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ABSTRACT

The rationale for, and use and effect of, audiotutorial minicourses in teaching basic biology are discussed. Statistical analyses of data from an evaluation questionnaire that was given the students at Hagerstown (Maryland) Junior College is presented. (SGM)

THE INTEGRATION OF AUDIO-TUTORIAL MINICOURSES WITH THE CONVENTIONAL BIOLOGY LECTURE AND LABORATORY

General Biology 101 at Hagerstown Junior College is a six hour course, three hours of lecture and three of laboratory. The general principles of modern biology are covered during the first semester course. It is usually followed by General Biology 102 in which the principles studied the first semester are discussed again as an integrated part of ecology.

The students taking General Biology 101 have little common academically. Since the course is required in many curricula, and due to an open door policy, the students cover the spectrum in terms of intellect, interest, and background. In past years as many as 40% of these students received D's or F's, particularly in General Biology 101.

The instructors of General Biology 101 investigated many techniques in an attempt to find a method that would remedy this high failure rate. In November of 1971 the Postlethwait method of audio-tutorial teaching was observed at Purdue. Although the methodology was found to be interesting and effective, the model itself could not be adapted to Hagerstown Junior College for several reasons. First, it was quite expensive requiring the use of numerous graduate teaching assistants who are not desirable to convert conventional laboratories into audio-tutorial centers at this time.

It was decided to investigate the possibility of using audio-tutorial minicourses as an integrated part of the regular lecture and laboratory in General Biology 101. The writing of the minicourses began as a ten-week summer project in 1971. Ten topics were chosen because students had demonstrated difficulties in these areas in the past. Minicourses were developed for each of the following topics:

- Chemistry for the biology student
- Mitosis and Meiosis
- Plant tissues
- Animal tissues
- Photosynthesis
- Homeostasis
- Graphing in biology
- Solving genetic problems
- Animal phyla
- Plant phyla

The two instructors, a paraprofessional, and a student aide developed the minicourses in the following manner. The instructors developed all models, laboratory activities, and scripts. The paraprofessional and the aide prepared the models, equipment, slides, photographs and drawings. The developmental sequence was as follows:

1. Behavioral objectives were written.
2. Each topic was discussed generally to list the activities that might be used in reaching the objectives (story boarding).
3. An integrated sequence of activities was stated.
4. A script was written to serve as the coordinating instrument.
5. Activity sheets were written.
6. Slides, charts, models, and photographs were made.
7. Tapes were made of the written scripts.
8. Pre-tests and post-tests were written.

All ten minicourses were introduced during the fall of 1971. Students were required to take them in addition to regular lectures and laboratories. Five copies of each were available in the Science Learning Center over a two week period.

At the end of the semester the students were asked to evaluate the minicourses. Six items were given on the evaluation form. The student could score each from a low of one to a high of five. A three (3) indicated no opinion. Table I gives the results of this questionaire.

A record card was maintained for each student during the entire semester showing the completion time, pre-test score, and post-test score for each minicourse the student completed. The mean completion time for each minicourse for three years is shown in Table II. A percentage gain was also calculated for each minicourse from the pre-tests and post-test scores. These can be found in Table III.

As a result of these findings several changes were made in General Biology 101 for the academic year 1972-73. Based on statistical data and student comments several minicourses were rewritten to improve content. In addition, two minicourses were divided into separate units to shorten

completion time and make them conceptually more manageable. Two minicourses were transferred to the second semester General Biology 102 and three additional enrichment minicourses (Ecology of Fire, the Biological Significance of Chelates, and Sewage Ecology) were added to the second semester.

Data collected for the academic year 1972-73 showed an improvement of gain scores for several minicourses indicating that the rewriting was apparently successful. A grading system was also introduced during the second year as a natural outgrowth of arriving at a student's grade by evaluation in three areas: lecture examinations, laboratory papers and examinations, and scores on minicourses.

At the end of the academic year the developers realized that the pre-tests and post-tests had been used over five-hundred times and there was a definite need to develop a new set of tests for each minicourse.

The summer of 1973 was spent writing a battery of test items for each minicourse. Six tests were prepared for each minicourse, each test containing from 15 to 20 questions. No question was used more than three times. Students were given a different test for their pre-test and for each post-test. In addition to the before mentioned data, additional data is being kept during this year in the following areas:

1. Mean scores for each pre-test and post-test for each minicourse.
2. Sufficient data to do an item analysis for each question.

