to portray methods and techniques or illustrate a principle or a fact. There are many suggestions about how to carry out demonstrations but as the purpose of each varies no "hard and fast rule" will apply. The teacher should perform the ones where the techniques are difficult or where there is any danger, but students can and often will do as good a job or better than the teacher and certainly will hold the attention. Sometimes a demonstration, for no apparent reason, fails. We must never try to cover up — actually some very good teaching can ensue from such a

situation. Reports on demonstrations are not always necessary. Be sure it can serve some legitimate purpose as a written report, or given orally, or dramatically, or a graphical representation as an exhibit.

Second, laboratory work is another means of developing techniques and of finding answers to questions. One great problem with laboratory work is that the manuals are written in the image of the text books and are often associated with a work book. They never really set up any miniature research problems where the answers cannot be known until the work is done. With large classes and short laboratory periods, it is difficult to arrange experiences where students can adventure into the unknown, where everything depends on the experiment and not on a book. An unknown reaction can be worked into most traditional experiments and will add to the interest and effectiveness of the experiment. I believe one reason we are often dissatisfied with laboratory work is that it is so routine and lacks challenge.

We do have to have time to plan and get materials ready for laboratory demonstrations, in order to make them effective. It is being recommended that we have a period for such preparations.

Demonstrations and laboratory work call for equipment — simple equipment is always best, but not too simple. Try to keep a balance between home-made and scientific equipment.

I believe none of us will ever have what we feel we need, but somehow we get along.

The choice of apparatus should be given careful attention. Catalogues from several supply houses should be studied and compared as to quality and prices. Build up the laboratory over a period of time, ordering one big piece a year and be sure the equipment chosen can always serve in more than one situation if at all possible. I wonder how many science rooms have unused apparatus stored away in some hidden place because it wasn't much use in the first place? In ordering, we must remember that our department is one of the many for which the Board must buy and we must make our requests reasonable. Ask them how much is in the budget for the science department this current year and stay within that. Above all things — avoid ordering from the suggested lists for high school science in catalogs and laboratory guides. You will never use most of it.

Field trips can always be used to stimulate interest. There is

the anticipation and preparation — the trip itself and the reports. A well organized trip serves many purposes.

Science clubs, meeting after school, can give interested students an opportunity to work out many of their ideas. They should never degenerate into just sitting and listening to speakers though effective use can be made of good speakers and of student reports of their research. Science Clubs of America, an activity of the Science Service in Washington, D. C., can send all the materials you can possibly need in organizing such a club.

Better still your club can affiliate with the Kentucky Junior Academy of Science — part of a national program sponsored by the National Academy of Science. We attended the spring meeting of the Junior Academy at Waggoner Junior High in St. Matthews. Our club members, newly affiliated, were amazed at the exhibits of work done and discussions given. It was an inspiration. Awards are given for exhibits by clubs and by individuals as well as for the discussions. They are given on the Junior High and Senior High level. We have been asked to meet at Wayne County High School next spring.

Bulletin boards can be used to create interest. After a little training, the youngsters are on the look-out for items in magazines and newspapers to see who can be the first to bring in the item. The boy who scooped the crown on the comet was very proud. Hurricanes, land slides, floods and research are all pinned up a few days and discussed.

Film strips and films, if carefully chosen, are a great help but it is difficult to find any that have not already been shown in Junior High. Most of them cannot compete with television and movies. Mr. Wizard seems to be good on Saturday morning, Walt Disney has some amazing ones on Disneyland. "Our Friend the Atom" was one. The Bell Telephone Company is sponsoring a series, two of which have been shown, "Mr. Sun" and "Hermo, the Magnificent." Films of these shows will be available soon and two more are coming out next year.

A science library is important. The A. A. S. is administering a Science Library program supported by a grant from the National Science Foundation. The purpose of the program is to stimulate interest in reading science and mathematics books, to broaden the science background and assist in choosing careers. Books were

chosen in cooperation with some participating schools and now 200 books are being circulated to schools, 25 at a time. A list is being published by the foundation and it can be a guide to buying books where funds are available. I have found that many of the books are now published in the 25¢-50¢ and $1.00 paper back editions and the students love to own their own.

Magazines are also a means of keeping abreast of science. There are the ones published for classroom use like CURRENT SCIENCE AND AVIATION, a weekly, and TOMORROW'S SCIENTISTS, a monthly. Then there is a new one, SCIENCE WORLD with a teacher edition. The few copies I have seen are good. SCIENCE NEWS LETTER is a must. Others include THE SCIENTIFIC AMERICAN, NATURE, AND NATIONAL GEOGRAPHIC, and there are always good articles in LIFE, SATURDAY EVENING POST, LOOK, etc. Students will bring all manner of things for a file to keep it up to date.

One of the best ways we can improve our science teaching is to be a member of the National Science Teachers Association, a department of NEA, and an affiliate of AAAS. Their monthly magazine, THE SCIENCE TEACHER, for junior and senior high and the ELEMENTARY SCHOOL SCIENCE BULLETIN for the elementary teacher are splendid. There is month after month of excellent articles — everything to keep you right up to date. And there is a packet service which send all manner of interesting and helpful materials free of cost all through the year.

Their annual conventions are an experience every science teacher should have. This year in Cleveland, the convention was attended by 1250 teachers. Twenty thousand teachers belong to the association. I believe every school district in Kentucky should be a sustaining member and should see that their science teachers have membership.

I do hope I can meet you all again next March in Denver at the convention of the National Science Teachers Association.

IMPROVING SCIENCE TEACHING IN THE JUNIOR HIGH SCHOOL

Hazel Nollau, Teacher
Training School, Morehead State College

The time is now for us to redouble our efforts to improve instruction while there are those who are awakened to the value of a good teaching program in science and while we have opportunities such as the National Science Foundation, State Colleges, and the State Department has made available to exchange ideas and set up a plan of action for future improvement. And it seems to me that the big challenge is at the junior high level — the connecting link between elementary school and high school — when the children have such limitless curiosity and whose interest in science has been aroused in elementary school or the outside world, or is easily developed because of this immense curiosity.

In junior high as well as in other grade levels the science teacher has a dual roll; to locate and develop those with ability in science (the potential scientist or science teacher) and to help make science meaningful for the student who is to take his place in the world of today and tomorrow. Dr. A. A. Kinsel says that to get the most out of modern living a person should have a basic knowledge of science. He points out that with so many changes taking place in the world today some knowledge of science is essential — even to fully understand the newspaper — housewives too find such knowledge helpful in performing their tasks. So as we look toward improvement in our instruction let us keep in mind both of these purposes.

