BEST PRACTICES AND SUCCESS FACTORS IN ONLINE EDUCATION: A COMPARISON WITH CURRENT PRACTICE IN TECHNOLOGY-BASED PROGRAMS

Neal Callahan and Martin Jones, Missouri State University; Richard Bruce, The Builders' Association

Abstract

This paper reports findings concerning the current and future prospects for online education and the established best practices in online education at the post-secondary level. Best practices conveyed by major learning commissions and institutional leadership organizations are identified and reported. Commonalities of best practices between these groups are identified and referenced in order to develop a common set of best practices that are representative of these major educational commissions and organizations. Generalized best practices are then broken down into specific success factors that have been shown to effectively support the various areas of online education. The current progress of technology-based programs toward these established best practices and success factors is then assessed through a survey of technology faculty. Survey results are analyzed and recommendations are made specific to technology-based programs.

Introduction

Technology-based programs in higher education face both challenges and opportunities as they prepare to compete in the global environment and economic realities of the new decade. Enrollment in many technical programs has suffered as manufacturing continues to move to developing countries and U.S. manufacturers slow plans for expansion. One bright spot in this environment has been online education. Online education has grown dramatically over the past decade and is now becoming a crucial strategy for many colleges and universities. This rapidly developing delivery method allows programs in higher education to expand beyond traditional geographic limits and affords working students more flexibility. These added capabilities and incentives are often enough to persuade prospective students, who cannot attend traditional classes, to begin or continue their studies using the online delivery format. This added pool of students is particularly promising for technology-based programs looking to increase enrollments and better serve their students who need specialized training, while working full time or living in a remote location.

This paper identifies best practices in online education as promoted by major learning commissions and institutional leadership organizations, and develops a set of commonly accepted areas of best practice and supporting success factors. A survey of technology faculty is administered to assess agreement with these best practices and success factors in technology-based programs. Limitations and solutions concerning laboratory exposure in technology-based online programs are identified and discussed.

Background

As the Internet came into widespread use in the 1990s, colleges and universities began to develop online courses and a few totally online programs began to emerge. By the year 2000, online course offerings were in rapid growth as institutions were developing their capabilities in this area. According to a study supported by the Sloan Consortium, the percentage of students in higher education taking at least one online course increased from 9.6% in 2002 to 25.3 % in 2008 [1]. This explosive growth over the last decade indicates that online education has grown into the mainstream and is now a major consideration for most colleges and universities.

By 2010, virtually all institutions with any interest in online education had already begun offering online courses. Larger institutions with deeper resources and infrastructure have been particularly interested in developing online capabilities. According to Allen and Seaman [1], these large institutions are responsible for most of the current growth in online education.

Several current factors are driving the interest and demand for online education to even higher levels. The economic crisis that began in 2008 resulted in serious budget shortages in many states, which seriously limited funding to higher education. At the same time, demand for college education increased [1]. Similarly, Basken [2] found that the poor economic conditions expanded enrollments at many colleges because individuals felt compelled to improve their skills to better compete in a tough job market; those unemployed individuals were, then, available to take courses. Federal programs such as the Workforce Investment Act,

which provides tuition, textbooks and gas money for the unemployed, deliver a strong incentive for some to continue their education [3]. As demand for education has driven up enrollments, expansion of physical facilities at many institutions has not kept pace. Limited physical space combined with limited budgets for expansion has focused administrators' attention on online education as a means for meeting demand without requiring expensive building projects [4].

As demand for online education grows, so does the capacity for delivering it. Internet availability, bandwidth and processing speed continue to increase rapidly. Specialized software for collaboration and course instruction has become commonplace, making online communication, data sharing and course management a reality even for those with limited technical skills [5].

As online education takes its place as a major delivery method for college education, it brings both promise and challenge that must be dealt with in order to achieve its full potential. Surveys indicate that students value the convenience and flexibility of online courses and that online instructors and materials can be very effective. However, students also indicate that the quality of interaction and feedback, lengthy reading assignments, and issues with technology are problems that can limit the value of online education [6]. Young [7] found that online students highly valued three attributes in online courses: effective instructor facilitation and communication, a challenging high-quality course and the opportunity for collaboration and interaction. Beyond specific teaching and interaction factors tied to coursework, an institutional approach to online learning that involves training, support services and proper planning and coordination of programs is also needed for a successful online strategy [8].

