SCIENCE EDUCATION

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ABSTRACTS

Common Problems in the Development of Carrel Learning Packets. STANLEY S. SHIMER, Assistant Professor, Science Teaching Center, Indiana State University, Terre Haute, Indiana 47809.——Carrel learning packets provide children with alternative, independent activities which reinforce or broaden learnings. Students in a pre-service elementary school science methods course were given an assignment to develop a carrel activity appropriate for school children at a specific grade level, to field test it, to improve it, and to share it with their classmates.

Specifically, in the assignment, the university students were instructed to construct a carrel which would lead a child to interact with materials without direct teacher involvement, provide immediate feedback to reinforce the child's learnings and instruct the child to return the matherials to the original state so that the next child could work through the carrel packets as designed. In addition, the university students were directed to prepare a carrel description which indicated the topic, type of activity, grade level, performance objective, concept, materials needed, procedure, and sources of the idea.

Two hundred seventy-eight carrels were reviewed. Some of the more common problems detected were:

1) the objective or concept was not in agreement with the content of the activity;
2) the directions were not clear nor specific enough;
3) the directions were too complex or too difficult to read at the grade level indicated;
4) the feedback tended to be too general and did not give all possible solutions; and
5) the directions for recycling the carrel were omitted.

A review of approximately forty carrel activities devised by in-service teachers enrolled in graduate science education courses indicated these carrels illustrated the same common problems.

Although individualized carrel learning packets are valuable instructor learning tools, inexperienced carrel developers generally tend to encounter the same predictable problems.

Environmental Field Day. MARSHALL D. MALCOLM, Department of Education, Purdue University, West Lafayette, Indiana 47907.——On October 5, 1974 an Environmental Field Day was held at the Tippecanoe

Battlefield, near Battle Ground, Indiana. The purpose of this activity was to provide the preservice teacher an opportunity to work with small groups of elementary school children who are in the same grade level as the classroom to which he has been assigned to do his student teaching. This teaching was to start at the end of the eight-week science methods course. Each teacher developed a process-oriented activity in some area of enivronmental education. The 233 Girl Scouts were divided into forty small groups, one for each preservice teacher. Each group was composed of children from the same grade level. The activities were followed by the showing of two movies, "Pitch-In!" and "The Litter Monster." Each girl received materials from the national Pitch-In program. Slides were shown of the preservice teachers using their environmental activities with the elementary school children. The feed back from both students and preservice teachers indicated that the field day had been a rewarding experience for all who participated.

Environmental Science: A New Direction in Science Education. CLAIRE A. PUCHY and GARY W. BARRETT, Institute of Environmental Sciences, Miami University, Oxford, Ohio 45056.——Environmental Science is a new interdisciplinary field of study that may be the "academic key" for training the personnel needed to attack systematically the complex problems that threaten the quality of our environment. Environmental Science is based on a three-pronged academic philosophy: (a) an interdisciplinary problem-solving core curriculum, (b) in-depth training in a multidisciplinary area of concentration (e.g., regional planning, population studies, environmental health, water resources, etc.), and (c) an on-the-job training or research experience (e.g., practicum, internship, or thesis). Whereas ecology is defined as the study of the structure and function of ecosystems, Environmental Science is defined as the study of the impact of man on the structure and function of ecosystems and the management of these systems for man's benefit and survival.

A relatively new Master's Degree program in Enivronmental Science at Miami University has been highly successful in training graduate students in the above-mentioned educational philosophy. We challenge science education specialists to encompass this philosophy in programs ranging from kindergarten through adult (continuing) education. Such curricula would, therefore, better balance the basic (liberal arts) and applied (mission-oriented) aspects of science education.

The Lecture Demonstration: A Neglected Audio-Visual Aid. JOHN A. RICKETTS, Chemistry Department, DePauw University, Greencastle, Indiana 46135.——When properly introduced, the lecture demonstration provides the avenue that can lead to a viable, academic teacher-student interaction. The science teacher who is provided with a repertoire of meaningful lecture experiments can stimulate student interest, reinforce ideas within the text, and supplement the laboratory experience in those instances where only a limited time is allocated for laboratory. Several demonstrations are presented for purposes of illustration.

The emphasis to use the lecture demonstration in the teaching of science is undergoing a renaissance; at the Penn State Priestley Con-

ference 1974, a featured symposium was titled "Lecture Experiments Revisited." This Division can constructively serve science education in the state of Indiana by encouraging the presentation of unique lecture demonstrations and laboratory experiments at the Academy meetings and insuring that these are published as part of the Proceedings of the Indiana Academy of Science.

