

Project FUTEPS—A Status Survey of Science Teaching in Indiana

JERRY M. COLGLAZIER

Science Consultant, Indiana Department of Public Instruction
Indianapolis, Indiana 46204

and

JAMES MODENA

Supervisor of Research Programming

and

JERRY J. NISBET

Chairman, Department of Biology
Ball State University, Muncie, Indiana 47306

Abstract

Project FUTEPS is an acronym for "Focus on Useful Teacher Education Programs in Science" which was initiated during Fall, 1972. All science teachers plus seven per cent of the elementary teachers in Indiana public schools were surveyed by a 148 item questionnaire. Seventy-two per cent of the science teachers and 37 per cent of the elementary teachers returned questionnaires. The questionnaire covered personal data, current assignments, experience, training, instructional values, teacher practices, and opinions about support programs. The Indiana Department of Public Instruction, Ball State University, Purdue University, Indiana State University, Indiana University, and Indiana University-Purdue University at Indianapolis shared in developing the questionnaire and processing the data.

Introduction

An Indiana project, "Focus on Useful Teacher Education Programs in Science" (FUTEPS), evolved from a July 1972 meeting of concerned individuals. This meeting, which was held at McCormick's Creek State Park, Spencer, Indiana, was attended by persons representing the science and science education departments from several colleges and universities in the state, staff members from the Department of Public Instruction, science supervisors from the public schools, and representatives from mathematics and the social sciences. The group's desire for specific information about inservice needs of science teachers resulted in the formation of a Steering Committee to launch Project FUTEPS.

Following a September meeting of the Steering Committee, an informal agreement resulted whereby the Indiana Department of Public Instruction was to coordinate the project and develop the data collection instrument; Purdue University was to print and mail the instrument; and Ball State University was to process the data. Indiana University, Indiana State University and Indiana University-Purdue University at Indianapolis provided continued input to the project through the Steering Committee.

Methods

A "Checklist of Science Teaching Practices, Grades K-12", prepared and used in Florida by James V. Pierce (unpublished data), was

used as the starting point for the development of the questionnaire. The committee reviewed this checklist and suggested revisions needed for the Indiana study. A first draft of the questionnaire was circulated among the committee members for additional suggestions. Dr. Wayne Welch, who was on special assignment as an evaluator with the National Science Foundation, was also asked to review the instrument. A second draft was submitted to the Ball State Research Computing Division to mate the desired data with the computer and the questionnaire was then revised to meet data processing requirements.

The final instrument contained 148 items. The first block of questions gathered demographic data. Among these were age, teaching assignment, experience both in the profession and in the teacher's major assignment, courses taken in the various science disciplines, and the currency of these courses.

Two blocks of items were intended to gather information of interest both to the National Science Foundation and to Indiana science educators. One block dealt with the NSF sponsored programs which the teacher had attended. The other examined his experience with the various new science curricula.

Two blocks of questions were intended to gain an overview of teachers' values with respect to science education. One set focused on the purposes for including science in the school curriculum. The second was concerned with the goals of science education (or the abilities that students should carry away from science classes.)

Another block of questions was designed to interrogate the teacher on his familiarity with and use of some 30 teaching strategies and techniques.

The final block of items was directed to teacher rating of the usefulness of some twenty services which might be an aid in performing his job. These services fell into the following categories: those which might be provided by the local district; those which might be provided by the state education agency; those which might be provided by colleges and universities; and those which might accrue from a combination of these sources.

A pilot version of the questionnaire was tested with about 40 teachers during December 1972 and January 1973 to discover problems which might develop during administration of the instrument. The final revision of the questionnaire was printed and mailed by Purdue University in February 1973 and returned to Ball State University during March, April and May 1973.

Data were collected from two populations. The first was the total population of science teachers as reported by their superintendent on the 1972-3 annual EIR-4 professional personnel report. This population included all science teachers in high schools, junior high or middle schools, and departmentalized elementary schools, and other elementary teachers with specialized assignments in science.

The second population was a 7% random sample of all elementary teachers. Elementary teachers were included to explore the applicability

of the instrument and the data collection system to this group. The assumption was made that a random selection of elementary schools would produce a sufficiently randomized sample. The full-time teacher equivalencies reported for the selected schools was totaled and found to be within a fraction of a per cent of 7% of the state total.

The instruments were mailed in packets to the school principal with a cover letter requesting his assistance in distributing and collecting the instruments. Each packet contained a direction sheet, a principal's report form, and an adequate supply of questionnaires to poll the sampled teachers in the building.

A total of 5,492 survey forms were distributed with 3,535 intended for science teachers and 1,930 for elementary teachers. Since 13 teachers were in both populations, there is a discrepancy between the above sum and number distributed. A total of 3,243 forms were returned: 2,545 from science teachers and 700 from the elementary sample. (Four of the returned forms were in both samples.) These figures reveal a 72.0% return for the science teachers. Calculation of the per cent of return for elementary teachers was difficult since the distribution was based on full-time equivalencies; however, on the basis of the number of forms distributed there was a 36.9% return.