The opportunities and challenges of online education have been considered and investigated for well over a decade, at the writing of this paper. Leners [9] identified benchmarks for online education based on recommendations from two major higher education organizations. Over the years, major learning commissions and institutional leadership organizations have done extensive investigations and research concerning the success of online education. Four organizations—the Institute for Higher Education Policy, the Sloan Consortium, the Higher Learning Commission, and the Alliance for Higher Education Competitiveness—have conducted extensive research and made specific recommendations concerning best practices in online education. A review of each of these organization's findings is presented here.

The Institute for Higher Education Policy

The Institute for Higher Education Policy (IHEP) is a non-profit organization whose mission is to promote access and quality in postsecondary education. The National Education Association (NEA) and Blackboard Inc. sponsored the Institute for Higher Education Policy to research benchmarks for successful online education. The study involved an extensive literature review concerning currently recommended benchmarks combined with site visits to six institutions identified as leaders in distance education. Based on the literature review and interviews at the six institutions, final recommendations were given concerning benchmarks for online education [10]. Here is a summary of those results:

- Institutional Support - A centralized system is in place for distance education that includes electronic security measures and a reliable and failsafe technology delivery system.
- Course Development - Guidelines and minimum standards are in place for course design, development and delivery.
- Teaching/Learning - Instructor feedback and student interaction with faculty and other students is effectively facilitated.
- Course Structure - Students are provided with written course objectives and expected learning outcomes, an orientation to online education and library resources.
- Student Support - Students are provided with information concerning admissions, required materials, library services and technical assistance.
- Faculty Support - Faculty are given assistance in transitioning to online teaching and in online course development and are assessed during the process.
- Evaluation and Assessment - Educational effectiveness and program administration are assessed through a variety of standard-based methods. Intended learning outcomes are reviewed regularly.

The Sloan Consortium

The Sloan Consortium is an association of colleges, universities and organizations that supports the development and improvement of online education. The consortium was created through funding from the Alfred P. Sloan Foundation [11]. The Sloan Consortium conducts research and encourages collaboration to develop effective practices in online education and to make higher education more accessible [12]. Recommendations made by the Sloan Consortium are summarized here:

- Student Satisfaction – Students are successful in learning online and are pleased with their experience. This includes interaction with instructors, peers and support services.
- Learning Effectiveness – The quality of online learning should be comparable to that of traditional programs, meeting or exceeding industry standards for learning outcomes.
- Scale – Institutions should achieve capacity enrollment and deliver the best value to learners while continually improving services and reducing costs.
- Access - Anyone who is qualified and motivated has access to such studies.
- Faculty Satisfaction – Faculty satisfaction with online teaching reflects institutional commitment to building and sustaining environments that are personally rewarding and professionally beneficial.

Higher Learning Commission

The Higher Learning Commission (HLC) is a major accrediting agency in the United States that accredits degree-granting post-secondary educational institutions in the North Central region, and is one of two commission members of the North Central Association of Colleges and Schools (NCA). The HLC also offers services, training and publications to help advance the cause of higher education. In cooperation with the other five regional institutional accreditors, the HLC has issued a report outlining best practices for online education [13]. Following are the highlights of the HLC report:

- Institutional Context and Commitment – Electronically offered programs are consistent with the institution's mission and an institutional structure is in place to fully support technical, administrative and oversight requirements.
- Curricula and Instruction – Qualified academic professionals assure that the rigor and breadth of online programs are consistent with the standards of the degree being awarded. A coherent plan is developed for students to access all necessary courses and technology to complete the program. The design of online courses reflects the importance of student/faculty interaction.
- Faculty Support - Participating faculty and the institution have considered issues of workload, compensation, intellectual property rights and the implications of program participation on the professional evaluation process. Faculty are provided appropriate technical support and training in the area of online education.
- Student Support - The administration has committed the administrative, financial and technical support necessary to enable admitted students to complete the program in the publicized timeframe. The institution promotes a sense of community among online students.
- Evaluation and Assessment - Overall program effectiveness is continually evaluated through a variety of student and faculty metrics including their ability to meet intended program outcomes, their competence and satisfaction and the program's cost effectiveness.

