

Bridging Hands-On Technical and Online Education

by Regina L. Garza Mitchell, Associate Professor at Western Michigan University

Community colleges are the foremost providers of both career and technical education (CTE) and online education. There is a gap in knowledge, however, about how the technical side of CTE is offered in an online environment. To help close this gap, researchers from Western Michigan University's Center for Research on Instructional Change in Postsecondary Education, Santa Fe College, and Santa Fe Community College received a grant from the National Science Foundation Advanced Technology Education (NSF-ATE) program to study how community colleges are implementing online technical education.

Background

In the current era of completion and economic return, CTE has shifted to the forefront of American education. CTE is viewed as a mechanism for increasing college completion (The White House, 2009) and for boosting the economy (D'Amico, Morgan, Katsinas, & Friedel, 2015; U.S. Department of Education, 2012). On the credit-bearing side, CTE credentials may be earned through certificate or associate's degree programs. The national interest in CTE is reflected in the phenomenal increase in certificates earned. Between 2000 and 2014 the number of certificates earned at community colleges increased by 236%, with certificates comprising 39% of all credentials earned at these colleges (Phillipe & Tekle, 2016).

Community colleges were the earliest adopters of online education, becoming and remaining its foremost provider (Parsad & Lewis, 2008; Radford, 2011). As early as 2004 a small number of colleges offered online courses in technical areas such as livestock production and digital circuits (Johnson, et al., 2004). However, the majority of online enrollment remains in career areas, such as business or computer science, and general education (Radford, 2011), as opposed to technical areas (Githens, Sauer, Crawford, & Wilson, 2012). This is not surprising given the hands-on nature of technical education, and the need for specialized tools or laboratories that must be accessed at or through a college (Horvitz & Zinser, 2011). Given advances in technology and the push for

Regina L. Garza Mitchell

Dr. Mitchell has worked in higher education for over 15 years in the areas of educational leadership, student learning, online learning, distance education, and faculty development. Prior to joining WMU, Garza Mitchell was the associate vice president for student learning at Texas State Technical College Harlingen and an adjunct faculty member at Texas Tech University. She earned her Ed.D. in higher education leadership at Central Michigan University, where she also earned her M.A. and B.S. degrees; she also earned an A.S. degree from Mid Michigan Community College. Her research interests include online education, leadership, and faculty work, predominantly in a community college setting.



college completion, our study is focused on the closing divide as community colleges offer more technical courses with online options.

"Online Technical Education in ATE-Funded Programs"

The NSF-ATE program focuses on improving "the education of technicians for the high-technology fields that drive our nation's economy" (National Science Foundation, n.d.). Over the past six years, ATE has funded at least 30 projects involving significant online educational elements at the community college level. In fall 2015, our research team began a two-year study, titled above, of ATE-funded projects to learn how technical education is being delivered in online formats in these projects. The team chose to focus on ATE projects for several reasons. First, the projects are housed in colleges across the country, which provides a national perspective. Second, the projects vary according to need and ability. For instance, a project may involve developing a fully online course or program, creation of an online simulation that is used for either online or face-to-face technical courses, or the online component may be a small part of a larger project related to enhancing

technical education. Third, since the projects are grant-funded, we knew there would be project personnel and documentation to help us understand the development and results of the courses and programs created. The main goal is to investigate how technical education is being offered online and to develop resources that highlight models and best practices for development.

Project Design

The qualitative design of our study centers on mini-case studies to investigate the projects and the contexts in which they developed. Each mini-case study consists of interviews, document review, and document analysis. Interviews are conducted with a Principal Investigator or Co-Principal Investigator from each project and at least one faculty member involved with developing and/or teaching the online material. Documents collected include course descriptions and syllabi, course and program enrollment information, demographics, yearly reports, and information available from public websites.

Descriptive Findings

To date, data have been collected for twelve mini-case studies. While analysis is ongoing, my intent is to share some initial findings of our study. The projects range in scope and intent, but all have developed online courses or course elements in an effort to increase student learning and provide learning opportunities for those who are not able to make it to campus due to work or other obligations. Although some programs are considered fully online, they all require lab and/or internship time in which students gain hands-on experience under the guidance of faculty or industry personnel. The following are two examples of these projects.

