

## **A Preliminary Report on the Identification of Instructional Problems of Teaching Assistants in Chemistry Which Might be Met With a Training Program**

**EPHRAIM WALL, Oklahoma State University**

### **BACKGROUND OF THE STUDY**

Extensive use is made of teaching assistants in beginning courses of science at most universities. This would appear to be a "target area" for the improvement of science education on this level.

Persons concerned with university instruction are aware of the problems posed by the extensive use of teaching assistants. Adams (1942), in a response to his request for questions on laboratory work in chemistry, received ninety-five questions from fifty-four schools. The question "What training should laboratory assistants have who are in charge of the laboratory" was sixteenth on the list when classified on the basis of frequency.

Lippincott (1959) outlines a training program for teaching assistants as followed at the Universities of Florida and Michigan State. He suggests the use of a pre-term training period, the use of staff meetings, and on-the-job training.

The problem is being given consideration at Oklahoma State University. Each year teaching assistants in chemistry meet for several hours with the staff during the week previous to the start of the fall semester. During these sessions, the technicalities of the assignment, teaching procedures, teaching philosophy, and laboratory management are discussed. In addition to this, teaching assistants are encouraged to attend the College of Arts and Sciences Teaching Seminars held on the first four Saturdays of the fall term.

The "Handbook for Chemistry Assistants" (Handbook Committee, 1952) published by the Division of Chemical Education of the American Chemical Society, is a device for meeting this problem on a widespread basis. Both Lippincott (1959) and the Oklahoma State University staff encourage laboratory assistants to read it carefully.

Research directed to testing the efficaciousness of training programs for teaching assistants is quite scarce. However, Elliot (1950), during the fall semester of the 1948-49 term at Purdue University, investigated the various criteria of teaching as applied to the teachers of Chemistry I, an introductory course in beginning chemistry for engineering freshmen.

Four criteria for teaching were investigated: (1) Students rating of instructors; (2) "How Teach and Learn Scores" (A teacher attitude instrument); (3) Teaching assistants' subject matter knowledge in chemistry; (4) Average achievement of each instructor's students. The first and third criteria are quite similar to instruments proposed for use in this study. The overall aim of Elliot's research appears to be a search for a desirable basis for selecting teaching assistants, rather than the improving of the teaching of those already selected.

Beginning chemistry at Oklahoma State University has certain features which will affect this study. First, the situation in the Chemistry Department can be considered as typical of other university chemistry departments. Use of teaching assistants is made in all beginning chemistry classes. Usually the assistants have no formal training in psychology or education and are without previous teaching experience; yet they are the face-to-face contact of chemistry as introduced to freshmen students in the university.

Second, teaching assistants are in contact with students four hours per week out of the six or seven hours of class attendance in chemistry. One of these hours is a quiz hour—a theory period largely unstructured where the assistant is left mainly to his own resources. The remaining hours of theory are taught by staff members in large classes.

#### PLAN OF RESEARCH

This is an exploratory study. The major purpose of the study is to:

A. Discover the relationships between (1) (a) the personality and the other selected characteristics of chemistry teaching assistants, and (b) the interest and motivation of teaching assistants in regard to their instructional tasks; and (2) the perception of the instructional problems of these teaching assistants by the teaching assistants themselves, their students, and the chemistry staff.

B. Identify the instructional problems of teaching assistants in chemistry which might be met with an in service training program.

The analysis of the purpose of the research resulted in the formulation of certain problems. These problems, with a plan of attack for each, are outlined as follows:

##### A. Characterization of Teaching Assistants:

1. Identifying characteristics: The identifying characteristics can be gleaned from an analysis of the application forms received from the teaching assistants by the Department of Chemistry. These will be recorded in appropriate tabulations.

2. Motivating factors: A questionnaire will be used to gather data on: (a) "why did they enter the chemistry field?" and (b) "what are their goals?", with tabulation made in suitable summaries. Interests will be tested with the Strong Vocational Interest Survey.

3. Characterizing personality traits: Cattell's Sixteen Personality Factor Questionnaire will be used. Analysis will follow Hemphill's (1962) plan.

4. Basic knowledge of chemistry: The Chemistry Department uses the American Chemical Society Tests in general, analytical, organic, and physical chemistry in the entrance examinations required for advanced study. The results of these tests will be used as a basis for determining subject matter preparation of teaching assistants.