Alliance for Higher Education Competitiveness

The Alliance for Higher Education Competitiveness (A-HEC) is a non-profit organization that promotes value through innovation by collecting, analyzing and disseminating information to institutions of higher education. A-HEC has released a paper based on surveys and interviews with twenty-one higher education institutions that are considered to have demonstrated successful online education techniques. The paper identifies best practices, innovations, major challenges and future priorities for online education [14]. The major recommendations of the paper are:

- Executive Leadership and Support - The institution maintains a program focus concerning online education and places importance on clear policies and the quality of teaching and learning.
- Faculty and Academic Leadership - Full-time faculty have significant involvement in online education. Faculty members are given incentives for participation and protection of intellectual rights.
- Student Service - A dedicated staff is maintained to assist distance learners in program advising, help-desk support, web-based enrollment, orientation to online education and retention.
- Technology Infrastructure - A highly reliable 24/7 infrastructure is in place that matches technologies with appropriate pedagogy.
- Course and Instructional Quality - A standard course structure and content management procedure is in place. The course design template promotes student/faculty interaction, lecture archiving and team activities.
- Financial Resources - The institution commits sufficient financial resources and seed funds to start and maintain the program.
- Training - Faculty receive required training and orientation including web-based training. Faculty mentoring and support from curricular designers is also available.

- Marketing - Marketing and retention plans are in place and strategic partnerships are encouraged.

Analysis

The recommendations of the four organizations studied are remarkably similar. Although each organization has its own style and perspective concerning best practices for online education, several areas of emphasis are clearly common to all groups evaluated. Five areas of significant focus for all four organizations are:

- Institutional Leadership
- Teaching/Learning Quality
- Student Support
- Faculty Support
- Evaluation/Assessment

These commonalities are supported by critical success factors that promote specific actions for improving online education. These success factors were extracted from the summarized best-practice listings presented earlier and from their supporting documentation. Table 1 identifies the five major areas of focus along with critical success factors below each major area. The promotion of each critical success factor is indicated by an "X" under the corresponding organization's column.

Survey of Faculty in Technology-Based Programs

A survey of faculty in technology-based programs was developed in order to compare faculty perceptions of online education with respect to the critical success factors identified by the four organizations listed in Table 1. While the survey incorporated most of these critical success factors, the scope of this paper is limited to the discussion of those success factors identified by all four organizations.

The survey was administered via SurveyMonkey.com, and members from the Association of Technology, Management, and Applied Engineering's (ATMAE) university-members listserv and professional-members listserv were invited to participate in the survey. There were a total of 80 members who began the survey. The first question on the survey asked, "Have you taught or are you currently teaching an online course." If the response was "No" then the respondent was not allowed to answer any subsequent questions on the survey. There were fifty respondents who completed the survey, representing about 11.8 % of the members on the two listservs.