The Viticulture Enology Science and Technology Alliance (VESTA) is a partnership between the Missouri State University system — including two state universities — and 13 community colleges and universities, as well as vineyards and wineries, across the country. In all, VESTA partner institutions are located in Arkansas, Arizona, California, Kansas, Michigan, Minnesota, New York, Ohio, Oklahoma, Washington, and Wisconsin, but their students are located around the world. The partners work together to develop and deliver online

courses. VESTA acts as a consortium in that students wishing to earn an associate's degree or certificate declare one of the alliance institutions as their home institution, and online credits received from any member institution are accepted as though they were taken at the home institution. The online courses do require some synchronous components in which students meet virtually as a class one or two times per week. Students are also required to find an industry partner for the hands-on or laboratory components of the class. VESTA currently has 15 state partners. Students can work with state coordinators within partner states to find a vineyard or winery to work with, they can check the list on the VESTA website, or the student may recommend a vineyard or winery that is not yet on the list. VESTA has existed for 13 years and is currently expanding its scope to include business and entrepreneurial skills.

Central Maine Community College (CMCC) created the Regional Advanced Machining Partnership, which offers a certificate in advanced machining to meet the demand from regional companies. The certificate is available to students who have completed an associate's degree in machining or an equivalent and is offered primarily online. The curriculum is competency-based and modular, so students move forward at their own pace after attaining the necessary skills. After meeting a particular level of competency, the students contact the faculty and reserve the equipment they need to work on assigned projects. Students demonstrate competency through their work on the equipment and the projects. The rationale for putting the curriculum online was two-fold: to meet the needs of employed students who could not make traditional class times and to allow enrollment to grow despite limited lab space. The college reported that several local companies have assisted employees in enrolling in the program, even providing time and transportation for them to do their hands-on work at the college. CMCC has also partnered with a local university so students who complete the advanced certificate can go on to complete a bachelor's degree with only one additional year of coursework. The college has also provided workshops to train faculty and industry professionals on the curriculum and has made the material available for other colleges to adapt.

Over the past six years, ATE has funded at least 30 projects involving significant online educational elements at the community college level.

The 12 ACT Projects or Centers Included to Date in the Online Technical Education in ATE-Funded Programs Study

ATE Projects or Centers	Description
<u>Sim-building: Teaching Building Science with Simulation Games</u>	The Concord Consortium and Santa Fe Community College are developing innovative simulation games for teaching building science, integrating them into existing courses and evaluating their educational effectiveness.
<u>Articulated Technological Education Pathways (ATEP)</u>	The ATEP project developed three semester-long courses for high school students that provide a bridge from high school technical programs to community college programs in technician education using primarily digital materials.
<u>Regional Advanced Machining Partnership (RAMP)</u>	RAMP developed a certificate in advanced machining designed for graduates of two-year machining programs and machinists with CNC experience wishing to upgrade their skill sets. Courses are competency based and offer modularized, transportable skill building.
<u>Preparing a 21st-Century Workforce for the Water Industry</u>	Red Rocks Community College, with the Colorado Department of Public Health and Environment, Regis University, Western State College, and the Colorado State University-Global Campus, is producing a statewide training network that expands access to workforce preparation for water quality management technicians that includes developing and adapting curricula for online delivery supported by a mobile hands-on learning lab.
<u>Revising Vacuum Technology, an Advanced Manufacturing Program (ReVAMP)</u>	The ReVAMP project aims to develop a cost-effective vacuum technology program, including a pilot distance education model that combines high-definition telepresence technology with hands-on instruction using a mobile, fully-functional vacuum trainer system.
<u>Technological Education for the Rural Community (TERC)</u>	TERC utilizes portable, personalized instructional methods to address identified barriers, including inflexible work schedules, extended time between high school and college, and poor academic preparation. In particular, access issues and low mathematics comprehension are being addressed by utilizing hybrid delivery systems and contextualized mathematics and engineering coursework.
<u>Cybersecurity Program Development (CPD)</u>	CPD integrates introductory cyber awareness and cyber safety modules into a large number of information technology classes, secondary schools, and online classes to the general public, employers, and other organizations.
<u>CREATE: Renewable Energy Regional Center</u>	CREATE is a multi-county consortium serving several objectives, including the development and refinement of modular in-class, on-line, and hybrid renewable energy curricula integrated into degree pathways.
<u>Expanding Career and Educational Learning in Information Technology (EXCEL-IT)</u>	EXCEL-IT involves dual-enrollment IT courses taught in high schools by trained, certified, and well-supported instructors using a hybrid online/classroom structure. Students will be able to earn both high school and college credit, and take free certification exams for industry-recognized credentials.
<u>Viticulture and Enology Science and Technology Alliance (VESTA)</u>	VESTA is a national grape and wine education program that combines online instruction, instructor-guided education from industry professionals, and crucial hands on experience under the guidance of an experienced mentor at a vineyard or winery close to where you live.
<u>SECURE-IT: Cybersecurity Project</u>	SECURE-IT involves reviewing and modifying curricula to include active learning strategies, such as the "flipped" classroom, online courses, and hybrid courses, as a means to engage students, heighten learning, and improve retention.
<u>A Regional Photonics Initiative (RPI)</u>	RPI offers innovative instruction, delivery, and scheduling, relying on a modular curriculum delivered through a hybrid, early entry/early exit system to reduce the time a student needs to complete a degree.