The school roll in producing tomorrow's scientifically trained personnel has three phases; identification, encouragement and opportunity. The junior high level is certainly the crucial one. It is in the junior high that we should locate those pupils who have scientific ability so that we may provide encouragement and opportunity for development along scientific lines in high school. Too often a student may be a junior or senior before he is discovered or discovers himself. Second because interest in science first comes at the elementary or junior high level. To improve instruction at

this level just as at any other it is necessary to have this need felt not only by the teacher but by the general public as well as the administration. Surely it is just important for the teacher as it is for the children to receive encouragement, sympathy and understanding. There is also the need for us to constantly improve our comprehension of science as well as how it can be made more effective in junior high school. Let us remember that the teacher may be the key who unlocks the doors of knowledge which can be obtained by more training in science courses, however, this is not always possible and so it is encumbent on the teacher to do her own studying and reading and this too is so often limited because of the numerous activities that are dumped on teachers. The development of the teacher may also be furthered through attendance at workshops, professional meetings, becoming acquainted with materials, visual aids, science equipment, and community resources (there are many in the community who can be of invaluable help and have much to contribute).

A teacher with an alert, inquiring mind who has the desire (and note, the desire is most important — not just saying I want to, but really feeling it) can make the teaching of science in junior high more effective even though not always able to increase her formal training. We should not fool ourselves by saying, science is too hard, I don't know anything about it, so I can't teach it or, I can only teach it by having the students memorize from the text. This is no alibi. It is true that often teachers are forced into teaching science in the junior high who lack adequate science training, are afraid of it, or are disinterested, but I believe, if a sincere effort is made to make it "come alive" for the children it will also become vital to the teacher whose enthusiasm will grow by leaps and bounds.

Now let us say we start out with an eagerness to improve the quality of instruction in junior high. How can we go about it? One thing we certainly do not do is teach the students to memorize isolated facts. The memorization of facts as a cut and dried method is the quickest way to dampen enthusiasm. Generally speaking, today the child comes into the seventh or eighth grade with a boundless curiosity and an interest and so there isn't much of a problem of motivation but the problem is, to guide, maintain, and develop this interest. We can build on the stimulation that has been brought about in the elementary school.

The greatest weakness in the junior high today is that teachers are not directing instruction with the aim of developing and understanding scientific principles and acquiring scientific attitudes.

Improve the effectiveness of instruction through the formation of correct science concepts. What science concepts are to be developed in junior high? These can be worked out according to the needs of the pupils if we have what is being taught in the elementary grades and what will be expected of the high school student. It is important not to try and form too many concepts at one time. And note that we talk about the development of concepts, not the statement. We do not say to the children that all matter is made up of tiny particles, or that air takes up space and has weight, or that all living things grow, reproduce, respond to stimuli, etc. Instead, these are brought about by guiding them to derive these concepts from a working out of a solution to problems.

Learning starts with a question in the mind of the learner. And so why not base our units on a problem? Motivate and guide children into discovering for themselves problems growing out of environment, or if you feel inadequate here or this doesn't work there are sets of books. After the problem is set up it certainly would be easier for the teacher to lecture or assign pages of reading for the children to memorize the facts and solution, however, when this happens we are defeating our purpose of creating a scientific attitude or approach. This, of course, isn't to say that they shouldn't get any of their information in this way. The approach to the problem should be flexible, but the teacher must guide in making plans for the gathering of information, the assembling of data and generalizing to the solution until the child can stand on his own. There are many varied techniques that may be used to gather information which will help children arrive at the solution and will at the same time aid in the development of skills and building of concepts. They may use books, surveys, community resources, observation, visual aids such as films, slides, etc., field trips, experiments performed by children and demonstrations by teacher. If children have worked in different groups there are numerous possibilities for other activities to present information to others such as demonstration experiments, reports, plays exhibits, displays on bulletin board collections, and panel discussions.

Discussion with careful guidance from the teacher helps children arrive at their solutions. In the skillful discussion the teacher must probe deeply but sympathetically to bring out superficial

thinking, prejudice or errors in reasoning. In conducting a discussion do you employ questions and answers to induce each student to come to his own conclusions by an active, creative process?

It is important to foster an attitude of free inquiry, replacing the slothful habit with active logical reasoning.

Help children to develop initiative and creativeness through projects working out their own experiments when possible or devising materials and equipment that can be used. A study of science equipment catalogues will help them to devise their own equipment with the materials at hand. Children this age have lots of good ideas about doing this, give them the chance.

And so perhaps you can see how a scientific approach of this sort, using whatever varied activities fit into the unit, or selected by children, provides for the following: development of concepts, understanding of science principles, guidance or direction of their enthusiasm and vitality, encouragement and opportunity to develop initiative and the process of reasoning, emphasizes full participation (there are enough varied activities to fit the ability of each child) makes science vital, presents the opportunity to discover and encourage the student with science talent and maintain interest of others.

Objections to the use of these activities or this flexible approach may arise as follows: "It is too hard," "I don't have any equipment or lab," or "I'm afraid to demonstrate experiments because they may not work," or "there isn't time." These are not really valid. As we have said before, it isn't hard, it just takes interest, careful planning, a check on community resources, experiments, supplies and reading. Many experiments can be performed with things children bring home such as glasses, bottles, etc. or animals and plants from the outdoors. There are many books that give experiments that take this type of equipment such as the books by Lynde, "Experiments with ten cent store equipment," "experiments with Home Equipment," and Sweezy's "after dinner Science," and "Science Magic." Many of the toys in use today help teach science principles (use magnets, soap bubbles, plastic car with balloon and plastic car with plastic engine block showing the action of the piston in the cylinder). Of course, for the teaching of the unit on internal combustion engine in the ninth grade the garage is a wonderful community resource and General Motors sends out free of charge one of the best teaching films on the internal combustion

engine. As to the fear that a demonstration experiment may fail to give the expected results put your fears at rest. The failure may provide a wonderful learning situation. It may set up the simulus for inquiry if we ask what went wrong and set about trying to find out **why.** This will foster the attitude of research. When the error has been identified redo the experiment. As to the time factor, it is true that teachers are "spread thin" but we must put first things first.

