

WRITTEN SUMMARIES FROM DISCUSSION GROUPS

1963 MACTLAC Meeting

Group 1. NEW IDEAS IN GENERAL CHEMISTRY LABORATORY

Chairman: Dr. Robert Rosenberg, Lawrence College

Resource People: Dr. Gerald Bakker, Earlham College

Dr. W. T. Lippincott, Ohio State University

Dr. Lippincott described an honors program at Ohio State involving fifteen students. These students are selected during the summer before their Freshman year on the basis of ACS exams, ATC scores and other data. The first quarter is concerned with structure, the second quarter is devoted to thermodynamics and quantitative analysis, with the emphasis in the laboratory being design of experiments and inorganic preps. The third quarter has as its theme "Reactivity and Structure." Research type problems are assigned during the last quarter. Modern equipment is introduced such as NMR, I.R., and X-Ray equipment. Three staff members are involved in the program. Students take Calculus concurrently with this course.

The Earlham program was described by Dr. Bakker. The normal program, which involves about 100 students, includes one course each term during the freshman year. The first course is titled Particles of Chemistry, the second is States of Matter, and the third is Covalent Bond. A second group of about 25 students, selected on the basis of exam scores, follows a somewhat accelerated program combining Mathematics, Physics and Chemistry in the first year. The laboratory program at Earlham is designed around three precepts:

- (1) Laboratory work should be an integral part of the course, both building on past lectures and providing the data and understanding for coming lectures.
- (2) The student should see the laboratory problem as intellectually sound, that is, the answer should not be immediately obvious and the techniques he uses should be understandable to him.
- (3) There should be a "vertical development" of laboratory ideas and techniques. New experiments must build on previous ideas and techniques.

The discussion afterwards centered on specific experiments which could be used. The point was made by Dr. Young that the pre-laboratory discussion of such experiments follows programmed instruction principles.

Group 2. PROBLEMS ARISING FROM ACADEMIC CALENDAR CHANGES

Chairman: Dr. Allen Hanson, St. Olaf College

Resource People: Dr. Kurt Kaufman, Kalamazoo College  
Dr. James Finholt, Carleton College

This group was concerned with the effect of calendar changes on the chemistry program. Dr. Kaufman described the unique Kalamazoo plan in which students follow a staggered sequence of eleven-week quarters which includes eleven terms on campus, two in study abroad, and two vacation quarters in a year-round program. Offsetting the admitted gain in reducing student provincialism, Dr. Kaufmann observed the chief drawbacks to be:

- (1) reduced time available to laboratory
- (2) one quarter too short for senior thesis, and
- (3) difficulty in recruiting student assistants and in promoting learning through inter-class associations.

Dr. Finholt of Carleton described the 3-3 program in which students take three courses in each ten-week term. He reported considerable flexibility in arranging student programs but noted a shortage of laboratory time. Speaking on the 4-1-4 plan to go into effect at St. Olaf, Dr. Hanson mentioned that chemistry majors' programs get "tighter" under a reduced course load but that the four-week Interim of one course provided challenging opportunities for project work and allowed total concentration on Qualitative Organic Analysis in the junior year. In general, the newer programs include fewer courses in the total program, hence decrease flexibility in choice of courses but some increased flexibility in schedule arrangement. Many found greater difficulty under calendar change to meet A.C.S. standards in certain details, but no one reported serious trouble.

Group 3. WAYS AND MEANS OF MEETING THE NEW A.C.S. MINIMUM STANDARDS

Chairman: Dr. Joseph Danforth, Grinnell College

Resource Person: Dr. Laurence Strong, Earlham College

The meeting opened with a general discussion of the new standards and some of their implications. A number of specific questions were then directed to Dr. Haenisch as a member of the Committee on Professional Training of the A.C.S. Some of the questions and Dr. Haenisch's answers were as follows:

- (1) Use of student assistants and calculation of faculty contact hours. Dr. Haenisch felt that the Committee encourages the use of undergraduate student assistants in liberal arts colleges. Faculty contact time should be computed on the basis of actual time spent.
- (2) In many schools courses in analytical and biochemistry are taken by pre-medical students and biology majors who have not had physical chemistry. Can all students be enrolled in the same course but with different exams given to chemistry majors and non-chemistry majors? Dr. Haenisch felt the Committee would frown on such a procedure, but might favor a course where chemistry majors received additional lectures as well as a separate examination.
- (3) In view of the different academic calendars now in use, it is difficult to equate course hours to a 15 week semester. Dr. Haenisch felt the Committee is more interested in evaluation of the overall program rather than evaluation of course hours.