Future Directions

These two projects exemplify how colleges are using technology to deliver quality programs and still provide the hands-on training necessary to develop skilled technicians. As noted earlier, analysis is still ongoing with this project, which is set for completion in summer 2017. Further findings, including models for online course delivery and best practices, will be shared in future publications. Anyone interested in learning more about these and similar projects may be interested in the High Impact Technology Exchange Conference, where many of these and similar programs are showcased.

Acknowledgment

This material is based upon work supported by the National Science Foundation under Grant No. 1501794.

References

- D'Amico, M. M., Morgan, G. B., Katsinas, S. G., & Friedel, J. N. (2015). State director views on community college workforce development. *Career & Technical Education Research*, 39(3), 191–211. doi: 10.5328/cter39.3.191
- Githens, R. P., Sauer, T. M., Crawford, F. L., & Wilson, K. B. (2012). Online occupational education in community colleges: Prevalence, programming, and connection with workforce development needs. *Career and Technical Education Research*, 37(1), 35–56. doi:10.5328/cter37.1.35
- Horvitz, B. S., & Zinser, R. P. (2011). Identifying the state of online instruction in national science foundation funded technical education programs at community colleges. *International Journal of Instructional Technology and Distance Learning*, 8(12), 33–44.
- Johnson, S. D., Benson, A. D., Duncan, J., Shinkareva, O. N., Taylor, G. D., & Treat, T. (2004). *Distance learning in postsecondary career and technical education*. St. Paul, MN: National Research Center for Career and Technical Education. Retrieved from http://www.nrccte.org/sites/default/files/publication-files/distlrng5_benson.pdf
- National Science Foundation. (n.d.). Advanced Technological Education Program Solicitation. Retrieved from <http://www.nsf.gov/pubs/2014/nsf14577/nsf14577.htm>
- Parsad, B., and Lewis, L. (2008). *Distance education at degree-granting postsecondary institutions: 2006–07* (NCES 2009–044). Washington, DC: National Center for Education Statistics. Retrieved from <https://nces.ed.gov/pubs2009/2009044.pdf>
- Phillippe, K., & Tekle, R. (2016, January). *Boom in certificates*. Washington, DC: American Association of Community Colleges, Data Points. Retrieved from http://www.aacc.nche.edu/Publications/datapoints/Documents/DP_Jan7.pdf
- Radford, A. W. (2011). *Learning at a distance: Undergraduate enrollment in distance education courses and degree programs* (NCES Report No. 2012–154). Washington, DC: U. S. Department of Education, Institute of Education Sciences, National Center for Education Statistics. Retrieved from <http://nces.ed.gov/pubs2012/2012154.pdf>
- U.S. Department of Education. (2012). *Investing in America's future: A blueprint for transforming career and technical education*. Washington, DC: U.S. Department of Education, Office of Vocational and Adult Education. Retrieved from <https://www2.ed.gov/about/offices/list/ovae/pi/cte/transforming-career-technical-education.pdf>
- The White House. (2009). *Excerpts of the President's remarks in Warren, Michigan, and fact sheet on the American Graduation Initiative*. Washington, DC: Author. Retrieved from <https://www.whitehouse.gov/the-press-office/excerpts-presidents-remarks-warren-michigan-and-fact-sheet-american-graduation-init>