Table 1. Major Focus Areas and Critical Success Factors

	Organization			
Area	IHEP	SLOAN	HLC	AHEC
1.0 Institutional Leadership				
1.1 Secure, dependable technical infrastructure	X	X	X	X
1.2 Program focus instead of course focus	X	X	X	X
1.3 Online supports overall mission of institution	-	X	X	X
1.4 Adequate funding is provided	-	X	X	X
2.0 Teaching /Learning Quality				
2.1 Facilitate interaction with faculty and other students	X	X	X	X
2.2 Students are provided written course objectives, outcomes and expectations	X	-	-	-
2.3 Program rigor is consistent with traditional programs	X	X	X	X
2.4 Feedback to students is constructive and timely	X	X	X	X
2.5 A sense of community is valued and promoted among online students	-	X	X	-
3.0 Student Support				
3.1 Students are provided an orientation to online education	X	X	X	X
3.2 The institution provides students with full support services including registration, advising, library, services, financial aid information, etc.	X	X	X	X
3.3 Students are provided adequate technology and technical support	X	X	X	X
4.0 Faculty Support				
4.1 Faculty are provided with significant training and technical support for online courses	X	X	X	X
4.2 Faculty are rewarded or given some form of incentive for teaching online	-	X	-	X
4.3 Workload parity between online and traditional delivery is considered	-	X	X	-
4.4 Faculty intellectual property rights are considered	-	X	X	X
5.0 Evaluation/Assessment				
5.1 Intended learning outcomes are emphasized in evaluation and assessment	X	X	X	X
5.2 Feedback from learners is taken seriously and used for continuous improvement	-	X	X	X
5.3 Educational effectiveness is assessed through standards-based methods	X	-	-	X

The survey did not ask about Area 1.1, "Secure, dependable technical infrastructure", since it was assumed that nearly all institutions would provide this. Although beyond the scope of this paper, the survey did ask demographic questions such as faculty rank and university type.

Respondents were given a six-point Likert scale from which to respond to statements based on the critical success factors given in Table 1. In left to right order, the choices were "Strongly Agree", "Agree", "Neutral", "Disagree", "Strongly Disagree", and "Not Applicable". For the purposes of this study, data presented here are shown based on combining responses of "Strongly Agree" and "Agree" into "Agree". Similarly, "Disagree" and "Strongly Disagree" were combined into "Disagree". "Neutral" and "Not Applicable" data not are not explicitly stated or discussed in detail in this paper. Only survey results for those areas identified by all four organizations are presented in Table 2.

As seen in Table 2 for each success factor area, a higher percentage of technology faculty agreed with the common recommendations of the four organizations. However, the percentage difference between those who agree and those who disagree varies greatly between the various survey questions. Several survey questions resulted in a relatively high level of agreement (60% or more) when compared with the recommendations of the four organizations. The questions resulting in relatively high levels of agreement listed below align with typical expectations for traditional courses.

- Interaction is facilitated between faculty and students and among students
- Program rigor is consistent with traditional programs
- Feedback to students is constructive and timely
- The institution provides online students with full support services including registration, advising, library services, financial aid information, etc.
- The assessment of online courses and programs emphasizes defined learning outcomes

The survey does indicate several areas of more limited faculty agreement with the recommendations of the four organizations (50% or less of faculty agree). These survey questions are:

- My institution focuses on overall online programs rather than specific online courses
- The institution provides appropriate student orientation to online education
- Students are provided adequate technology and technical support
- Faculty are provided significant training and technical support for online courses

These survey questions, which resulted in less agreement with the four organizations' recommendations, focus more on overall program issues such as training for the online environment, technical support, online orientation and development and administration of a complete online program.

Table 2. Selected Survey Results of Technology Faculty on Best Practices for Online Education

Area	Statement	Response	
1.0	Please rate your level of agreement with the following statements concerning your institution's leadership in online education:	Agree	Disagree
1.2	My institution focuses on overall online programs rather than specific online courses	39.20%	33.30%
2.0	Please rate your level of agreement with the following statements concerning your experience with online education:	Agree	Disagree
2.1	Interaction is facilitated between faculty and students and among students	60.80%	15.70%
2.3	Program rigor is consistent with traditional programs	72.60%	13.70%
2.4	Feedback to students is constructive and timely	74.50%	9.80%
3.0	Please rate your level of agreement with the following statements concerning your institution's support of online students:	Agree	Disagree
3.1	The institution provides appropriate student orientation to online education	39.30%	37.30%
3.2	The institution provides online students with full support services including registration, advising, library services, financial aid information, etc.	68.00%	6.00%
3.3	Students are provided adequate technology and technical support	50.90%	19.60%
4.0	Please rate your level of agreement with the following statements concerning your institution's support of faculty teaching online:	Agree	Disagree
4.1	Faculty are provided significant training and technical support for online courses	47.00%	26.50%
5.0	Please rate your level of agreement with the following statements concerning your institution's evaluation and assessment of online courses:	Agree	Disagree
5.1	The assessment of online courses and programs emphasizes defined learning outcomes	62.70%	15.70%