B. Identification of problems: Three groups will be considered as data resources for the identification of problems of teaching assistants: (a) the staff; (b) teaching assistants; (c) the chemistry students being taught by the teaching assistants. Data will be collected from each of these three groups by (a) Participant Observation (Becker and Geer, 1960), and (b) Student's Rating Scale for Teachers. Comparative analysis will be made of the results of these two techniques to determine those problems which are important or basic to teaching assistants.

C. Determination of amenability to a training program: Problems identified above will be submitted to a panel of qualified persons in education and chemistry, who will be asked to select those which may be appropriate for a training program.

#### PARTICIPANT OBSERVATION

The principal procedure for gathering data is an application of "Participant Observation" as developed and refined by Howard Becker and Blanche Geer (1960). Observations, including interviews, are made on an informal basis—in classes, quiz hours, laboratory, staff meetings, informal discussions—of teaching assistants, students, and staff members; thus observations are made wherever they can be found. All information that shows relevance for research is recorded. Each item is recorded on an individual card, carefully coded as to date, informant, and categories.

These items of evidence may be observations of behavior of teaching assistants, students, or staff; information may be derived from an individual or group, from conferences or discussions, from expressions of feeling or opinion by the subjects involved. Items are categorized as to (1) suggested problem; (2) operation or job category; (3) educational concept; (4) sociological, educational, psychological, or administrative theory. Analysis is progressive; it is made during data gathering and will serve as a guide for further data gathering.

In the final stage, the observer will design a descriptive model which best explains the data which he has assembled. In this research, this will include (1) statements of the necessary and sufficient conditions for the acceptance of certain problems and concepts, (2) statements supporting the contention that certain of the problems presented in (1) are "important" or "basic" concerns of teaching assistants in chemistry, and (3) the identification of these problems with basic theory and the structuring of the interrelationships of the research.

In the final form of each problem, each kind of item that leads to it should be covered by the inference of the statement of the problem. Each item should have a characteristic that can be interpreted as an expression of the problem to which it is assigned as relevant. Each problem should encompass the items assigned to it.

Support of each problem will finally be made by (1) excerpts from actual field notes which characterize the problem, (2) checking and detailing the frequency of supporting statements, (3) checking and supporting the range of the problem, and (4) checking and supporting the collective character of the problem.

#### PRELIMINARY REPORT OF RESEARCH

At the present time, data-gathering has been limited to laboratory observation, a staff meeting observation, and casual conversation. This appeared to be the initiating activity of data collection, since in the laboratory, the staff meeting and study room, the observer presents less of a

"threat" to the teaching assistant and the students than in the classroom. As the "participant role" of the observer is accepted by teachers and students, the observations will be shifted to other settings.

Seventeen individuals compose the block of teaching assistants under observation. The role of the researcher-observer has seemingly been well accepted by the group. Often the observer is surprised with unexpected data—problems are presented to him by individuals without prompting. Even though no suggestions are made by the observer as to solutions of problems, the conversations often seem to lead to satisfactions and even solutions by the informants.

The conclusion of this report must await completion of the research. The final phases and summaries will be presented to the Academy in 1964.

#### LITERATURE CITED

- Adams, C. S. 1942. The importance of laboratory work in general chemistry at the college level. *J. Chem. Educ.*, 19: 266-270.
- Becker, Howard S. and Blanche Geer. 1960. Chapter 21, participant observation: an analysis of qualitative field data, in R. N. Adams and J. J. Preiss (ed.) *Human Organization Research*. Dorsey Press. Homewood, Illinois, pp. 266-289.
- Darley, John G. 1941. *Clinical aspects and interpretations of the strong vocational interest blank*. Psych. Corp., New York City.
- Elliot, Donald N. 1950. Characteristics and relationships of various criteria of college and university teaching. in H. H. Remmers, (ed.) *Stud. Coll. Univ. Staff Eval. LXX. Stud. Higher Educ.* Purdue Univ. Div. Educ. Ref. Lafayette, Indiana.
- Handbook Committee. 1952. *Handbook for chemistry assistants. Committee on Teaching of College Chemistry. Division of Chemical Education of the American Chemical Society.* (Order from Fisher Scientific Company. 717 Forbes Street. Pittsburg, Pa.)
- Hemphill, J. K., Daniel E. Griffeths and Norman Fredericksen. 1962. *Administrative performance and personality*. Bur. Pub., Teachers Coll., Columbia Univ., New York.
- Lippincott, W. T. 1959. Teaching assistants for general chemistry. *J. Chem. Educ.*, 36: 84.