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mosum (Chevallier) Sacc. var. *squarrulosum* (Bres.) Pearson & Dennis]

Solitary, and scattered to cespitose on humus. PL, 30 Aug 1968, *MGW 1695;* 12 Oct 1969, *MGW 1993.*

T. terreum (Schaeff. ex Fr.) Kumm.

Gregarious on humus. ISP, 24 Sep 1970, *MGW 2079.*

Tulostomataceae

Tulostoma fibrillosum White

Scattered to gregarious in sand in open area. PL, 8 Sep 1965, *MGW 1257;* 7 Jun 1969, *MGW 1789;* 10 Oct 1969, *MGW 1987*.*

Volvariaceae

Pluteus admirabilis (Pk.) Pk.

Gregarious on log. CCNHA, 24 Jul 1968, *MGW 1610.*

P. cervinus (Schaeff. ex Fr.) Kumm.

Solitary to gregarious on humus, logs, and woody debris. CCNHA, 16 Jun 1969, *MGW 1800;* 28 Jun 1969, *MGW 1815;* NWSP, 24 Jun 1962, *MGW CC2**; 25 Oct 1963, *MGW N1;* 23 Jun 1965, *MGW 1163**; F, 24 Jun 1968, *MGW 1553.*

P. leoninus (Schaeff. ex Fr.) Kumm.

Solitary on log. CCNHA, 14 Sep 1968, *MGW 1726.*

P. luteomarginatus Rolland

Solitary on log. CCNHA, 4 Oct 1968, *MGW 1776.*

P. nanus (Pers. ex Fr.) Kumm.

Gregarious on humus and roots at base of tree. NWSP, 22 Jul 1967, *MGW 1430.*

Volvariella speciosa (Fr. ex Fr.) Sing. [*Volvaria speciosa* (Fr. ex Fr.) Kumm.]

Gregarious on humus. ISP, 24 Sep 1970, MGW 2096 (in U. of Mich. Herbarium only).

EDUCATION

An Experimental Introductory Course for Prospective Secondary Science Teachers

MARJORIE A. BOECK*

ABSTRACT — Described is a first course in education at the University of Minnesota for prospective science teachers which combines educational psychology, science content and micro-teaching experiences. The methods used and logistical problems related to such a course also are described. Students in the course kept daily logs of their reactions to curricular materials, teaching techniques, and the micro-teaching experience to provide positive feedback to the instructors. In an examination covering the psychology aspects, all students in the combined course scored above the median for students from other sections. This experimental course has been adopted as the pattern for all science education majors.

University of Minnesota students preparing to be secondary school science teachers are enrolled in the College of Education for their junior and senior years. Until this experimental program was started in 1969, all education students were required to take two five-credit courses in education during the junior year. One course dealt with sociological and the other with psychological foundations of education. The "methods" courses taken during the senior year consisted of a three-credit, fall-quarter increment followed by one-credit courses in the winter and spring quarters. Students had their first classroom experience during the senior year as student teachers.

Most educational psychologists would maintain that certain topics such as classroom measurement and evaluation, behavioral objectives, motivation, and learning are germane to prospective teachers regardless of major specialty. Yet, students in the psychological foundations course complained that the material was irrelevant, while instructors of methods courses complained that students lacked background which they assumed had been taught.

During the 1969-70 school year, the author became involved in teaching an experimental course for College of Education juniors who were preparing to teach science in secondary schools. The new course carried six credits and combined the content from the five-credit introductory educational psychology course with selected content from the one-credit science methods sequence. The class met for two consecutive hours five days a week concurrently with two sections of seventh grade science from Marshall-University High School which were made continually available for practicum.

The content, organization, and activities of the course were selected with the following assumptions in mind:

There should be early work with high school pupils to provide an opportunity for career choice evaluation;

Course work in education should become more meaningful after classroom experience;

There should be earlier identification with teaching and pupils as well as with the academic subject field.

Combining educational psychology, science methods, and classroom experience should make a highly relevant package.

The team-teaching in this combined course was provided by an instructor of educational psychology with a science education background and a professor of science education. In addition, the seventh grade science instructor served as an observer and feedback-resource person. Each college faculty member was considered to have

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given one fourth of his time to this assignment, and the high school teacher was considered to be giving one-fifth of his load to it.