Group 3. (continued)

- (4) German requirement. Dr. Haenisch felt the Committee would not approve a department if another language was substituted for German. He also pointed out that the Committee wants to see evidence of the use of German in chemistry courses.
- (5) How rigidly is the requirement of a four man staff enforced? Dr. Haenisch felt this would depend on the staff loads and fields. If a school offered a limited freshman program, then a three man staff might be acceptable.

Group 4. THE USE OF VISUAL AIDS

Chairman: Dr. Paul Wright, Wheaton College

Resource Person: Grovenor Rust, Southern Illinois University

- (1) Programmed Learning - Several types of programs are available, including linear programs and scrambled book presentations. Some programs may be used by themselves while others are best used along with a text. Much depends on how well the program has been written and the progression of material. Criterion tests are essential. Programs do not do away with teachers -- teachers are essential for the successful use of programs. Mr. Rust expressed a willingness to accept invitations to address college faculties on the subject of programmed learning.
- (2) Modecular models and Films were discussed briefly. Many large companies have films on specific processes which they are willing to loan on request.
- (3) Transparencies - These are very useful with large classes. A plastic sheet material is available from 3M Company which can be used in Thermofax and Xerox machines for rapid making of transparencies (black and white or color) for use with overhead projectors. A wax pencil can be used for additions in class. Zipitone and Transpak provide colored plastic sheets for transparencies (available from Welch and Central Scientific). Mr. Rust recommended that projectors older than about 1957 models should be replaced with the newer and more convenient models. Organic equations, notes and diagrams made into transparencies and then into ditto masters on Xerox or Thermofax machines can also be a wonderful time saver.

Group 5. NEW IDEAS IN ORGANIC LABORATORY

Chairman: Dr. William Martin, Lake Forest College

Resource Person: Dr. John Crump, Albion College

(A) Organic qualitative analysis

The group present felt that organic qualitative analysis was most important and a survey of the group clearly indicated that it is offered in some form or another at most schools. Many offer organic qualitative analysis as a separate advanced laboratory while others incorporate a large amount of it in the latter part of the elementary organic laboratory. Further discussion indicated that the classical organic qualitative analysis course should be modified so as to make realistic use of infrared and gas-liquid chromatography techniques.

Group 5. (continued)

(B) Instrumentation

The two instrumental techniques that are in widespread use in modern organic chemistry are infrared and gas-liquid chromatography.

Approximately one half of those present had operating infrared instruments and about one third of these use this technique in some way in the elementary organic laboratory. Most have a student assistant working closely with the student and in many cases the assistant actually prepares the sample and operates the instrument with the student as an observer. It was felt by many that this was not a desirable situation. Some schools have been making use of printed spectra for student practice in interpreting infrared spectra. This seemed to most to be a good teaching procedure to follow and was used by a few schools that did not have an infrared instrument available.

Again about one half of those present had operating gas-liquid chromatography instruments. Approximately one half of these use this technique in the elementary organic laboratory. A number plan to use this technique for complete product analysis in the beginning organic laboratory in order to make the usual preparation experiments more meaningful. Most use is made of this technique at the present to follow distribution of products and to establish product purity. In most cases the operating variables, temperature, flow rate, etc., were set by the instructor with the student then carrying out the sample injection and interpretation of the chromatogram.

(C) General

About one fourth of those present use standard taper ground jointed glassware in the elementary organic laboratory and all favored the use of this equipment. Most seemed to be planning for a shift to this equipment in the near future. There was general discussion and general agreement that "open ended experiments" and "individual project experiments" were good and many schools are inserting experiments of this type into their programs.