Let's Put "Audio" into Audio-Tutorial Teaching. Larry R. Yoder, The Ohio State University, Marion Campus, Marion, Ohio 43302, and James T. Addis, Wisconsin Department of Natural Resources, Milwaukee, Wisconsin.——Taped porgrams for audio-tutorial teaching provide a medium for audio techniques that are not conveniently used in a lecture. Audio-tutorial biology tapes produced at the Marion Campus of The Ohio State University utilize musical backgrounds scored to the verbal script to emphasize the taped commentary. Period music was used with remarks about the history of biology, and electronic music helped describe the movement of chromosomes during meiosis and mitosis. Dramatic reading highlighted quotations and historical accounts, and sound effects such as bird calls and chain saws were used for a unit on forest ecology. Varied tape speeds and electronic echo were special effects used in a dialogue with a human embryo in which the embryo described its stages of development. Interviews with professionals and laymen were integrated into the audio programs for variety and stimulation. Multiple readers provided conversational dialogue for the scripts.

We attempted to produce the highest quality of tapes possible within the limits of our equipment and technical abilities since students compare the quality of audio instructional materials with programming on commercial or public broadcasting. To maintain a lively, stimulating style, taped commentary proceeds for no more than 3-5 minutes between student learning activities.

We suggest that instructors who write and produce audio-tutorial materials should make judicious use of every production technique at their disposal for maximum student motivation.

Enhancing Science Education Accountability: A Model for University Secondary School Cooperation. Jon R. Hendrix, Thomas R. Mertens, and Jerry J. Nisbet, Ball State University, Muncie, Indiana 47306.—— After receiving eight weeks of instruction in an N.S.F. Biology Institute, fourteen high school life science teachers cooperated with their public school administrators and higher education personnel in testing a model designed to enhance science education accountability. Our model held teachers accountable for pupil gains as measured by pre/post-tests based upon performance criteria. Higher education personnel, public school teachers and administrators were held accountable for cooperative establishment of performance objectives, for implementation of teaching strategies, and for assessment of measurable student gains. Participants were visited six times during the academic year by the Coordinator of the School Science Visitation Program from Ball State University. The model involved the following steps: (1) Cooperative assessment of student needs relative to local school science goals. (2) Development of curricular guidelines based upon needs assessment. (3)

Development of instructional units composed of performance objectives, pre/post-tests, and instructional strategies. (4) Administration of pretest prior to initiating instructional strategy. (5) Adjustment of instructional strategy based upon analyzed pretest data. (6) Implementation of instructional strategy for student attainment of desired performance. (7) Administration of post-test and application of student *t* test to pre/post-test data, testing the null hypothesis that the mean of the differences between the paired measures is zero. (8) Evaluation of the effectiveness of instruction through analysis of test data.

The null hypothesis was rejected for test data gathered on 84 instructional units; in all cases the probability that the differences between pre and post-test scores was due to chance was less than .001. We may thus conclude that statistically significant learning had taken place.

Fostering Communication and Attitudinal Development in Science between Elementary and Secondary Teachers and Administrators. DR. HAROLD H. JAUS, DR. GERALD KROCKOVER, Purdue University, Education West Lafayette, Indiana 47907.——The purpose of this investigation was to determine the effects of teaming elementary and secondary teachers and administrators and their subsequent changes in communication and attitude toward teachers from diverse grade levels. The changes in communication and attitude were measured by a Likert-type attitude scale and written comments by the subjects involved.

The 38 subjects in the study were participants in a four-week summer NSF Implementation Program. This sample consisted of 17 elementary teachers, 17 junior-senior high teachers, and 4 administrators.

Prior to treatment all subjects were administered the attitude measure. This instrument measured attitudes toward (1) science, (2) teaching science, and (3) teaching in a team consisting of individuals from diverse grade levels. The subjects also wrote several brief statements concerning their feelings about team teaching with individuals from diverse grade levels.

Treatment consisted of team teaching S-APA and ESS lessons to children in grades K-6. A "team" consisted of (1) an elementary and a senior high teacher; (2) an elementary, junior high and senior high teacher; or (3) an elementary, junior high teacher and administrator. Each "team" taught 7-10 children 1½ hours five times a week for three weeks. Following treatment, the subjects were again given the attitude measure and asked to write their comments about mixed "teaming".

Pre- and post-test analysis of the data showed significant positive changes in attitude toward working with teachers from diverse grade levels. Rapport, understanding, insight, exchange of ideas, help, and respect were significantly improved.

Does the Participation in a Science Methods Course Change the Attitudes of a Pre-Service Elementary Teacher Toward Science Teaching? ROBERT K. CAUDELL, Southeast Fountain Elementary School, Veedersburg, Indiana 47987.——One of the instructional goals of the science

teaching methods course at Indiana State University is to improve the attitudes of prospective elementary teachers toward the teaching of science in the elementary grades. It is believed that, if the prospective teacher has a positive attitude, he will feel more confident in teaching science and, therefore, will be a more effective teacher in that portion of the curriculum.