An audio-tutorial system such as this, operates efficiently and in the best interests of the student only if there is continuous evaluation of feedback information. The initial evaluation concerned the feasibility of introducing an audio-tutorial system into our particular environment. Once this proved practical, it was necessary to evaluate each minicourse with regard to its effectiveness as a learning tool. Evaluation is now being carried out to improve the reliability and validity of test items.

The Science Learning Center at Hagerstown Junior College has been in operation for three years and has not yet realized its full potential. The science faculty is continuously exploring new and innovative ways of using the audio-tutorial concept to bring the student a variety of learning experiences.

STUDENT EVALUATION OF AUDIO-TUTORIAL MINICOURSES

STATEMENT	MEAN*	STANDARD DEVIATION	T-TEST VALUES
1. THE USE OF THE A-T MINICOURSES HELPED ME DEVELOP BETTER STUDY HABITS.	3.30	.97	2.7**
2. THE A-T MINICOURSES AIDED ME IN UNDERSTANDING CERTAIN LECTURES AND SPECIFIC AREAS OF THE TEXT.	4.38	.73	17.2**
3. I FEEL THE A-T MINICOURSES HELPED ME LEARN THESE SPECIFIC CONCEPTS BETTER THAN LIBRARY RESEARCH ALONE WOULD HAVE DONE.	4.32	.80	14.6**
4. THE A-T MINICOURSES ENHANCED MY OPPORTUNITY FOR FURTHER IN-DEPTH INVESTIGATION IN CERTAIN AREAS.	3.54	.91	5.4**
5. THE A-T MINICOURSES USED ALONG WITH LECTURES AND LABORATORY EXPERIENCES WERE RELEVANT AND MEANINGFUL TO ME.	4.21	.84	13.4**
6. I WOULD LIKE MORE LECTURE AND/OR LABORATORY TIME GIVEN OVER TO A-T MINICOURSES.	2.98	1.26	.14

* STUDENTS EXPRESSED THEIR AGREEMENT WITH TEE STATEMENTS ON A SCALE OF ONE TO FIVE. A VALUE OF ONE INDICATING LITTLE AGREEMENT AND A VALUE OF FIVE STRONG AGREEMENT.

** SIGNIFICANT AT THE 0.01 LEVEL.

TABLE I

COMPARISON OF MEAN COMPLETION TIMES

A-T MINICOURSES	MEAN TIME-MINUTES 1971-72	1972-73	1973-74
1. CHEMISTRY FOR THE BIOLOGY STUDENT	138.4	104.1	109.6
2. MITOSIS	145.4	83.0	90.8
3. MEIOSIS		71.2	81.3
4. PHOTOSYNTHESIS	101.2	101.2	95.5
5. RESPIRATION		63.4	95.5
6. GENETICS PROBLEMS	82.2	86.1	84.5
7. HOMEOSTASIS	72.2	70.2	65.8
8. PLANT TISSUES	112.2	NO DATA	88.9
9. ANIMAL TISSUES	80.8	65.0	63.7
10. PLANT PHYLA	71.7	90.0	NO DATA
11. ANIMAL PHYLA	86.4	NO DATA	NO DATA
12. SEWAGE ECOLOGY	NO DATA	NO DATA	NO DATA
13. FIRE ECOLOGY	NO DATA	NO DATA	NO DATA
14. BIOLOGICAL SIGNIFICANCE OF CHELATES	NO DATA	NO DATA	NO DATA

TABLE II

COMPARISON OF MEAN PERCENTAGE GAIN SCORES

A-T MINICOURSES	1971-72	1972-73	1973-74
1. CHEMISTRY FOR THE BIOLOGY STUDENT	72.69	74.97	60.75
2. MITOSIS	59.78	90.76	69.39
3. MEIOSIS		90.60	81.30
4. PHOTOSYNTHESIS	79.63	88.68	64.20
5. RESPIRATION		92.17	67.17
6. GENETICS PROBLEMS	94.42	99.17	75.46
7. HOMEOSTASIS	92.19	95.91	74.84
8. PLANT TISSUES	78.02	NO DATA	76.86
9. ANIMAL TISSUES	84.35	92.30	69.15
10. PLANT PHYLA	79.08	84.42	NO DATA
11. ANIMAL PHYLA	84.54	78.80	NO DATA
12. SEWAGE ECOLOGY	87.97	89.44	NO DATA
13. FIRE ECOLOGY	100.00	98.84	NO DATA
14. BIOLOGICAL SIGNIFICANCE OF CHELATES	NO DATA	91.53	NO DATA

TABLE III