Gaining Faculty Acceptance for Distance Learning Science Labs

Norma Hollebeke
Director of Strategic Initiatives

Background

Disruptive innovations are changing the landscape within higher education, and college leadership is well aware of the situation. Evolution is a slow process and change is harder to accomplish on campus than in a corporate setting where power resides largely with the executive team and flows downward. In academia, it usually emanates from the faculty and works its way toward the central administration. Tenure and academic autonomy, combined with the concept of shared governance, set precedents for an organization where broad change cannot be mandated. It can only be achieved by working with faculty to build a compelling case with robust evidence and a clear path forward while supporting the mission of the institution and effectively managing fiscal constraints.

Current Challenges

Administrators are prompted by state and federal directives to boost enrollment, improve student retention and success, and increase graduation rates while simultaneously keeping tuition and fees low. Additional pressure originates from outside higher education. Well-funded philanthropies, such as the Lumina Foundation and the Bill & Melinda Gates Foundation, have been working to persuade policy makers that higher education is inadequately preparing sufficient numbers of Americans for work and life. Conversely, faculty worry about the possibilities of student consumerism and the market logic leading to a decline in educational quality and rigor. Furthermore, many students entering college are underprepared, under skilled, and disengaged from the academic experience, adding to faculty concerns.

Online Education Emerges

The demand and rapid growth of online education has captured the attention of many administrators and policy makers, consequently transforming the course of higher education. In 2013, the National Center for Education Statistics' Integrated Postsecondary Education Data System (IPEDS) survey collected data revealing over 2.6 million students enrolled exclusively in distance education courses and just under 3 million students enrolled nonexclusively in distance education courses (NCES, 2014).

Online education offers opportunities and benefits in a number of areas. The value proposition for students is in flexibility and overall cost savings. For institutions, the advantages are in economics (lower fixed-cost dollars), marketing and recruiting (increasing reach and enrollment), as well as outcomes and assessment (better tracking and measurement). In a survey of over 2,500 institutions, approximately two-thirds of the college and university leaders said that an online strategy is critical to the long-term success of their institution (Babson Survey Research Group, 2015). There is, however, a gap between institutions acknowledging the long-term strategic importance of online education and those including it as part of their strategic plan.

Faculty Opinion

The scores of students taking online courses today is more than enough evidence that this learning modality is meeting an obvious demand on the part of students. The biggest setback for online education has been the inability to convince its most important agents—faculty—of its value. Current data show no significant change in faculty acceptance of online education in the last ten years and more recently reveals faculty

accepting the "value and legitimacy of online education" is declining (Allen and Seaman, 2015). From my own experience as an administrator, faculty also cite a lack of acceptance of online degrees by potential employers as a barrier.

In a 2014 survey of faculty attitudes toward technology, only 9% of professors strongly agreed and 17% agreed that online courses can achieve student learning outcomes that are at least equivalent to those of classroom courses at any institution. Faculty were more favorable about online courses at their own institutions, with 13% strongly agreeing and 19% agreeing that online courses can achieve learning outcomes equivalent to classroom courses.

However, faculty who have taught an online course were more positive about the quality of online learning and more likely than their peers who had not taught online to strongly agree that online courses can achieve student learning outcomes that are equivalent to classroom courses (Inside Higher Education and Gallup, 2014).

Hands-On, Inquiry-Based Online Learning

Historically, the transmission model of instruction has been the predominant paradigm in the lecture hall and most teaching laboratories. Too often, the lab activities simply give students recipes to follow—activities that students perform step by step, following instructions, using simple measurement tools, and collecting small data sets. In many situations, a concept or technique is merely demonstrated for the students by an underprepared teaching assistant. Furthermore, in one sector of higher education, these teaching assistants are undergraduates with minimal to no authentic science lab experience. This modus operandi shortchanges the core of scientific inquiry, which is observation, innovation, reasoning, and problem solving. It also creates deficits in skills and learning outcomes.

A constructivist view of learning recognizes that students need time to interact with objects, organisms, substances, and equipment to develop a range of experiences on which to base their thinking. Integration of an inquiry-based learning experience into an online science curriculum infuses active learning and emphasizes student engagement. This model incorporates dynamic teaching strategies that result in students actively engaged in their own learning. It sequences learning experiences so that students have the opportunity to construct their understanding of a concept over time

Healthy Skepticism

Science education has also been challenged by the demands and rapid growth of online education. Skepticism is a key feature of the scientific field. Being skeptical does not mean doubting the validity of everything, nor does it mean being cynical. Instead, to be skeptical is to judge the validity of a claim based on objective empirical evidence. It is not surprising that most of the genuinely held concerns among science faculty are rooted in the laboratory experience for students. The hands-on use of real lab equipment to gather and analyze real data is perceived as necessary for students in lab-based science courses. The majority of scientists and employers are in full agreement that the best way to learn science is to do science.