We might also aid in the scientific development of the child by the establishment of science clubs which might affiliate with the Junior Academy of Science. This provides opportunity for the child to work out independent or group projects, write articles for the academy bulletin and present discussions at the meetings. Here there is full scope for the talented as well as others.

There may be committees to help with materials and care for the living things in the classroom and these may be changed from time to time. This helps the teacher and makes the child feel important.

Provide the opportunity for students to apply or practice the science principles they have learned. Children this age love to "show off" and may write their own science plays as well as a science program of experiments to present in chapel or may work up a science fair for the school. We can provide for those of ability by furnishing the opportunity for them to demonstrate experiments in the elementary school. This may act as motivation for others in the class as well as the elementary child. We may work through the principal and the art teacher to have an exhibit case made and set up in the school hall where our students can put on exhibits.

Some units of science in junior high such as conservation may be worked out as a C. E. P. The core teacher or course will be intergrating science and math with social studies and English. In units on transportation working in the internal combustion engine, jet, electricity, and Archimedes principle a student can unite both the natural, social, and physical sciences. Junior high is a fine time for students to learn the metric system. Math helps them to understand this better.

In conclusion we may keep in mind that to improve instruction in junior high as well as other areas, we need to encourage, guide,

allow for free inquiry and when children bring in things of interest to them, don't dampen their enthusiasm by saying I don't know and cutting them off, rather, tell them you don't know but suggest that you all find out together. We need constant self evaluation, criticism, and constructive programs. How well this may be brought about depends on you.

THE ELEMENTARY SCIENCE PROGRAM*

Esther Bossung
Louisville City Schools

Miss Esther Bossung of the Louisville Schools said, "All Elementary rooms should have a science program. Science in the elementary school is a study of childrens' problems. A good program is brought about by teacher-pupil planning."

"Experiences for grades one through six include (1) weather and climate, (2) matter and energy, (3) machines and nutrition, (4) magnetism and electricity, and (5) light and sound," she said.

"Children need to perform experiments, select materials, observe and draw conclusions. They understand best when they can plan and participate. They need to do their own experiments instead of watching teacher perform," Miss Bossung emphasized.

She illustrated the initiation of an experienced unit. "One day on the play ground in last September Eddie came to school inadequately dressed. A sudden drop of temperature brought on questions. Thus, a unit on weather and climate was begun.

Further the speaker said:

Materials should be simple, inexpensive things brought from home.

A teacher must be concerned with the way children learn and gather concepts.

It is a **sin** to tell the pupil the answers. Guide him in seeking his own answers.

In performing experiments other subjects are correlated. All available resources should be used.

Capitalizing on appropriate incidents is the best of teaching. Sometimes the first science teaching is the best when the teacher is learning with the pupil.

Some concomitant learnings developing from the science units would be:

(1) ability to distinguish truth from fantasy

*For expansion of the above summary statement see Curriculum Bulletin II, a source bulletin of science experiences—for elementary school children, Louisville Public Schools, Louisville, Kentucky.

(2) ability to be more self-directive in the solution of prob-problems in areas other than science

(3) ability to appreciate the importance of language arts skill in all areas of study

In summarizing, the following characteristics of a well-managed classroom were identified:

development of pupil leadership
pupil-teacher planning
pupil participation
team spirit

EXCERPTS from . . .

"CHALLENGES IN PRE-SERVICE EDUCATION OF SCIENCE TEACHERS"

W. J. Moore, Dean
Eastern Kentucky State College
Richmond, Kentucky

In this scientific age it is most important that we teach science to young America.

It seems to me that the teaching of science should very well begin in the elementary grades and should continue through college. When I make the statement that it is important that we teach science in the schools and colleges, I am not placing its importance above the social sciences, the humanities, or communication. They are all important and indispensable.

The curriculum for the preparation of teachers for the public schools should be composed of three components, general education, subject matter or teaching fields, and professional education. The curriculum preparing elementary education majors should give the prospective teacher a broad general education in science, and in addition, should give him some courses which will enable him to teach the subject in the elementary schools. The curriculum preparing elementary education majors should give the prospective teacher a broad general education in science, and in addition, should give him some courses which will enable him to teach the subject in the elementary schools. The curriculum preparing science teachers should give courses in the subject matter of all the sciences and, in addition, should have courses designed to prepare the prospective teacher to do excellent teaching.

Our professional educational courses should be as functional as we can make them.

As to teaching fields, it would seem that broad comprehensive areas are to be preferred over narrow specialization.

Attention should be given to the preparation of core teachers.

ADVANCING EDUCATION

Dr. Robert R. Martin
Superintendent, Public Instruction

University of Kentucky Conference

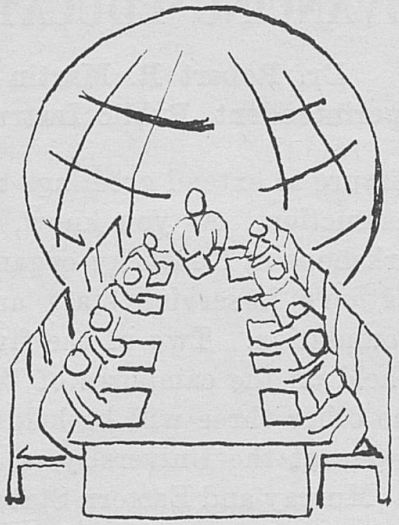
ADVANCING EDUCATION

Dr. Robert R. Martin
Superintendent, Public Instruction

It is a great pleasure to extend greetings to this Regional Workshop on Science Instruction. As you know, this Workshop is one of five regional workshops in Kentucky organized by the State Department of Education's in-service staff and sponsored by the National Science Foundation. Two of the five regional workshops have already been held on the campuses of Western and Morehead State Colleges. The other three will be held today and tomorrow. In addition to this one at the University of Kentucky, workshops are opening today at Murray and Eastern State Colleges. The funds for these regional conferences were provided by a $9,000 grant from the National Science Foundation. Fifty or more people are attending each of these regional conferences (forty teachers are attending with their expenses paid). In addition, superintendents and principals have been invited at their own expense.

Next summer as another part of Kentucky's program to improve science instruction a four-week National Science Foundation Workshop will be held on the University of Kentucky campus from August 5 to August 30. One-hundred or more people will attend that workshop. A grant of $35,000 from the National Science Foundation has made it possible. A National Science Foundation Workshop will also be held at Murray State College from June 10 to August 2, made possible by a grant of $73,000 by the National Science Foundation. Science instruction in Kentucky is on the march as a part of our Advancing Education in Kentucky campaign.

