
MULTIPLE POINTS OF VIEW OF DISTANCE EDUCATION IN CHEMISTRY: CHEMIST, PRACTITIONER, CURSED ADMINISTRATOR

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Introduction

Let me begin by saying that the advertised title is slightly off-base. As I was writing this, I realized that I really cannot present multiple points of view of distance education, but rather a single point of view that has been molded by the multiple roles that I have played over the years. Let me briefly share those roles with you so that you can glimpse the past that has shaped the present: 10 years as research chemist in the petroleum industry, 12 years as chemistry professor at Virginia Tech and 1.5 years as Associate Dean for Research and Outreach in the College of Arts and Sciences at Virginia Tech. In my present role of Associate Dean (one of "them"), the extended campuses and distance education are a significant part of my responsibilities. In the ramblings that are about to follow, I will attempt to discuss my view of distance education in chemistry from my current perch as an administrator. At the outset, I must say that this will be a very limited view (simply from my vantage point) and a very Virginia Tech-centric view. Nevertheless, I hope there will be some merit in my words - at the very least to start some worthwhile discussions.

What is Distance Education?

If you would indulge me for a few sentences, I would like to talk a bit about distance education from a pseudo-historical perspective. While the advent of technology has given us a whole new set of tools, there is really nothing new about "distance education". At the risk of trivializing the discussion, it involves having the student where the teacher "ain't"! Correspondence courses, audio tapes, video tapes have all long been staples of delivering material at a distance. I would submit that the traditional chemistry teacher instructing

her students to work out problems 1-10 at the end of Chapter 3 over the weekend is really one form of distance education.

I have seen the following table in a number of presentations that I have attended and I find that it succinctly captures some important points for this discussion:

TIME	Different Time, Same Location	Different Time, Different Location
	Same Time, Same Location	Same Time, Different Location
	LOCATION	

If one looks at the possibilities of time and location for both the deliverer of the course content ("teacher") and the receiver of the content ("student"), the bottom left quadrant in the above chart represents the traditional lecture situation - teacher and students all gathered at the same time and same place with the hope that that teacher can pass along some knowledge via lecture or other activities to the students. The upper left quadrant could contain activities such as laboratories, office hours, resource rooms where students can come at a variety of times to one place to take advantage of the available resources there. The lower right and upper right really encompass what most of us mean when we talk about distance education. The lower right will have all of the participants gathering at the same time, but in different places. The upper right quadrant describes modes of education where time and space really don't matter - the student may be anywhere and take advantage of the offerings at anytime.

As I mentioned above, we have all really had experience with all of these modes of delivery at some point in the past whether we realized it or not. As an elementary school student, I recall seeing lots of film strips on various subjects. From the point of view of the creator of those strips, they were involved in distance education where the students would be seeing these materials at different times in many different locations. Mr. Wizard's television shows (and the more recent, more frenetic Billy Nye television shows) were examples of same time different locations. As an undergraduate chemistry major grappling with the age-old problem of trying to understand organic nomenclature, I purchased a self-paced activity book to help me with that task. The American Chemical Society produced a number of audio courses that were available to me at my university to augment some of my courses. The list can go on and on. The point, though, is that until recently, we have not had the tools to really make widespread use of distance education concepts. Very very few of us could expect to have our own chemistry show on television nor did most of us have the inclination to write a self-paced course. However, computer technology, two-way video technology, the internet have all placed tools in our hands to practice distance education quite readily.

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Some Distance Education Activities at Virginia Tech

I thought it might be instructive to mention a few of the distance education activities at Virginia Tech to provide a framework for some later discussion. Please bear with me since not all of these examples will be drawn from chemistry, but the principles will still apply

Two-Way Video Courses: NET.WORK.VIRGINIA is an advanced, broadband network delivering ATM (asynchronous transfer mode) service statewide. It is the result of a project led

by Virginia Tech in association with Old Dominion University and the Virginia Community College System to develop universal access to advanced digital communications services for all of Virginia. One of the uses of this network is that a course originating at Virginia Tech can be sent, via two-way interactive video, to any of the net.work.Virginia sites. For [Spring semester, 1999](#), a number of courses were offered to sites around the state, a majority of them to The Virginia Tech/UVA Northern Virginia Center (NOVA). These clearly fit into the same time, different place mode of operation.

Web Enhanced Courses: At the very least, much of the new technology allows us to supplement and enhance courses in ways that have rarely been possible before. World Wide Web sites allow professors to place material that students can access at anytime. (Placing material on reserve at the library also serves this function, but the convenience of accessing it online at anytime from one's own room makes it so much more appealing to the student.) You can see a wide variety of offerings at Virginia Tech's "[VTONLINE](#)" site. Beyond simply providing factual material, the web allows the professor to engage students in practice questions and in discussions with other students that have the potential to really enhance the classroom experience. A typical lecture in a 3 credit course lasts 50 minutes. A chat room for asking questions and discussing concepts is available 24 hours a day. So, while the traditional lecture setting is a focal part of the course, much information can be obtained by the student at a distance. I have used the web to enhance a number of courses I have taught including [Physical Inorganic Chemistry](#).