Unfortunately, as the growth and demand for online science accelerates and directives from administrators increase, many programs simply replicate the transmission instructional model to their online science courses. In many cases, the department and/or faculty are compelled to rely exclusively on virtual lab exercises or delete labs entirely. With concerns over budgets and retention rates, and yielding to student consumerism, administrators are willing to cut a few corners at the expense of the academic and workforce training competencies. Keep in mind, however, cost does not always correlate with value.

Addressing Faculty Concerns

So, it is no wonder that there is significant skepticism among science faculty regarding the validity of offering lab-based science courses

online. Faculty who oppose online science courses have presented a variety of arguments against offering them. They can be summarized as follows:

- Lack academic content and rigor
- Lab skills are not credible without direct observation and interaction
- Lack of opportunities for cooperative learning
- Use of legitimate lab equipment and basic instrumentation
- Safety procedures and disposal of hazardous materials
- Four-year university partners are unwilling to accept credit from community colleges offering online sections

Realistically, as for a classroom course, the first three points are easily addressed and subjugated through course design, instructional effectiveness, and interconnectivity. In most institutions of higher education, academic content and rigor for classroom and online courses are driven by faculty and, in many cases, guided by curriculum committees. These programs set the expectations for content, quality, and rigor while delineating the method(s) for how instructors, faculty, and the courses will be evaluated.

Within the distance education community, several respected organizations provide conduits and repositories for best practices in designing and teaching online courses. These include the Online Learning™ Consortium, Quality Matters, and the United States Distance Learning Association®. Science programs planning to offer online science courses would benefit from integrating these best practices into their online plan. Implementing best practices for online course design promotes cooperative learning, and allows for meaningful student and instructor interaction.

Kits Help Create Desired Outcomes

The incorporation of well-designed labs using distance learning kits for the hands-on, inquiry component of online science courses will accomplish essential lab skills and learning outcomes. Moreover, students learn the content by actively engaging in processes of scientific inquiry; and lab kits that are developed with scientific inquiry as the foundation will deliver the appropriate proficiencies for observation, innovation, reasoning, and problem solving. These inquiry-based experiences include ones that involve students in direct experimentation and ones in which students develop explanations through critical and logical thinking. Students ask questions, observe, analyze, explain, draw conclusions, and ask new questions.

Additionally, the integration of complementary, supplemental learning activities further promotes active learning, deeper learning, and enhances cooperative learning. Science courses require active learning strategies, which are at the heart of scientific inquiry, and online courses are no exception. Advances in technology and innovative assessment methods using tools such as photos, videos, and Web conferencing allow for necessary observation and assessment of lab skills.

Student Safety

With respect to safety procedures and disposal of materials, faculty and course design staff should investigate their lab kit options. Choosing a reputable vendor is essential. Early and frequent communication with the vendor is recommended. Review the contents of the lab kit to ensure the experimental design and procedures meet your institution's safety standards. Also, confirm the experiments have been tested outside a laboratory setting to ensure they will work properly for students in an off-campus environment. The vendor should provide clear instructions to the instructor and students providing details of safety hazards and precautions for each experiment, including proper use of personal protective equipment. Additionally, the vendor should provide a certificate of liability on insurance coverage for the lab kit.

Credit Transfer

Transferability is a reasonable concern for faculty and students taking any online course. Consulting with four-year institutions that students commonly transfer to, early in the design process, is valuable. Granted, there will be strong opposition unless the two-year institution presents a durable, well-defined plan for each course. However, the paradox is that the concerns from the four-year institutions are usually the same or very similar to other skeptics of online science courses—thus the need for a well-defined plan.

In 2012, the Colorado Department of Higher Education (CDHE) released a comparison study of community college students who took science courses online versus in traditional classrooms, and then tracked those students who transferred into four-year institutions in the state of Colorado. The study of 4,585 students examined cumulative GPA, cumulative credit hours, and science-only GPA. There were no statistically significant differences in students' science GPAs across instructional method (online versus traditional) (CDHE, 2012).

This suggests that the online students perform just as well in science classes at four-year institutions as their on-campus counterparts. Additionally, there were no significant differences in biology, chemistry, and physics GPAs between online and traditional students. As previously mentioned, with well-designed courses and labs developed to meet learning outcomes, the opposition will find it difficult to dispute the transfer of online science credits.

Conclusion

Given current calls for a greater focus on teaching scientific practices and for more authentic lab experiences, gaining faculty acceptance for distance learning science labs may seem daunting or even unachievable. However, there are institutions of higher education that have gained faculty acceptance and successfully implemented online science labs with high-quality, rigorous content using kits that employ legitimate lab equipment to teach vital, hands-on skills. To move forward, 1) know your goals, 2) do the necessary research, 3) develop a durable, well-defined plan and timeline, and 4) work with faculty and other institutions.

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About the Author

Norma Hollebeke brings more than 20 years of higher education experience to Carolina Distance Learning™. Prior to joining Carolina, Norma was the Associate Dean of Science with CCCOnline, a division of the Colorado Community College System, where she was instrumental in building strategic partnerships and negotiating articulation agreements for online science programs. She has a proven track record of developing and directing national STEM educational programs.

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www.carolina.com/distancelearning
distancelearning@carolina.com
866.332.4478