Taken together the five regional science workshops this Spring and the longer science workshops in the summer constitute an experimental program that will be watched with great interest by the entire nation. They represent the first time the National Science Foundation has supported a program for improving science instruction at the elementary as well as secondary and collegiate levels. It also represents the first time the National Science Foundation has supported a series of coordinated regional workshops. The success of our program in Kentucky can set a pattern for future workshops throughout the country. I wish you luck in this workshop today and tomorrow. The eyes of the nation are upon you.



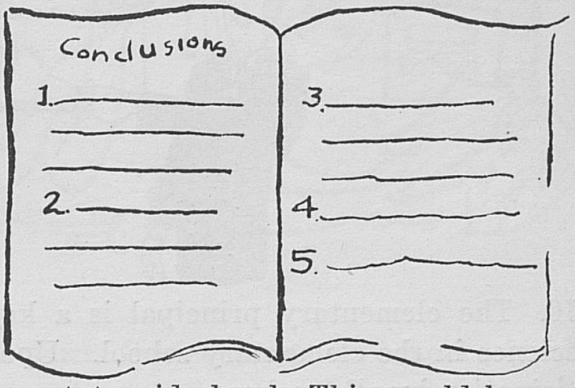
SUMMARY OF GROUP DISCUSSIONS

Reporters ..... Willie B. Norton
Audrey Wright
Elizabeth A. Taylor
Alice Strange
Hazel Adams

Chairmen ..... John Brennan
Barbara Tea
Myrtle S. Woods

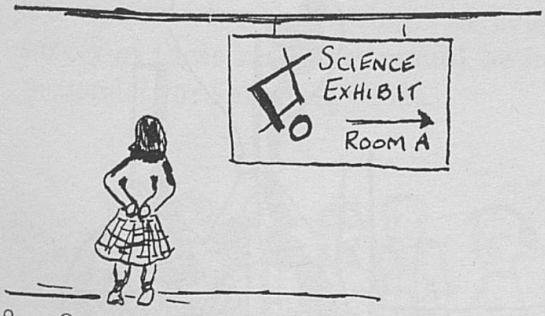
University of Kentucky Conference

SUMMARY OF GROUP DISCUSSIONS

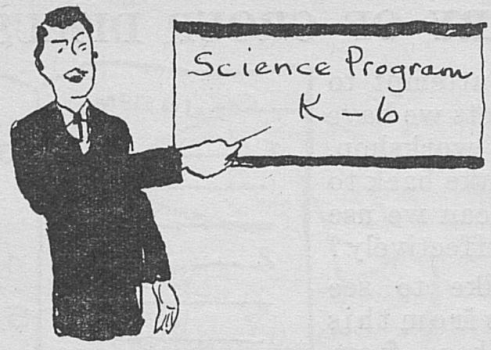


"This is our attempt to tie together the facts we have learned in this workshop. What should we take back to our people? How can we use this information effectively?

1. We would like to see representatives from this workshop with those from other workshops in the state, toward a compilation of a **Guidance of Science Study** on a state-wide level. This would be organized on three age levels; elementary, junior high and secondary. It would include a list of concepts that should be studied at each grade level. It would also include lists of resource materials, helps with experiments, etc. Teachers in each system should be given training in the use of this guide by some interested science teacher in the system.
2. A survey needs to be conducted among teachers to determine their needs in science education as a basis for improving the quality of science instruction.
3. We recommend in-service workshops in each school, previous to the opening of school in the fall so there may be sharing of ideas and planning for acceptance of responsibility in science instruction.
4. Should have more regional workshops throughout the state for teachers on basis of identified problems of instruction.
5. There should be more communication between the different schools — elementary, junior and senior high — so as to know the problems, program and goals of each.

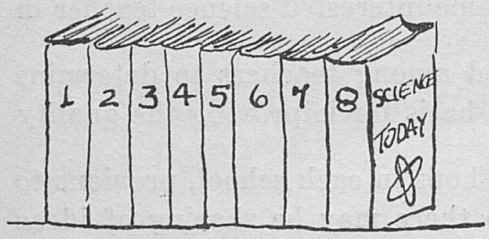


6. Visits between schools and systems should be encouraged so that good science programs can be seen in action.
7. Science fairs, held regularly, are an incentive to teach science regularly.
8. Open house for parents and others at a science exhibit, when children are making a summation of a unit is very effective.
9. We recommend college science departments hold clinics for science teachers from local systems. This would help the teachers with their subject areas, and be a way of the college might locate some of the gifted students who never go to college.



10. The elementary principal is a key person in the program of science in the elementary school. Upon him depends the total participation by all teachers.

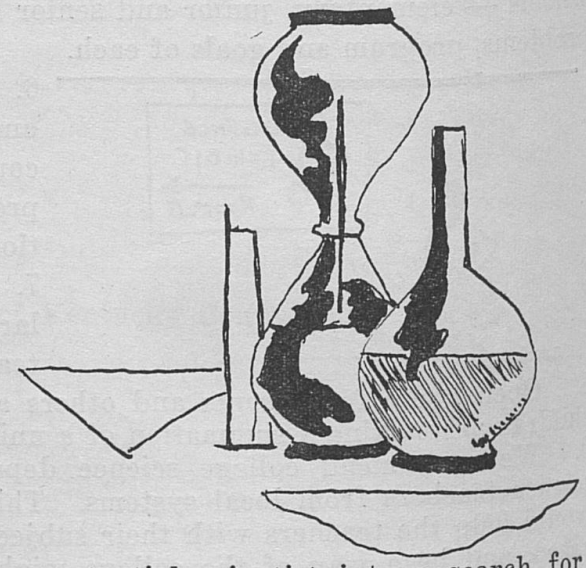
11. Science should be recognized as a full-time, required subject in the elementary curriculum. **Science textbooks should be on the basal text list.**



12. Overlapping can be avoided by a unified program; probably through a **textbook series** at first. Additional experiments may come from inquisitive pupils, who bring specimens from their surroundings. Individuals should not be restricted to just one or two projects or textbooks in their solutions to problems.

13. Use science books as references and not as readers. It is helpful to have science books on different levels of vocabulary difficulty.

14. Teach children to do research — this should begin in the elementary school and continue on through the school program.



15. Laboratory equipment—realize we need a certain amount to do a good job. Experimentation is a vital part of effective science teaching. There needs to be time and facilities provided for the teacher to guide the young potential scientist into a search for answers to problems of concern to them.

