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CBA, CHEMS, Traditional: The Dilemma

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Since the advent of the CHEMS and CBA chemistry materials, many teachers have been in a state of confusion as to whether they should use these new materials. Perhaps there is now, or soon will be, adequate research available to you so you can make your choice between the two new programs and the more conventional approach to chemistry.

Heath and Stickell (1963) studied the achievement of CBA and CHEMS students with traditional, CBA, and CHEMS tests. They also studied the achievement of traditional students with traditional, CBA, and CHEMS tests. These results indicate that each group was superior on the tests designed for that group, i.e., CBA students scored better on CBA tests, etc. Because this was an "on-site" comparison, no statistics were applied to show if test score differences were significant.

Monteau (1964) studied the objectives of critical thinking of CBA students by having the CBA teachers answer questionnaires as to whether CBA promotes critical thinking. One hundred per cent of the teachers felt that critical thinking was an integral part of the CBA course. No attempt was made to test the students' critical thinking ability before and after the course by utilizing a standardized critical thinking exam.

Rainey (1964) compared CHEMS students with "conventional" chemistry students. He compared students using the ACS-NSTA Form 1959

chemistry exam and the CHEMS Final. He found neither approach under study showed superiority in student learning as measured by the tests given. The sample size, however, consisted only of two classes of each type of chemistry.

Rainey (1965) studied the question "with all other classwork kept equal, do students do as well in chemistry when their laboratory work is conducted in a directed manner (as in CHEMS) as contrasted with a non-directed way (as in CBA)?" He found no significant differences between the groups in CBA and CHEMS on the ACS-NSTA Form 1959 and the cooperative chemistry tests. However, students in the non-directed group did significantly better on a written lab test and in a performance test (lab practical). Subjectively he found the non-directed group took longer to adjust to the lab, but took greater pride in their accomplishments.

Bennett and Pyke compared the philosophy and objectives of CBA and CHEMS. They indicate their common objectives as being those which:

1. develop critical thinking;
2. develop an understanding of science in terms of topic discovery and theories;
3. develop a background in chemistry;
4. develop an appreciation of chemistry in terms of a positive attitude toward science as a whole.

Whether these courses, as well as more conventional courses such as

"Modern Chemistry," meet these objectives is the concern of a vast Midwest study presently being conducted at The University of Iowa which will be discussed later in this article.

Noojin Walker made a topical and organizational comparison of CBA, CHEMS, and Modern Chemistry. Walker indicates that CBA may be called a continuous approach, whereas Modern Chemistry is more of "the quantum" approach, where the facts proceed as tiny packets. It seems CHEMS is a hybrid of the two in terms of organization, i.e., sometimes continuous, sometimes discrete. In general, Walker feels that both CBA and CHEMS offer more of a challenge to the student and therefore the student learns more from this type of course than he does in Modern Chemistry.

Morlan (1965) conducted a study by questionnaire in which students evaluated the CBA course, in terms of 1) Text, 2) Laboratory Guide, 3) General Organization. In general, the students felt the text was difficult to understand, but felt that the laboratory guide was excellent. The general organization was considered to be satisfactory in that it was not factual in approach.

In reviewing the literature it is fairly obvious that there has not been a complete objective analysis of these courses of study in chemistry. What is needed is a complete analysis of these chemistry courses based on objective and quantitative data. The question is obvious: WHICH OF THESE COURSES OF STUDY PROVIDES FOR THE DEVELOPMENT OF BETTER UNDERSTANDING, AT-

TITUDE, ACHIEVEMENT, AND CRITICAL THINKING IN CHEMISTRY?

In order to answer the above question, more work is presently being done to compare the CBA and CHEMS courses with Modern Chemistry published by Holt, Rhinehart, & Winston. Under the sponsorship of the Office of Education, over 2,000 students in fourteen schools using these courses in Iowa and Illinois are being given the following objective instruments on a pre-post test basis.

Objective Instruments:

1. *ACS Cooperative Examination in General Chemistry*
 - A. Recall of Information
 - B. Applications of Principles
 - C. Quantitative Application of Principles
2. *Watson-Glaser Critical Thinking Appraisal*
 - A. Inference
 - B. Recognition of Assumptions
 - C. Deduction
 - D. Interpretation
 - E. Evaluation of Arguments
3. *Test on Understanding Science*
 - A. The Scientific Enterprise
 - B. The Scientist
 - C. Methods and Aims of Science
4. *Prouse Subject Preference Survey*

These courses will then be evaluated statistically on the basis of the achievement by the students. Extreme care has been taken to assure randomization during the selection procedures in order to assure meaningful statistical results. In addition, a Flanders Interaction Analysis is being conducted and will be correlated with achievement in all of these courses to determine the optimum teaching techniques necessary for meeting the objectives of each course.

If you are interested in the results

of this study which will be completed in August, send a self-addressed post card to Verne Troxel, Science Education, The University of Iowa, Iowa City, Iowa 52240.

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SCIENCE ENGINEERS AND HUMANITIES SYMPOSIUM

Iowa-Western Illinois Junior Science, Engineering and Humanities Symposium, co-sponsored by U.S. Army Weapons Command, Army Research Office—Durham, The University of Iowa, Collins Radio Co., Deere & Company, French & Hecht, Iowa-Illinois Gas & Electric Company, Massey-Ferguson Inc., Northwestern Bell Telephone Company, and Chamberlain Manufacturing Company will be held April 8-20, 1968, on the campus of The University of Iowa. Dr. T. R. Porter is the coordinator for this regional program. Over 150 students in Iowa and Western Illinois and fifty of their science teachers will be invited to the symposium.

The National Science Engineering and Humanities Symposium is scheduled May 16-18, 1968, at The University of Iowa. The National Symposium will bring 300 selected students and science teachers and administrators

from twenty-four regional symposia to the University Campus. Previous National Symposia have been held at West Point, New York, Princeton, N.J., and Industrial College of Armed Forces in Washington, D.C.

QUINT CITIES SCIENCE FAIR

The 12th Quint Cities Science Fair is scheduled for April 4-6, 1968, at Augustana College, Rock Island, Illinois. Junior and senior high school students from Scott County, Iowa, and Rock Island County, Illinois, are eligible to submit exhibits. Chairman of the Registration Committee is Miss Mary Sievert, Chemistry Department, Davenport Public Schools. Mr. Dick Peterson, Corps of Engineers is Chairman of the Steering Committee. Mr. Warren Classon, Davenport Public Schools, is Secretary.

Grand Award Winners from the Quint Cities Science Fair will represent the regional at the International Science Fair in Detroit, May 15-18, 1968.