Class discussions initiated by student-developed definitions resulted in the formulation of a working definition of science, and this, plus the ways in which it could be implemented in the classroom, became the framework for consideration of such topics as reinforcement theory, behavioral objectives, motivation, attitudes, and grading practices. The course activities included discussions, observations, films, readings, and a series of "micro-teaching" experiences with pupils from Marshall-University High School.

Micro-teaching in the course was a modification of the concept as developed at Stanford University in which all dimensions of the teaching situation were scaled down to reduce complexity. Each student taught four to eight pupils a 10-20 minute lesson while observed by a faculty member and his peers. No attempt was made to fit these lessons into the seventh grade science course. The teacher of the seventh grade classes considered these periods to be "intellectual holidays" for his pupils.

The fall and winter quarter micro-teaching pattern was one of teach and then reteach. The student taught a lesson and received feedback from his peers and the faculty observer. He then retaught the same content to a new group of pupils. During the fall quarter, the schedule for the seven enrollees included three such micro-teaching experiences of twenty minutes duration in a variety of arrangements and a full period (40 minutes) of teaching with a full class. During the winter quarter a similar pattern was followed with minor modifications to adjust for an increase in enrollment to fifteen students.

A further increase to 22 students in spring quarter necessitated several changes. Each student taught ten, ten-minute micro-lessons on consecutive days to the same group of pupils. Each student was assigned one of three topics: simple machines, heat transfer, or color, as a unit to be developed during the ten lessons. It was not possible to schedule any full-period teaching in this quarter.

In the fall and winter quarters, the students chose their own teaching topics. The topics included static electricity, osmosis, density, fluid pressure, acids, classification of conifers, types of cells, and bird migration. Several students in the fall quarter chose to develop the same topic during each of the three teaching periods to form a "micro-unit." During winter quarter, however, any continuity of teaching the same seventh graders was impossible, and unique topics were used in each teaching period.

In the future, teaching topics will be assigned. It was noted in the fall and winter quarters that students spent too much time seeking and rejecting topics before they settled on a teachable piece of subject matter. That time, it was concluded, could better be spent in developing the micro-lesson. Topics will be chosen from chemistry and physics and might include static electricity, color, heat transfer, solutions, density, and fluid pressure. These topics were found to provide for ready demonstration and high level questioning and were readily adaptable to short teaching periods.

During the fall and winter quarters, duplicate critiques of the micro-teachings were written by peer and faculty observers. One copy was given to the student who taught while the other was filed for review by the faculty observers. Similar written statements were provided by peers in the spring quarter when, in addition, audio-tapes of each lesson were made and the students were encouraged to use them in lieu of feedback sessions.

Students were asked to make daily entries into a logbook which was collected several times during the quarter and read by the faculty. The log served as a place to record insights and reflections about the course, its material, its methods, and its instruction. Students were extremely candid in their remarks and provided feedback regarding the sequence and choice of activities and readings as well as information on the mannerisms, strengths, and weaknesses of the instructors. Communication was not one-way, however, for faculty comments were added to the logs, particularly when requested by students.

Response to the course was generally enthusiastic. The seventh grade pupils were cooperative and interested, and they learned about subjects they would not have encountered otherwise. Their teacher, however, suggested that pupils should not be involved for more than two quarters of the academic year.

The following comments, abstracted from several logbooks, illustrate the feeling the college students had toward the new ways of presenting the required content in educational psychology and science education.

> I really feel that I've learned a lot—not just facts, but an attitude or philosophy about teaching and education in general.
>
> Starting off in education this way has given us a positive, practical outlook on teaching that is invaluable.
>
> I feel that the most outstanding aspect of this course has been the micro-teachings. It provides a laboratory experience for testing the various ideas that are introduced into the course. Presenting our lessons to the peer group would have been (I think) a mistake. There is no way to duplicate the response of seventh graders.
>
> We can now imagine ourselves in the appropriate situation when educational psychology is discussed.
>
> Though doing some critical thinking, after so many years of just accepting as truth what is given to you, is hard, it is one of the most rewarding experiences a person can have.
>
> The whole pattern will definitely give us an advantage when student teaching begins.

Multiple-choice examinations were administered in all sections of the educational psychology course to measure the attainment of cognitive objectives. None of the students from the experimental pattern scored as low as the median score of the students enrolled in all other sections. This outcome, coupled with the gratifying acceptance by the students, provided justification for using the combined course as the standard offering for all science education majors.