16. University should offer a course for teaching high school science, which would help teachers to

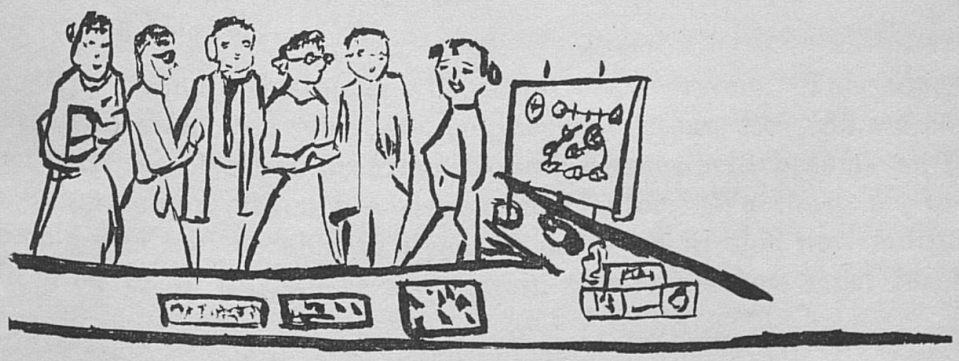
(a) Define science in terms of everyday living.

(b) Understand more about group dynamics and human relations so that the learning climate will be improved for all the students—especially how to organize a large class so that the needs of each individual student will be met.

(c) There should be a follow-up program of the teachers for the purpose of doing some research on the effectiveness of the teacher preparation program.

17. We would like to see a closer working arrangement between the math and science departments. Science teachers have a great opportunity to teach math as it occurs in their course of study.

18. There are many resources in the local community, state, national and inter-national for improving the quality of science teachers that are available for the asking. A cooperatively developed plan for a survey of these resources would be helpful in terms of materials and personnel for school systems.



ADDRESS

Dr. Ellsworth Obourn
U. S. Office of Education

The Western Conference — May 2

The Murray Conference — May 3

WHAT SCIENCE SHALL WE TEACH IN ELEMENTARY THROUGH HIGH SCHOOL?

Dr. Ellsworth Obourn
U. S. Office of Education

Today we are living in a new culture: "Atomic Year II". The influence of science in early generations is quite different from what it is today. Things that were once looked upon as a mystery now seem very simple. Things are now moving at an accelerated pace and we move with them. We are not conscious of the effect they are having on our culture.

Within the First World War the fuse of science was ignited. This fuse burned rather slowly until 1945 when atomic bombs first ushered in this new age. From that time on, science has come a long way, until today supersonic speed, space travel, etc., are taking place.

What are the problems of science in this new culture? As science is the dominant theme of today, everyone must adjust to this new cultured environment in order to get along. There are two types of adjustments that must be made. The first adjustment is that of the average person or "the man on the street". We are now thinking of the 35-hour work week. If this takes place, the average man will have to learn to adjust to new types of entertainment and use of his leisure time. The housewife now has to learn to adjust to modern equipment in the home, such as washers, dryers, etc. The farmer has to learn the new and modern means of tilling his soil and harvesting his crops.

The second adjustment will not affect everyone. This adjustment will affect the scientists, engineers, doctors, etc. As we cannot turn the clock of progress around, science will become an increasing factor and not a decreasing factor. We must produce people who will be able to live and carry on in this new culture. In order to do this, there are certain things that we must teach:

1. The ability to think actively and to solve problems. We must do something to the thinking mechanism of young

people so they will be able to solve problems that they meet. In so doing, we will be developing the ability of scientific thinking.

2. An understanding of scientific facts, concepts, and principles or order for them to have a basic body of information which will enable them to adjust to their problems.
3. Desirable attitudes and interests toward good health, career interests, etc. We must do away with the false ideas about palm reading, astrology, etc.
4. Change the haphazard methods of science teaching that have been going on. We must put the experiment back into science. We must also remember that an experiment is not an experiment until it is controlled. Our job is to do something about the children's interest in science. We must make science such a living experience that they want more of it.
5. Development of the appreciation of science as in music, art, literature, etc. We must teach science so that it can create an emotional response. In order to do this, science must begin in kindergarten and continue throughout the following years.

What is the place of science in this new culture? Science must be taught as an integrated sequence from the beginning to the end of school. This must be SCIENCE and not Health, Safety, or anything of that type. It must be "good honest to God science." This must be a part of the required curriculum. Emphasis must be placed on science as the "way of life." If the teaching does not do something to prevent the child from being influenced by false superstitions, it is not very good science. It must be taught in relationship to other subjects. It must contribute to the unique education of young people.

What shall we teach? This may differ throughout the states and may vary throughout the different sections of a state, as this should be determined by local needs. The pattern of needs will vary. What we teach is a means to the end of better interests and better adjustments. There will be common elements but also those that deal with your locale.

We need more great American scientists, and in order to have these, we need to focus more attention to the fast learners in the school and not so much to the slow learners as has been done previously. The slow learner must learn to shift for himself more than he has been doing.

DEMONSTRATIONS

Training School—Western Kentucky State College

DEMONSTRATIONS OF SCIENCE ACTIVITIES IN THE ELEMENTARY GRADES

Since the participants had indicated a desire to know more about the teaching of science at the elementary grade level, the planning committee arranged for opportunities to observe the work being done in the Training School on the Western Kentucky State College campus. The Workshop participants were given time to visit various elementary grade rooms to observe the teaching of science and to learn from the children some of the major activities in science which had been carried out through the year.

On the second day of the Workshop, the children of the fourth grade gave a science play which they had used previously as a culminating activity in a study of the planets.

SYMPOSIUM

Miss Louise Combs, Moderator
Dr. Lynwood Wren
Mr. W. B. Moser
Dr. Ellsworth Obourn

The Murray Conference

SYMPOSIUM–"Materials and Experiences for teaching Science Effectively"

Miss Louise Combs, Chairman — **Mr. W. B. Moser**
Dr. Lynwood Wren — **Dr. Ellsworth Obourn**

Miss Combs opened the symposium by defining a symposium as a process for exchanging viewpoints and by indicating that this process offers an opportunity for all to change viewpoints. Also, she said that this was perhaps a scientific approach to the improvement of science teaching—that as we change our viewpoints and beliefs we change about the importance of materials and experiences. We will then change what we do wherever we are—in the college classrooms or in the elementary and secondary school classrooms.