This study was conducted to determine whether, in fact, attitudes changed as a result of participation in the science teaching methods course.

Although the data is based on a small sample and the instrument used was designed solely to represent the attitudes of the staff of the Science Teaching Center, Indiana State University, this study indicates a change in attitudes does occur.

Can Your Attitude Towards Elementary Science Instruction Change? H. MARVIN BRATT, Assistant Professor of Science Education, The Ohio State University, Marion, Ohio 43302.——There has always been a concern for the development of various affective behaviors concommitant with instruction. Recent literature describing science education reflects an even greater concern for the development of affective behaviors. Many scientists, educators and psychologists have recommended that university instructors give attention to developing these affective behaviors among prospective elementary teachers because of their direct involvement with young children.

Over the years, science instruction has been primarily concerned with helping the student learn a pre-selected body of scientific knowledge. This would seem to indicate that there has been an emphasis on the development of cognitive skills and behaviors. Affective and cognitive behaviors and skills apparently develop together in a manner that is not well understood. Most psychologists and science educators would agree that although cognitive skills are important, perhaps the development of affective behaviors are of equal importance. Thus, one goal of elementary science instruction should be the development of positive affective behaviors towards science.

The Evaluation of Implementation and Support Procedures in Selected Indiana Corporations that Adopted Either SCIS, SAPA or ESS Elementary Science Programs. KENNETH L. POTTS, Science and Mathematics Curriculum Exploration Center, 618 Franklin Square, Jeffersonville, Indiana 47130; JERRY M. COLGLAZIER, Science Consultant, Indiana Department of Public Instruction, Division of Curriculum, 120 West Market Street, 10th Floor, Indianapolis, Indiana 46204.——Fifteen school districts randomly selected from the twenty-seven districts within a seventy-five miles radius of Indianapolis which had reported the implementation of either SCIS, SAPA or ESS elementary science programs provided the data for the study.

An interaction analysis instrument was used to measure verbal interactions between teachers and pupils to determine the extent to which the critical thought development (inquiry) component of the three programs had been implemented. This instrument along with interviews

with administrators, principals and teachers were used to identify those factors affecting the success of implementation programs. The results of the study served as a basis for the development of an implementation model for elementary science programs.

Total Environmental Education: Getting Environmental Education into Indiana Classrooms. H. JAMES FUNK, NEIL V. WEBER, Indiana University, South Bend 46615.——In recent years the general public has suddenly awakened to the reality that man is altering his natural environment at a devastating rate, and that in many instances nature is retaliating. The growing concern of many environmentalists at the present time is that much of the citizenry is not fully aware of the delicate interplay among natural and man-made systems, and the need for an interdisciplinary approach to environmental problems.

Elementary and secondary school teachers have the unique opportunity of reaching the young people during a highly informative stage of their development. All too often, however, these teachers are not properly prepared to give their students a substantive, comprehensive look at local environmental issues and concerns.

The purpose of this paper is to acquaint elementary, secondary, and university personnel with methods of integrating conservation instruction into the K-12 curriculum. More specifically, the paper is meant to focus attention on a particular approach to environmental education that proved to be quite successful on the Indiana University at South Bend campus.

During summer session I of 1974, the authors team-taught a three-week workshop on the "Teaching of Environmental Conservation in the Elementary School" for graduate elementary teachers. The major goals of the course were to develop:

1. an appreciation for the complexity and dynamic character of your natural environment,
2. a recognition of man's interdependence with both natural and man-made components of your environment,
3. an understanding of essential environmental concepts,
4. an awareness of resources available to teach environmental conservation in the Michiana area (e.g., outdoor education facilities, local environmental organizations, environmental education aids, and resource people), and
5. skills in organizing and developing an environmental conservation unit for use in your classroom.

The focus of the course was twofold: (1) to develop requisite knowledge, skills, and attitudes to teach environmental education, and (2) to develop curricular materials congruent with the guidelines prescribed by the State Department of Public Instruction in *Total Environmental Education.*

In developing environmental education competence, instruction consisted of lectures, labs, field trips, films, and environmental simulations. Building on this basic knowledge the teachers, working in teams, developed resource units covering the following topics: Energy, Earth

Resources, Resource Reclamation, Population Processes and Dynamics, Interdependence, and Quality of Life.

By pooling and duplicating the units developed by the various teams, each teacher took back to his/her classroom a complete environmental education resource unit specifically geared to his/her respective grade level.