Challenges Specific to Technology-Based Programs

Research indicates that the lack of program focus in many technology-based online education efforts is, to some degree, tied to the challenges of including a laboratory component. The laboratory experience is considered to be critical for many technology-based programs. The value of hands-

on activities compared with simulated or remote laboratory exercises has been debated by academics for some time. Ma and Nickerson [15] reviewed research on laboratory education and concluded the following:

- Interest in the effectiveness of virtual versus traditional laboratory exercises has increased, probably due to advances in technology and cost pressures relating to physical laboratories.
- There is a long-running debate concerning the effectiveness of virtual versus traditional laboratories with advocates and detractors for each type.
- Further research is needed to identify the correct mix of technologies that will allow the appropriate balance between the sense of reality developed with hands-on experiments and the conceptual understanding that can be achieved in virtual laboratories.

With the level of controversy and challenge associated with developing online laboratory activities, it is no wonder that technology-based programs, administrators are reluctant to offer complete programs online. Some faculty members and students will prefer face-to-face interaction, and some situations require this in order to meet learning requirements. Hands-on laboratory experience cannot be duplicated through online delivery, in many cases. However, if the will and need exist to develop an online program that integrates laboratory exercises, innovative approaches exist that can be realistic options.

Achieving a quality laboratory experience can be difficult to incorporate using web-based tools. Some programs have focused on simulation software and/or web cameras to achieve lab experiences from a remote location. Others have focused on creating web-based tools to compliment the on-site laboratory experience. In this scenario, some lab experience is provided online that complements on-site experience where students travel to the school once during the class for condensed lab activities. This allows online students to complete a lab-based course online and travel to the lab site on a limited basis.

The Industrial Engineering School at the Spanish Open University in Madrid, Spain, has completed extensive work in developing a web-enhanced approach for distance education students taking lab-based Industrial Engineering courses. In this approach, lab work is developed around three phases: pre-lab, lab and post- lab. The pre-lab is carried out online by students using simulation software and collaboration exercises with other students.

Students conduct experiments, analyze data and interact with other students in this phase in order to become familiar with lab processes and become better prepared for the live lab. Once during the course, in the lab phase, students travel to the laboratory in blocks for lab exercises that are conducted over two or three days. In the post-lab, students use the online system to work collaboratively with other students to reflect upon and discuss the on-site lab [16].

Others have concentrated on further developing access to labs via the Internet. Pastor et al. [17] developed a platform to enable students to perform experiments in real time on actual lab equipment using cameras and the Internet. The system uses a standardized language for the specification of systems, making it easier to share the technology with other institutions once it is developed. With this system, the researchers found it possible to reuse common code to support fast and easy integration of various control systems.

Leva and Donida [18] developed laboratory exercises online based on National Instruments' LabVIEW environment. Students participated in control system experiments via the Internet. The labs included theoretical abstract models, simple physical situations and real physical apparatuses including a speed controller with flexible transmission.

Couture [19] evaluated a simulation-based virtual physics lab that was developed to teach experimental physics. Findings from this study indicate that students value a realistic simulation environment that closely matches actions required in the real world. Other researchers [20-22] are experimenting with the creation of Virtual Labs for their technology students.

Based on the literature available, there appears to be several approaches for incorporating online laboratories into technical programs; these include:

- Online lab activities complimented by condensed on-site labs once per course.
- Online labs incorporating simulation software to provide a realistic experience.
- Specialized software and web cameras to allow remote control of actual laboratory equipment.

Developing laboratory exercises for online courses definitely requires extra effort and thought, and can be a roadblock to developing a program approach to online education in technology-based programs. The above options provide solutions that can assist in moving toward a more program-focused approach.