A coding scheme was developed to transfer the data into a computer useable form. A sample code and the state numeric school and corporation codes were entered on the questionnaires to simplify the tabulation and retrieval. The forms were checked for omissions and a special code was inserted for missing responses.

The questionnaires were submitted to the Ball State University Computer Center for keypunching. The punched cards were copied onto magnetic tape to facilitate computer processing. Editing runs were made in late July and August 1973, to ensure correct card order for each questionnaire and to eliminate obvious keypunch errors. Due to the numbers involved, no attempt was made to correct other inaccuracies in coding or keypunching; however, the number of errors was apparently small.

The Statistical Package for the Social Sciences (maintained by the Nat. Opinion Res. Cent., Univ. Chicago) was used to process the data. Missing values and values that were out of range for the questionnaire due to keypunch and coding errors were excluded from the statistics. During September and October 1973 several tabulations and cross tabulations were run on the overall file and on various subsets of it using parameters such as sample designation, county, and courses taught.

Preliminary Results

One or more teachers completed a questionnaire from 798 or 81.8% of the 976 schools employing science teachers. Elementary teachers from 56 or 50.0% of the 112 sampled schools returned completed forms.

A brief review of the straight tabulations reveals several initial observations for the science teacher population:

- 1) 55% have not participated in any NSF sponsored teacher education program.
- 2) 45% of the science teachers not currently using one of the new science curricula indicated a desire to use one.
- 3) 33% indicated that they have used but are not now using one of the new science curricula.
- 4) From a list of seven purposes for including science in the school curriculum, science teachers rated the development of science literate citizens, the solving of environmental problems, and the development of wise public decision makers as most important while they rated the production of scientists and meeting of national needs least important.
- 5) From a list of 10 goals for science instruction 7 out of 10 teachers judged that the ability to use the methods and attitudes of science in solving every day problems was one of the three most important goals in teaching science; and 6 out of 10 judged that the ability to apply facts and principles to practical problems had equal importance.
- 6) 36% of the science teachers judged that following the content and sequence of the textbook was useless.
- 7) 39% indicated they used objectives stated in behavioral terms with confidence, 42% indicated they would like help with using them and 19% considered them useless.
- 8) 53% made some use of the Indiana State Science Guidelines.
- 9) 78% permitted students to conduct activities not included in the science text.
- 10) 42% considered that non-graded materials were useless, 36% felt similarly about self-pacing materials, and 49% judged learning contracts to be useless.
- 11) 60% judged that allowing the student to select his own units of study was useless; 56% felt that allowing students to help plan the program was useless and 68% judged allowing students to design their own program of study was useless.
- 12) More than 2/3 of the science teachers indicated they would like inservice programs to aid them in implementing new curriculum materials and to help them with up-to-date methodology.
- 13) 81% felt quite strongly that their materials and equipment were inadequate.
- 14) Two-thirds indicated they wanted to be able to use science curriculum materials on an exploratory loan basis.
- 15) 66% judged that they felt a strong need for local K-12 coordination of the science curriculum.

Although the above list does not exhaust observations that can be made from the initial print out of the data, it includes highlights.

Two additional studies have been conducted which illustrate other categories of information that can be obtained from the file. In preparing a proposal for an NSF Instructional Improvement Implementation Program, the Ball State University Biology Department had the responses to selected items tabulated for biology teachers from a 26-county area surrounding Muncie, Indiana. The Department of Public Instruction requested a cross tabulation of age, total experience, and experience in major assignment, with major assignments. This study was conducted to determine the distribution of future teacher needs in the various categories of science teacher assignments.

Discussion and Future Implications

To determine reliability of the collected data in depicting the status of science teaching on a state-wide basis, the return was reviewed on a county by county basis. For the science teachers, the range was from 25% to 100%. Although the return varied more than 10% from the 72% state-wide mean in 54 counties, 33 of these are

predominantly rural with less than 20 science teachers. Another 17 had less than 50 science teachers where the action or inaction of a single principal could influence the return by more than 10%. Thus, only 4 heavily populated counties were beyond a 10% variation, two of these employed 51 science teachers and one of the others was within 11% of the average.

Although the county by county analysis of the returns would tend to substantiate the validity of almost any state-wide implications drawn from the science teacher data, similar analysis of the elementary returns tended to cast greater doubt on the reliability of this data as a state-wide indicator. Conclusions pertaining to elementary teacher sample cannot be made until these data are subjected to further treatment.

A copy of the straight tabulation of the FUTEPS study has been deposited with each member of the Project's Steering Committee. Science educators are welcome to examine the data. The FUTEPS Steering Committee requires that anyone planning to publish interpretations of the data clear his interpretation with the committee.

Project FUTEPS might be described as a spark that fell into the darkness resulting from an inadequate data base for responsible decision making in teacher education. The data from the project should provide the State of Indiana and its institutions of higher learning with a more solid foundation for building future science education programs. Perhaps just as importantly, the cooperative effort of the Indiana Department of Public Instruction and the several universities has been brought to focus on a common problem—a problem which cannot be resolved by independent action of any single agency.