The chairman also made the point that these **five science conferences were planned for the purpose of providing an opportunity for scientists on the campus, professors of education, and public school teachers to share ideas and beliefs with each other on ways to improve the quality of experiences being offered to teachers in their preparation for science teaching.**

Then, she paid tribute to a group of science professors in Kentucky who met recently to discuss ways to improve the preparation programs offered in our colleges to teachers. They looked at the situation, failed to blame anyone, but concluded that they could offer better guidance to the young people and could offer courses which really met the needs of the teachers, and could be more aware of the teaching methods they used in their classrooms. This was an example of a group of scientists who were mature enough to approach a problem with intelligence—not with emotions. They did not blame the public school teachers nor professional educators for poor science teaching, but said, **"Here are some things we can do together, scientists, professors of education, and public school teachers."**

In the way of equipment, Mr. Moser suggested that every teacher could afford to buy a gallon of formaldehyde to preserve different things that are interesting enough to keep. It will take only a tablespoon of this and some water to preserve anything. Another suggestion in preserving is to add a pinch of sodium bicarbonate to

retain the color. One very interesting piece of equipment mentioned by Mr. Moser was an electric board with twenty-five spaces and pictures. If the correct name is placed in the space under the right picture, a bell will ring. This can be made for two or three dollars.

Another suggestion made by Mr. Moser was to compile a list of places that would be of scientific interest to the students and let the students visit them on their own time if they wish to. Mr. Moser stressed more than anything else letting the students make their own decisions.

Dr. Wren: Dr. Wren stated that math needs science and that science needs math. He stated that we are using too much of the drill and techniques of problems. We need to make the children fully understand what they are doing when they do get the answer to a problem. The problem of many of today's children is that they can work out problems, but they do not understand what they are doing. The children of today do not have time to get into the real appreciation of the subject matter. Dr. Wren says we are making a big mistake if we try to put the subject into immediate utility. Ultimate utility is much more important.

Dr. Obourn: Dr. Obourn states that America and other countries have no equipment so science is mostly a reading subject, which is definitely not what it should be. **Experiments are the one thing that make science unique. Science must be experienced and not just learned about.** It must be learned by senses. Unless we set these experiences for the child to gather information through his senses, we are missing an obligation. We need to keen up these senses. **We should let the children make a survey of our community and find resources for teaching science.** Most of all, we should get the child into the act and let him build things. It may be possible to get science equipment built through the Parent-Teacher Association. A very good book for building inexpensive science equipment is, "Handbook for General Science," New York State Department of Education, Albany, New York. The price is 35c.

SUMMARY OF PANEL DISCUSSION

1. To have a quality science program, experiences and experiments are essential, thus equipment is necessary.
2. If science is really important to us, we'll find the way to get equipment.
3. Science has a relation to language, arts, math and health.
4. We as the staff have the responsibility to plan together the sequence of the science program.
5. We should sometimes create our equipment as we go along. We cannot produce creative scientists unless we give creative experiences. Creating equipment to meet a need is one way.
6. It is a tragedy to teach science today without experiments—without the opportunity for discovery.
7. The student should be given the opportunity to discover problems to be solved and to discover the solution. When they are denied this they miss the experience of learning a scientific approach.

APPENDIX

Some exhibits are included in this report because they represent some of the basic communications essential to launching plans for the Conferences. These contain suggestions for involvement prior to and subsequent to the Conferences. The granting of the money for the five regional in-service Conferences started a continuous flow of communications for improving science program planning and science teaching on the part of local systems, the colleges, the State Department of Education, and other organizations and agencies.

September 13, 1957

Dr. Alan T. Waterman, Director
National Science Foundation
Program for Education in the Sciences
1520 H. Street
Washington 25, D. C.

Dear Dr. Waterman:

It is with very great satisfaction that I am reporting to you on the five conferences on the improvement of science teaching sponsored by the State Department of Education through support from the grant NSF-G3512 in the amount of $9000.

On behalf of the 217 local school systems, the 34 teacher institutions and the State Department of Education, I express deep gratitude for the added impetus given to the effort we are making to "advance education in Kentucky."

This unique enterprise in the area of science involving all levels of education—elementary, secondary, and college—has been one of the most exciting and profitable phases of the education planning we have undertaken to date.

The attainment to a high degree of the objectives we set forth initially is now a matter of record. Some evidence of this attainment is contained in this "Kentucky Report." The report contains a synopsis of the five programs and an evaluation. These conferences made a distinct contribution to the Science Summer Institute which will be reported on separately. In addition to the values, outcomes, and ideas contained in these reports, I should like to say that from my conversations with school leaders from all sections of the Commonwealth I have sensed a heightened interest in science teaching, a deepening awareness of the importance of science teaching, and an eagerness at all educational levels to build quality in science teaching in the elementary and secondary schools and in the programs of preparation of science teachers.

A very significant beginning has been made and I feel confident that our teachers and educational leaders at the local, state, and college levels will continue to go forward in a variety of significant ways to make science teaching adequate for our times. In the fullness of time, I am confident, there will be a deep consciousness that

our real advance in science instruction began in the five conferences on Science Improvement supported by the National Science Foundation in 1957.

Cordially yours,

(signed) Robert R. Martin
Superintendent of Public Instruction
Kentucky State Department of Education
Frankfort, Kentucky

March 8, 1957

TO: Public School Superintendents, High School Principals, and Supervisors

As a part of our over-all program of "Advancing Education in Kentucky," we requested and received a $9,000 grant from the National Science Foundation for five two-day conferences for teachers in service on the "Improvement of Science Teaching." We are confident that this fund can be used for the type of conferences which will make a difference in our science programs in Kentucky.

The purposes of the five two-day conferences, the places they will be conducted, the possible dates and the director of each conference are indicated on the enclosures.

The major portion of the grant will be used to pay the expenses of 200 classroom elementary teachers and high school teachers of science and to pay up to a maximum of $12 per day for a substitute for each of these 200 participants in the five conferences.

No doubt, you and your staff will be eager to have a part in this state-wide program for the improvement of science programs and science teaching. You are invited, therefore, to assist in getting immediate plans under way by taking the following steps:

Step One: Discuss with your staff and list on the enclosed form two or more major concerns, problems, needs or goals of your system-wide science program.

