

HIGH SCHOOL CHEMISTRY: THE DISCIPLINE IN THE MIDDLE

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Abstract

The purpose of this paper is to generate discussion on issues relating to high school chemistry and its role in the overall education of chemistry and chemical engineers as well as all others who take chemistry at any point in their lives. This includes those for whom high school chemistry is a terminal course.

The paper is called High School Chemistry: The Profession in the Middle because I see high school chemistry as an essential part of a continuum. I will propose some issues to initiate discussion. The list is by no means an exhaustive one because there is no limit to the issues. I want other participants in the conference to respond to the paper, propose other issues and engage in productive dialogue looking at all as contributors to the improvement the effectiveness of high school chemistry and chemical education as a whole for students and teachers. After all, our job is to contribute to the success of our students.

Introduction

Why is high school chemistry the discipline in the middle? I selected this title because, in my experience, high school chemistry is that portion of science (chemical) education that is between elementary and middle school science and college chemistry. We are in the middle in the same way that college chemistry is in the middle between high school chemistry and graduate school for chemistry majors. As such, we experience some of the same problems and face some of the same issues. Specifically, in the effort to meet the needs of all of our students, we need to know where they have come from, ie., their prior knowledge, and where they are going, what we need to prepare them for in their future careers. Just as at all levels of chemical education, high school teachers have our own set of unique challenges that arise from our students age levels and the environment in which we teach.

Purpose

My purpose in presenting this paper is to move from a time of general discussion of issues and needs that has taken place in the past to a time of concrete action. I would like to see us synthesize the issues into a manageable number so that we can begin working on those most feasible so that we can begin to move forward. The preceding discussions have been absolutely necessary in the brain storming phase to review what is out there. I thought last year's conference began to move in that direction and I wish to continue the momentum. This is where I got my ideas and I will return to some of the suggestions made then as a spring board.

Background

For those out there who are newer to the field than some of us, I think it productive to give some history. This is from my experience as is this entire paper. I do not wish to offend anyone, so if I do, I apologize now.

My first experience with chemical education outside my own classroom took place at the BCCE at Oklahoma State University in 1982. I became an ACS member right after I received my BS degree, but had only attended Indiana Section meetings prior to this. Before leaving for Stillwater, I heard several stories, fact or fiction, about very negative experiences that high school teachers had at the previous BCCE. Therefore, I had no idea how we would be received, especially since I had to co-present a proposal to the Division for seed money for CHEMED 83. We could not have experienced a warmer welcome from people like Glenn Crosby, Dwaine Eubanks and John Gelder. I learned that at least some of what I heard was true and that people such as those mentioned were working to amend the situation and to improve the degree of respect afforded to high school chemistry teachers.

Since that time I have witnessed the establishment of the High School Office at ACS, a more collegial relationship between CHEMED and the BCCE, and the inclusion of high school teachers on committee of the Division outside of the High School Committee. That said I still see vestiges of doubt and paternalism among some individuals. I have been assured that the philosophy of DIVCHED has not changed toward us by Mort Hoffman and others. Mort had been the strongest advocate I can imagine for equal and quality participation by high school teachers in the activities of DIVCHED. If we look back to papers presented last year, it seems that the feelings of high school teachers today mirror the feeling that have existed in the past by all members of DIVCHED as the division was being organized under the umbrella of the national office of ACS. The preceding is to provide history and a context for our discussion from a committed high school teacher and not to present of forum for descent, so let's move along to the intent of this paper.

Some Issues and Potential Resolutions

What are some of issues we share as a community of chemistry instructors? It seems to me that the first concern we all have is quality chemistry instruction to meet the ultimate career goals of our students. We are also interested in chemistry and in furthering our knowledge of chemistry.

So how can we help each other meet our mutually shared goals? Since, many high school chemistry teachers do not have degrees in chemistry, but are chemistry minors while college chemistry teachers for the most part have both undergraduate and graduate degrees in chemistry, as well as are engaged in chemistry research, we can benefit from lectures, workshops and collaborative relationships between high school teachers and our college colleagues. On the other hand, high school teachers have had specific training in pedagogy Therefore, college teachers could benefit from presentations, workshops, etc provided by high school teachers. We also share the need for laboratory safety and proper chemical waste disposal in the laboratory. We usually have to deal with ultimate disposal of our waste whereas many colleges have formalized programs to do this. We can both benefit from acquiring the most up-to-date information about hazardous waste and high school teachers can use assistance from local college where appropriate.