Fully Online Courses: To move fully into the upper right quadrant of the time/place matrix, a mode of delivery which allows students to learn at a time and place of their choosing must be available. The world wide web offers possibilities there that previous types of correspondence courses could never achieve. It is now possible to take modules, full courses and even complete degree programs entirely online. Again, visit [VTONLINE](#) for a sample of some fully online courses. Within the College of Arts and Sciences, it is possible to complete a [M.A. in Political Science](#) fully online.

The Math Emporium: In my mind, one of the most exciting developments in education at Virginia Tech is found at the [Math Emporium](#). The Emporium is a radical approach to reform in mathematics education (and has many lessons for those considering the future of education in their own fields.) A large, vacant department store at the edge of the Virginia Tech campus was renovated and fitted with 500 computer stations. If it were nothing more than a large computer lab, there would be little to say about it. However, the Emporium combines the traditional (real live honest-to-goodness lectures are available) with fully self-paced online courses. In addition, professors and graduate assistants are available and the facility is open 24 hours a day. Please visit their homepage to see the breadth and kinds of activities available.

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Why Be Involved in Distance Education?

The above section provides the briefest smattering of some distance education activities. There are countless others at other institutions and the other talks in this conference speak more directly to specific ones in chemistry. My point in relating the above information was simply to highlight some of the possibilities. Given the fact that the tools to realize all of these possibilities are now available, a big question remains: why be involved in distance education? The answer to that question is different for the institution and for the individual.

The Institution: To begin with, there is so much rhetoric bandied about that I must say there is a huge myth that must be dispelled before proceeding. Myth: use of technology and distance education will save money and allow the institution to do more with less. The equipment, technical support and administrative support needed to sustain a quality distance education program represent an enormous cost to the institution. Even after a large equipment investment, since various bits become obsolete on almost a monthly basis, continuing

investment in equipment and support is a necessity. Technical support personnel to keep the equipment running and to assist the faculty in using the technology are essential.

Given that, the only reason for an institution to be involved in distance education is that it supports one or more aspects of the institution's mission. Each institution must make the determination of how best to meet their mission(s) and the role that distance education plays. So far, I have avoided the issue of the type of education. By that I mean, courses for credit, continuing education types of courses, or outreach or community service types of activities. I am not going to dwell on these different types of offerings except to say they all potentially have a place. There are important ways in which distance education can help an institution meet its missions. Allow me to address my remarks by addressing the potential student populations who may benefit from the distance education offerings.

The Traditional Student: For the full-time student, whether resident or commuter, the staple means of delivery has and continues to be the traditional lecture or laboratory course. For this student population, at the very least, web enhancement of courses will hopefully add value to those traditional offerings. Even such small things as having the syllabus and announcements posted on a web site are viewed by students as beneficial. Beyond that, however, fully online courses may aid the traditional student to make greater progress toward completing their degree than would normally be possible. For example, a student may be able to complete some core requirements or take some needed electives online during the summer while they are away from campus for the summer (perhaps earning money or being involved in some other experience). At Virginia Tech, many students co-op and fully online courses give them the opportunity to take some needed courses while gaining the valuable on-the-job experience.

The Distance Student: As a land-grant university, Virginia Tech has a state-wide educational mission. Indeed, the bottom of our letterhead declares "The Commonwealth is Our Campus." For institutions such as ours that have a broad mission that covers a wide geographical area, distance educational tools will allow them to more easily serve that wider audience without having to establish a large physical presence throughout that wide area.

K-12 Institutions: Partnerships between higher education institutions and K-12 systems have long been important for both sides in the partnership. The K-12 institutions gain the benefit of the research and expertise of the higher education institution while the higher education institution helps to ensure that their future student population is well-prepared. Advances in technology help colleges and universities to more easily foster those partnerships. One very successful program is the [DSL:Partners in Education](#) project which links the VT Physics Department with rural high schools in southwest Virginia.

Outreach to the Community: Most institutions of higher education feel a responsibility to "give back something" to the communities in which they operate. A reading of the National Science Foundation's [Guide to Programs](#) time and time again mentions outreach as an important component of all the grant activities of the foundation. No longer is it sufficient to carry out research and disseminate the fruits of that research solely by publication in scholarly journals. The NSF is asking the researchers to demonstrate how the results of their funded efforts will be brought to the world at large. The technological tools at our disposal make this possible.