Step Two: Nominate for possible participation in one of the conferences one elementary teacher, one intermediate teacher, one junior and one senior high school teacher of science. (Attention should be given to representation of the races.)

Step Three: Nominate one of the four as a delegate leaving three as alternates.

If it is at all possible, the selection committee will choose your delegate, but in order to give fair distribution geographically and to have an adequate proportion of elementary and secondary teachers in each conference, it may become necessary, in some instances, to select one of the alternates.

You are requested to return the information at your very earliest convenience. According to present plans, the very latest date on which an application will be accepted is **March 22.** At least, all applications received by that time will be given priority by the selection committee.

This grant provides a great opportunity for us in Kentucky and your complete cooperation is invited.

Cordially yours,

(signed) Robert R. Martin
Superintendent of Public Instruction
Enclosures

MEMORANDUM

TO: Presidents, Deans, Heads of Science Departments, Heads of Departments of Education of Private and Parochial Colleges and Universities

FROM: Louise Combs, Director
Division of Teacher Education and Certification
State Department of Education

DATE: March 5, 1957

Inasmuch as you and your institution make a definite contribution to education in Kentucky through preparation of teachers, I want to share with you information concerning the five 2-day in-service conferences on Science. These have been made possible through a $9,000 grant from the National Science Foundation. The proposal for the grant specified that these in-service conferences would be directed by the Division of Teacher Education and Certification of the State Department of Education.

The purposes of these conferences which we incorporated in our request to the National Science Foundation are stated in the enclosed letter which Superintendent Martin received from the National Science Foundation along with the grant.

Enclosed is information concerning the places of the conferences, the possible dates and the directors of each workshop. As you will notice, these five conferences will be only 2-day conferences. Each workshop will be open to 40 classroom teachers. Their expenses will be paid from the $9,000 grant. Each public, private and parochial college will be invited to send representatives to one or more of these five conferences. Of course, their expenses will need to be taken care of by the college.

Finally, I want to emphasize that our 2-day conferences are for classroom teachers. No doubt these teachers will represent all the colleges and universities in the state. If you have graduates who in your judgment would profit from this 2-day experience on Ways to Improve Science Teaching, I suggest you communicate with them or their principals, superintendents or supervisors and encourage them to explore the possibility of attending one of these conferences.

On a separate memorandum I am giving you some information concerning the cooperative Summer Institute to be held at the University of Kentucky on basis of a $35,000 grant from the National Science Foundation.

MEMORANDUM

TO: All Participants of the Regional In-Service Work Conferences On Science Instruction—Grades 1-12

FROM: In-Service Teacher Education Staff

SUBJECT: Post Meeting Evaluation

DATE: September 1, 1957

Will you, as a participant, take some time to help evaluate the Central In-Service Region Work Conference on improving science instruction? A summarizing report will be made of all the evaluation forms returned. The information is needed for a summarizing report to the National Science Foundation.

This evaluation report will serve some of the following purposes:

1. Provide suggestions for improving future conferences.
2. Provide an objective basis for reporting to the National Science Foundation on our experimental project in Kentucky.
3. Help the individual participant take another look at our In-Service planning for improving science instruction.
4. Provide all concerned with a more accurate group evaluation of the total conference. (Each participant will receive a copy.)

You will find enclosed "the objectives of the conference" as stated in the grant instrument—just to save time if your copy of the program is not close by.

Please return to the In-Service Consultant of your respective in-service Region:

Miss Ethel Barnard
Western Kentucky State College
Bowling Green, Kentucky

Mr. James Brown
Eastern Kentucky State College
Richmond, Kentucky

Mr. Eugene Russell
Murray State College
Murray, Kentucky

Mr. Frank Vittetow
Morehead State College
Morehead, Kentucky

Mrs. Mary Marshall
State Department of Education
Frankfort, Kentucky

POST MEETING EVALUATION

Regional In-Service Work Conference
On
Science Instruction

(Check Where You Attended)

Morehead ☐ April 29, 30 | Richmond ☐ May 1, 2 | Lexington ☐ May 1, 2

Bowling Green ☐ May 1, 2 | Murray ☐ May 4, 5

1. How would you describe this meeting: (Check One)

Inadequate	Unimpressive	Acceptable	Satisfactory	Very Satisfactory

   A. What were its strengths?
   B. What were its weaknesses?

2. Did you find yourself wanting to say something during the meeting that you actually did not say? (Check One)

Very Frequently	Frequently	Fairly Often	Often	Never

   A. Why didn't you contribute when you felt you wanted to?

3. How many members do you think were in accord with the stated objectives of the meeting? (Check One)

Small Minority	Large Minority	About One-half	Good Majority	All

4. How do you think we can improve our next meeting?

5. Have you done any of the following on your return to your school situation?
   A. Planned with other school personnel in your local system? (Check)
      1. Superintendent ☐
      2. Supervisor ☐
      3. Principal ☐
      4. Teacher ☐
   B. Planned for changes in your own program of Science Instruction.
      1.
      2.
      3.

C. Planned with any other groups other than your school personnel?

1. Industry
2. PTA
3. Service Clubs
4. Governmental Agencies—State or National—Example: State Department of Conservation
5. Others

(1)

(2)

(3)

6. Has there been any staff workshops for improvement of science instruction planned for this coming year in your school system?
7. Other activities related to your participation in the regional conference.

A. Attendance at Summer Institute

B.

C.

D.

Please return to the In-Service Consultant of your respective in-service Region:

Miss Ethel Barnard
Western Kentucky State College
Bowling Green, Kentucky

Mr. James Brown
Eastern Kentucky State College
Richmond, Kentucky

Mr. Eugene Russell
Murray State College
Murray, Kentucky

Mr. Frank Vittetow
Morehead State College
Morehead, Kentucky

Mrs. Mary Marshall
State Department of Education
Frankfort, Kentucky

PROGRAM PERSONNEL FOR GENERAL SESSIONS

(Out of State)

Dr. Ellsworth S. Obourn
Specialist for Science
Department of Health, Education and Welfare
Office of Education
Washington, D. C.

Dr. W. W. Wyatt
Professor of Education
College of Education
The University of Tennessee
Knoxville, Tennessee

Dr. John R. Mayor, Director
Science Teaching Improvement Program
American Association for the Advancement of Science
1515 Massachusetts Avenue, N. W.
Washington, D. C.