What are some of the issues faced by high school teachers not shared with our college colleagues? The first that comes to mind is the issue of a combination of state standards and standards provided by multiple national professional organizations. Although most of these are based on the same studies done on the condition of public education in the United States and in response to the performance of American students on science and mathematics assessments done internationally, the standards do present a varied list of requirements, some of which are more specific than others. This is especially true when an organization such as ACS and DIVCHED deal with teachers from all states, each of which has its own set of standards and its own pressure for students to take state-wide assessments. In this area, I am not sure DIVCHED can do much, but ACS has a very strong lobby in Congress to push for a more unified approach to standards. Just my thought!

High school teachers suffer from a serious shortage of funds for materials, equipment and especially travel funds for professional development. This issue is also shared with some of our college colleagues. It is very difficult to get away from school to go to a conference, especially a meeting in a large city where airfare and hotel accommodation are prohibitively expensive. Most of us agree that getting ready for a substitute and cleaning up the mess afterwards is more of a hassle than it is worth. When dealing with minors we must have adult supervision for them during all class periods. Here is where ACS, DIVCHED and local college colleagues can be a very valuable resource.

In terms of meeting, holding the BCCE in the summer on a college or university campus is especially helpful. All conferences of the scope of a BCCE are expensive to provide, but selection of location, a variety of geographical locations over time and the recruitment of outside fund sources such as industry on the part of local planning committees go a long way toward keeping costs at a reasonable level. Strong participation by high school members of the local planning committees for BCCE conferences, placing high school teachers in areas of greater responsibility rather than restricting participation to only the high school program, would move high school teachers more toward full participation rather than confinement only to planning high school related programming. The CHEMED conference planning committees should likewise include full participation by college members. In terms of ACS meetings, regional meetings are much more accessible to high school teachers than are national meetings. National meeting times are the very worst for us in terms of our school schedules. Regional meetings are much more flexible as to their location and timing. Meetings on college and university campuses are the most cost effective and many regional meetings are held in these locations. Some regions might consider scheduling their meetings in the summer rather than during the school year. This may be difficult for regions that have fixed times that members can expect a meeting to happen, but a regional meeting was held during the summer in the northeast last year. Unfortunately it was not well attended by local high school teachers, but that can be changed with more meetings and aggressive advertising, utilizing high school teachers on planning committees, etc. It is at ACS meetings that high school teachers are able to attend sessions regarding the latest in chemistry research.

The on-line format is also an ideal forum for high school teacher participation. Conferences such as this fit perfectly into a high school teacher's environment. I hope we see more with topics that

range across the spectrum of our community. These can impart information as well as promote networking.

Local ACS sections are another valuable resource. The Local Section provides an arena for networking and building collegiality. The relationship between high school teachers and their Local Sections varies a great deal from section to section. For example, my section The Indiana Section, has for many years had a strong emphasis on high school chemical education. A large amount of the financial resources of the section are invested in the scholarship competition. This section has further included high school teachers by electing several to leadership positions within the Executive Committee. I have held every elected office in the section except counselor (due to timing of national meetings) and there have been four other high school teachers who have served as chair. One alternate counselor is currently a high school teacher. Local Section planning committees have a variety of programs through the year where high school teachers can experience programs specifically for them as well as programs on research.

Membership in ACS and DIVCHED has always been a topic of discussion. The national ACS membership requirements were changed recently to permit full membership to teachers who would not have met the degree requirements under the old system. Unfortunately, participation has been limited primarily because of the cost. Many high school chemistry teachers belong to the National Science Teachers Association and another expensive national membership is not possible. It might be worth thinking about some type of alliance between DIVCHED and NSTA. Many high school chemistry teachers benefit from the Journal of Chemical Education either through personal subscriptions or through their school library. Local Section membership is an option, but leadership potential is limited because of the lack of full ACS membership. Membership in DIVCHED is an option every high school chemistry teacher should know about and take part in. The usual question I get when I suggest division membership is, What do I get from it? The newsletter is very good, especially when it provides access to abstracts of national DIVCHED presentations. I know this question has and is being considered by the division leadership and membership services should continue as an ongoing topic of concern. The separate corporate structure of the Journal prohibits its inclusion with membership and encourages subscribing outside of membership. This may or may not be a good thing.

And So?

So where does this leave us? The purpose of this paper was to initiate discussion. The issues I have cited are in no way a comprehensive list nor is it in any priority order. I only sought to provide some of what I know, some of the things that are in place, and some that are needed in order to plant seeds for thought. It is now time for all of you out there to get involved yourself and to encourage your high school and college colleagues to join in the conversation. I look forward to your comments.

CONFCEM on-line conferences are organized by the ACS Division of Chemical Education's Committee on Computers in Chemical Education ([CCCE](#)).