The Individual: As a chemistry professor, my initial foray into the use of technology and distance education was motivated by one (perhaps trivial) motivation - it looked like it would be fun. I enjoy using technology to enhance my courses and to provide some distance offerings. I still find it to be fun, but I never would have predicted at the outset the large amount of time and effort that it requires. Nevertheless, the question that each individual teacher is confronted

with is not too dissimilar from that of the institution: does this make sense for me? If the individual sees that they have little to offer to a distance education program, then they should be free to operate in the traditional settings (and be recognized and rewarded for their contributions there.) Not everyone can do all things nor should any one individual be asked to do all things. I mention this because I have seen that there is some pressure at some institutions (whether real or perceived, it doesn't matter which) for everyone to be involved in distance education since it is viewed as the "thing to do." This is dangerous since it stretches the efforts of individual faculty too thin with lots of things being done with nothing done well.

So, should an individual take on this kind of activity? Clearly, every individual works within the framework of the institution and some give and take must occur between the two to make sure that the two are in agreement. So, to me, the bluntest statement is that an individual should be involved if they have the talent and the desire and it fits their institution's mission.

The View of this Administrator

After one and a half years in this position, I still have difficulty calling myself an administrator. For so many years to me administrators were "the other side". That this view was not unique to me is brought home at just about every scientific meeting I attend. When I tell colleagues what I am up to now, the invariable response is sympathy with some sort of phrase as "Oh, you're one of them, now!" I don't think that I'm any different than I was a year and a half ago, but maybe I am not capable of judging. Anyway, I am rambling. What I want to mention in this section are just some of the challenges associated with this whole area that must be considered either by the individual or by the institution or by both before entering the arena of distance education.

Support: I've mentioned this before, but it is so critical that it must be mentioned again. Before embarking on this journey, there must be a strong institutional commitment to provide the tools, hardware, software and people, to make the venture a successful one. This is an expensive proposition. Those computers that seemed so fast and so wonderful just a year ago now seem slow, outdated and incapable of doing what you want. This is a great because it means the tools and capabilities at our disposal have progressed in a short period of time, but it "ain't" cheap. There is nothing more frustrating to a student than discovering that they cannot access the course home page right before some major deadline because the server is down or the network is down. We are fortunate at Virginia Tech that there is a [large institutional commitment](#). One of the more intriguing manifestations of that commitment is the [FDI \(Faculty Development Institute\)](#) which delivers workshops to faculty on the use of instructional technology (and provides a computer for the faculty to keep). This is funded at a level such that every professor at Virginia Tech can participate in a workshop (and get a new computer) once every four years with an effort to make that every three years. The subjects covered in this summer's workshops can be found [here](#).

Assessment: Probably the toughest problem to deal with, simply because many of the tools we would like have yet to be developed, is that of assessment. Here I mean both assessment of the student and assessment of the course.

The Student: When we are talking about fully online, "upper right" kinds of courses especially, how do we make sure that we are assessing a student fairly? (Or to put one aspect of it quite bluntly, how do we make sure the student isn't cheating?) Did the student really take the online quiz or did someone else? Did the student have unfair help when taking that test? Of course this may be a big problem or a non-problem depending on the location of the student. If a student is just a short distance from campus or a short distance from some other physical location of that institution (such as an Extension office for Virginia Tech) then it may be possible to require a student to go to an "official" site for the test. This does not work for all students or all situations so the whole concept of grading and assessment has to be rethought for the distance programs.

The Course: How can we be sure that the quality of the course that is being offered at a distance is at least the same as that being delivered in the traditional on-campus setting? Now, of course this begs the question of whether or not all traditional on-campus courses are of good quality. We know that the professor, the student population and a host of other factors all enter into whether a course is a success or not. Still, there are those who will contend that an online course or a video course or whatever is inherently inferior to a traditional "meet on campus" course. I don't believe that is true. Yet, I don't think we have enough hard evidence to say one way or another. (I have seen anecdotal evidence from my campus which goes both ways: some online course have been a roaring success and some have been dismal failures.) We need to develop the tools which will give us the feedback we need to tell us if the course has been a success.

Laboratories: In most of the above, I have not focused on chemistry but rather on distance education in general. One important feature of most of the physical and life science courses is that there is a hands-on laboratory component to them. If there is real merit to these laboratories (and I firmly believe there is) how do we duplicate this experience at a distance? It is possible to give a "flavor" of a laboratory in a virtual situation. And, it is quite possible that for many of the target student populations, that is all they will need. Nevertheless, the question of the laboratory experience must be addressed for distance education in some chemistry courses to be truly successful.

Conclusion

The above is certainly not a complete discussion of all of the issues that face an institution concerning distance education. Further, much of what I discuss above glosses over many of the subtleties of each circumstance. However, as I stated in the introduction, if this piece does nothing more than act as a springboard for the further discussions of this online conference, then I will have considered it time well spent. If I were to make a brief summarizing statement it would be that distance education is not for every student, every professor or every institution. However, when the circumstances are correct (the right student population, the right professor and the right institution) distance education offers a powerful opportunity to reach out and fulfill an institution's mission.

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