Dr. Lynwood Wren
Professor of Mathematics
George Peabody College for Teachers
Nashville, Tennessee

PROGRAM PERSONNEL FOR GENERAL SESSIONS

(Within the State)

University of Kentucky Conference

Dr. Lyman Ginger	University of Kentucky
Mrs. Alice Strange	Franklin County Schools
Dr. Herbert Riley	University of Kentucky
Dr. Lyle Dawson	University of Kentucky
Dr. Robert Boyer	University of Kentucky
Dr. Paul Ray	Asbury College
Dr. Noah Turpen	Fayette County Schools
Dr. Frank Dickey	University of Kentucky
Dr. Robert R. Martin	State Department of Education
Mr. H. A. Cocanougher	Boyle County Schools
Mr. Owtis Ragland	Clark County Schools
Mrs. Frances Eubank	Clark County Schools
Miss Louise Hardy	Clark County Schools
Miss Jean Doyle	Lexington, Kentucky
Mr. Howard Lusk	University of Kentucky
Mrs. Audrey Wright	Louisville, Kentucky
Mr. J. W. Dennis	Woodford County Schools
Mr. Ernest Woford	Danville, Kentucky
Mr. James Washington	Lincoln Institute
Mr. John Walters	Shelbyville, Kentucky
Miss Christine Jansing	Louisville, Kentucky
Mrs. James Gladden	Fayette County Schools
Mr. Sidney Simandle	State Department of Education
Mr. James M. Yonts	Transylvania College
Mrs. Stanley Moore	Fayette County Schools

Western Kentucky State College

Dr. Lee Francis Jones	Western
Dr. Kelly Thompson	Western
Dr. Paul Ray	Asbury College
Mrs. C. P. McNally	Western
Miss Della Daniel	Western
Mrs. Carolyn Sewart	Western
Dr. H. L. Stephens	Western
Mrs. Herman Lowe	Western
Dr. C. H. Jaggers	Western
Dr. Ward Sumpter	Western
Dr. Willard Cockrill	Western
Mrs. Lurene Gibson	Warren County Schools

Morehead State College

Dr. Adron Doran	Morehead
Dr. William Owsley	Morehead
Mr. Toney C. Phillips	Morehead
Dr. Norman Tant	Morehead
Mrs. Lake C. Cooper	Morehead
Miss Nell Cheatham	Morehead
Dr. Fenton T. West	Morehead
Dr. Margaret P. Heaslip	Morehead
Mr. James Claypool	Ky. State Dept. of Conservation
Mr. John Palmer	Lee Clay Products Company
Mr. Bertram K. Rigg	Armco Steel Corporation
Miss Billie Jo Caudill	Morehead
Mr. Paul C. Overstreet	Morehead

Eastern Kentucky State College

Dr. W. F. O'Donnell	Eastern
Dr. Thomas C. Herndon	Eastern
Dr. Henry Martin	Eastern
Dr. Harvey LaFuze	Eastern
Mr. Clifton Bayse	Eastern
Miss Agnes Hopper	Whitley County Schools
Mrs. F. L. Phillips	Berea City Schools
Miss Esther Bossung	Louisville City Schools
Dr. Robert R. Bryden	Union College
Mr. Roy C. Richardson	Irvine City Schools
Dr. Smith Park	Eastern
Miss Hazel Nollau	Morehead
Dr. J. G. Black	Eastern
Dr. Harold Zimmack	Eastern
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Mrs. Minnie Wyatt	Lexington City Schools
Mr. Meredith Cox	Eastern
Mr. Robert Tarance	Eastern
Dr. D. T. Ferrell	Eastern
Mr. Allen L. Lake	Lees Junior College
Mr. Don Bale	Department of Education
Dr. W. J. Moore	Eastern

Murray State College

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Dr. Hunter Hancock	Murray
Mr. Fred Schultz	Murray
Miss Frances Lashbrook	Owensboro City Schools
Mr. Ardath Cannon	Murray
Mr. Wesley Kemper	Murray
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Miss Lottye Suiter	Murray
Mr. R. E. Goodgion	Murray
Dean W. G. Nash	Murray
Miss Roberta Whitnal	Murray

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Each planning committee provided opportunity for the personnel of the academic departments and education department to work and plan together in terms of the real instructional problems in science as identified by the elementary and secondary teachers.

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Dr. Harry Sparks	Education Department
Dr. Hunter Hancock	Science Department
Dr. Robert Alsup	Education Department
Dr. W. E. Blackburn	Science Department
Mr. M. O. Wrather	Public Relations, Murray
Mr. Ardath Canon	Science Department
Mr. C. W. Kemper	Science Department
Dr. William G. Nash	Dean, Murray
Miss Venona Rogers	Training School
Mr. Fred Schultz	Murray City Schools
Dr. Liza Spann	Science Department
Dr. B. J. Tillman	Social Sciences
Miss Roberta Whitnal	Science Department
Dr. A. M. Wolfson	Science Department
Mr. W. B. Moser	Murray City Schools

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Mrs. Eunice Cecil	Supervisor, Rowan County Schools
Dr. William B. Owsley	Biology Department
Dr. Fenton West	Dept. of Mathematics and Science
Mr. Roger L. Wilson	Dean, Morehead
Dr. Z. S. Walter	Education Department
Mr. Sidney Simandle	Department of Education
Mr. Monroe Wicker	Breckinridge Training School
Dr. Warren C. Lappin	Dean of Instruction
Mr. John B. Sowards	Ashland Junior College
Miss Lacie Pennington	Ashland Senior High School

Frank H. Vittetow, Director

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Dr. J. G. Black	Science Department
Dr. D. J. Carty	Education Department
Dr. J. D. Coates	Education Department
Dr. M. J. Cox	Science Department
Dr. D. T. Ferrell	Education Department
Dr. R. E. Jaggers	Education Department
Dr. H. H. LaFuze	Science Department
Dr. Henry Martin	Education Department
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Dr. C. P. McNally	Chemistry Department
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Dr. A. B. Crawford	Education Department, Transylvania College
Mr. James M. Yonts, Jr.	Education Department, Transylvania College
Mr. Rodney M. Hayes, Jr.	Biology Department, Transylvania College
Sister Mary Charlotte	Math and Physics Department Nazareth College

Sister Virginia	Chemistry Department, Nazareth College
Sister M. Raymond	Dean, Ursuline College
Sister Mercia	Chemistry Department, Ursuline College
Dr. J. Paul Ray	Science Department, Asbury College
Mr. Sidney Simandle	Department of Education

Mrs. Mary Marshall, Director

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