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Changes in Training for Teachers Made Necessary by CBA

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Changes in Training for Teachers Made Necessary by CBA

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Abstract. In summary, surveys conducted at the State University of Iowa have revealed the following points that lead to a single conclusion: 1) Science teachers in Iowa are generally eager to improve their courses and their teaching. 2) Science teachers desire help from the colleges in securing appropriate training in order to approach the "new" science courses. 3) New graduates of most colleges and Universities feel wholly inadequate about teaching the new courses. 4) Apparently considerable reorganization of college curricula is necessary to provide certified teachers who would be ready to teach the CBA course (and presumably the other new courses).

The CBA course differs from traditional chemistry in both specific content and method. The content is organized around the main basic theme of the chemical bond and the approach is one of inquiry. These differences suggest needed changes in the training of teachers who will be involved in the teaching of the "new" chemistry.

In 1957 the Svoiet Union announced that they had successfully placed Sputnik I in orbit around the earth. The accomplishment of the Russians had many effects on the people who inhabit the earth. In the United States there was a general concern about the science programs of the country. The need to reevaluate the existing programs was apparent. The Congress of the United States formed the National Science Foundation, which supplied funds to improve scientific training and knowledge, and passed the National Defence Education Act, which allowed schools to buy more and better equipment for their science laboratories. Conferences to study existing science programs and possible revisions were held at different colleges and universities throughout the country with funds provided by the National Science Foundation (NSF) as well as other agencies and the science educational revolution was on.

With the revolution came the Physical Science Study Committee (PSSC) course for physics, the Biological Sciences Curriculum Study (BSCS) presenting several courses in biology, the

Chemical Education Materials study (CHEMS) course on chemistry and the even less conventional Chemical Boads Approach (CBA) course in chemistry. These courses have been developed by physicits, biologists, and chemists as well as educators and reflect the thinking of scientists as to what concepts students should know and what experiences they should have to properly comprehend science as a phenomenon in today's world. After years of preparation these programs are now being used in public and private schools throughout the country. Since these courses represent considerable departure from the traditional courses of the last thirty years, they require specially trained people to teach them. The training of these people is the problem facing educators today.

Most beginning teachers will follow the textbook rather closely. An investigation of the high school textbooks will indicate what is being taught in the chemistry courses, as an example. In general the students are taught basic definitions, the Bohr-Somerfield atomic structure, the periodic chart, basic chemical reaction, basic calculations including the mole, and a description of the different chemical compounds, both organic and inorganic. The emphasis of the descriptive chemistry is upon industrial uses. The laboratory exercises are of the "cook book" variety where the student is told what to do and then expected to answer questions over what he has observed. If the student does the experiment, he learns to work with the equipment, but these experiments are easy to write up without doing the exprriment. The course tends to become a memory course. The prepared tests supplied by the publishers ask the students to recall facts for the most part. Strong and Wilson (1) report that the typical high school chemistry course has little effect on the success of the student in a college chemistry course. Dessel and Yager (2) report that high ability secondary students succeed just as well in college chemistry whether they have had high school chemistry or not. However, students who have had the high school course have more confidence and are more at ease with the college offering. It is interesting to note, however, that most college chemistry students obtained their interest in the subject while taking the high school course.

According to Livermore and Ferris (3) in the new CBA chemistry course the emphasis is placed on observation and experimentation on the part of the student. Investigation and scientific inquiry are stressed as opposed to demonstration and concentration upon memorizing knowledge already known. The course investigates the subject through a central theme of chemical bonds, the question, "Why does the phenomenon occur?" is answered by an investigation of the structure. (4) To accomplish this aim the course introduces the concept of using models to ex-

plain phenomena. A charge-cloud model is introduced and is used to explain much of the chemistry of period one and two elements. The orbital model is used to explain the more complex structures of the elements. Throughout the course physical properties and energy relations are considered. The course is built around the laboratory. Many of the experiments are of the "open ended" type where the student is presented with a problem and is required to develope his own procedure.

Teaching such a course requires a different type of chemistry background than is being obtained by most of the new teachers in the field today. A number of surveys have been and are still being made to determine teachers background for the CBA course as well as the other new courses. This report is to present the results of some of these surveys conducted at the State University of Iowa and point out the need for a reevaluation of the teacher-training program in general. Over forty teachers in a physical science institute were interviewed and only one teacher was willing to teach the CBA chemistry course without further training. In a recent survey conducted by R. E. Yager, professor of science education at the State University of Iowa, 120 science teachers within a radius of 150 miles of Iowa City were contacted and 50% expressed an interest in the CBA course if they could obtain further training before teaching the course. Each year hundreds of teachers spend their summers and/or Saturdays in NSF sponsored programs of teacher training for the new programs. The NSF is interested in improving the backgrounds of teachers in the fields who have weak or outdated backgrounds. However, it seems that this job of up-dating is never ending since new teachers are as much out-of-date as the teachers who have been in the field for a number of years.

To effectively improve science education the new high school science teachers that are graduated each year will also have to be trained in the ways of the new programs as a part of their preservice training. For the past several years a study was made of the student teachers in chemistry at the State University of Iowa. These teachers for the most part felt, and in many cases demonstrated, that their backgrounds in the subject matter were inadequate. A survey by the science staff at the University High School of students teachers in all areas showed that less than 10% of the group were willing to teach the new programs in their field without further instruction. This study has involved seventy-two student teachers who have applied for certificates at the State University of Iowa during the past three years.

Dr. John F. Baxter (5), professor of chemistry at the University of Florida, on his last Continental Classroom program

in chemistry suggested that teachers can improve their teaching by being critical of their professors and adopt the good points while avoiding the bad points where ever possible. He recognizes the situation that teachers tend to teach the same way that they have been taught and that they are not anxious to teach using material that they have not encountered as a part of their own training. The problems associated with the training of science teachers are numerous. Further studies in progress at the State University of Iowa include the following: 1.) the subject matter of new courses, 2.) the overall curriculum required of teachers of science (chemistry), 3.) available courses which will give the student teacher a sufficient background at the undergraduate level, 4.) the development of new content courses designed for training of teachers other than method courses, 5.) the advantages of an additional year of training, 6.) the advantages of requiring a master's degree, and 7.) the success of teachers after five to ten years with varying background and experience. It is hoped that the results and the continuation of this study will identify some of the primary problems which exist in the training of teachers. Apparently improved college courses and college curricula for teachers are needed to secure an adequately trained chemistry teacher after completion of the four years required for a Bachelor's degree.

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The Dipole Moment of Styrene[1]

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Abstract. The dipole moment of styrene, calculated from eighteen solutions ranging in weight fraction from 0 - 100%, was found to be 0.181 D. The method and results of the measurement were compared to the method and results of Petro and Smyth for the same compound. It was concluded that the atomic polarization in styrene in small, and thus is taken into account by the measurement of the molar refraction at the sodium D line. It was further proposed that the relatively large dipole moments of *trans-p,β*dinitrostyrene and *trans-p,β*-dicyanostyrene may be due, at least in part, to abnormally large atomic polarizations.

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