Conclusions

Online delivery of courses and programs has become a significant factor in post-secondary education. Online education offers great advantages in convenience and flexibility that can clearly improve accessibility for students in a variety of situations. With almost two decades of experience in online education, best practices have been developed and identified that can assist in delivering a quality online experience. The best practices identified in this paper indicate that online delivery should maintain interaction with the instructor and among other students, and include the same level of support, advising, assistance, financial services and information sharing as the on-site environment. Best practices also indicate that institutions should look at online education at the program level in order to ensure that Internet courses are developed with a coherent strategy that serves the needs of the students.

The survey of technology faculty indicated that basic classroom expectations are being delivered with online courses. This includes rigor, interaction among students and with faculty, feedback, non-technical support and assessment. However, the survey of faculty did indicate less agreement with the recommendations of the four organizations from the perspective of the overall program. Less than a majority of faculty agree that their institutions have a program focus when it comes to online education. There may be a strong focus on delivering a good online course, but less attention is given to developing an entire online program that completely serves off-campus students. The survey also indicated limitations concerning student orientation to the online environment and technical support and training for students and faculty.

Technology-based programs are challenged by the need to integrate laboratory coverage when developing online programs. Different approaches to laboratory integration such as limited campus visits, simulation and remote-control interaction have been successful in specific situations. Additional development in the area of online laboratory integration is needed in order to assist technology-based programs in moving toward a program approach in online education.

Online education has come a long way on college campuses over the last 15 years. Although some faculty members are becoming more comfortable with the rigor and effectiveness of online teaching, others still have strong concerns about the quality and effectiveness of online compared with face-to-face interaction. Work still needs to be done in developing a program approach to online education, where entire programs and supporting training and orientation are at the same level of priority as delivering quality individual courses. Some disciplines or individual courses that require complex equipment, or that depend on face-to-face interaction, may not be suited for online education.

Limitations and Future Research

This paper addresses online education issues from the perspective of learning commissions/organizations and technology faculty, but is limited by the absence of student input. As ultimate participants, the opinion of students is a primary concern in assessing performance of online education. Future research is needed to better understand the students' perspective with regard to common best practices that have been identified. Based on the faculty survey results shown in this paper, there may be a gap between the needs of online students and the technical and programmatic support available. Since the sample size of fifty faculty members participating in the survey is relatively small, the results should only be viewed as an indication and not as conclusive evidence. Future research should include a larger sample to further evaluate this indication. A gap analysis could be made by administering a survey to students, as described in this paper, in order to obtain their perception of the criticality of the common success factors identified by the four major educational organizations.

The laboratory component of technology-based programs was identified in this paper as a major challenge in achieving a program approach to online education. Input from students and further input from faculty concerning how best to deal with laboratory requirements in technology-based programs is needed. Some students and faculty members prefer both face-to-face courses and laboratories, and many situations may require face-to-face formats in order to achieve the level of exposure and experience required. A more detailed analysis of options for integrating laboratory exercises into online programs should be investigated. This analysis should include student perceptions concerning online laboratories and possible options for accommodating students who prefer or need face-to-face participation. Future research should also include investigation and analysis concerning which laboratory integration methods are best for specific applications.

Future research should also consider the demographics of the faculty surveyed. Although demographic data were collected, the limited sample size of this survey does not provide strong indications in this area. Age, rank and area of discipline could be an important indicator of faculty perception concerning online education.

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Biographies

R. NEAL CALLAHAN received a Ph.D. in Engineering Management from the Missouri University of Science and Technology in 1999. He is an associate professor at Missouri State University where he teaches project management and is Director of the Project Management Master's program. Dr. Callahan may be reached at NealCallahan@MissouriState.edu

MARTIN P. JONES received a Ph.D. in Materials Science and Engineering from the Johns Hopkins University in 1987. He is an assistant professor at Missouri State University where he teaches engineering economy and construction safety. Dr. Jones may be reached at MartinJones@MissouriState.edu

RICHARD D. BRUCE received a Ph.D. in Technology Management from Indiana State University in 2008. He is the Professional Development Manager at The Builders' Association in Kansas City, MO. Dr. Bruce may be reached at rbruce@buildersassociation.com