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To date, little has been done to benchmark the level of online course development for specific fields within higher education. Most studies that do exist tend to focus on instructional techniques and course design issues rather than on faculty perceptions and attitudes concerning online instruction. This is especially true for technical teacher education (TTE) programs. A lack of studies relating to usage trends and faculty perceptions of online course development within technical teacher education programs represents a significant gap in the literature.

Purpose of the Study

This study seeks to determine the state of online course development and faculty attitudes toward online instruction within technical teacher education programs in the United States. An understanding of online course development trends will allow technical teacher educators to gauge their own use of online courses against that of similar programs. Those planning for the implementation of technology in higher education institutions will be able to use the results of this study to identify activities which may lead to more rapid and effective infusion of technology into teaching. It is also expected that analysis of data collected within this study will lead to further research in the area of online course development in higher education.

Specifically, this study is designed to address the following research questions:

1. To what extent are courses in technical teacher education programs offered via the Internet, as measured by the percent of coursework offered?

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2. What equipment (i.e. hardware, software, course management systems, videoconferencing, etc.) is being used by technical teacher educators to offer online coursework?

3. What types of support for online course development do technical teacher educators receive from their institutions?

4. What are technical teacher educators' opinions about online course development and online learning in general?

Review of Literature

Although the prospect of Web–based learning has generated a high level of interest among educators, historically, educational institutions have been slow to embrace changes in technology (West, 1999). Much of the early activity within schools has focused on building technology infrastructure and providing access to the Internet. As a result, nearly all public schools have access to the Internet (Williams, 2000). The Center for Research on Information Technology and Organizations reports that a majority of schools offer some form of technology training or in-service for teachers (Ronnkvist, Dexter, and Anderson, 2000). These developments create both opportunities and challenges for colleges of education to provide teacher education services that will assist teachers in designing and implementing technology-based instruction.

Providing access and in-service training, however, may not be enough to encourage faculty to fully integrate instructional technology into teaching. Research shows that, despite high levels of access, many faculty members are skeptical about integrating instructional technology (Rickard, 1999). This skepticism and resistance to change is bolstered by "a lack of faith that institutions are supporting faculty in their efforts to transform learning through information technology" (p. 2). Rickard interviewed the 1998 winners of the Educom award for improving undergraduate education through information technology. In that interview, award winner Dr. Paul Velleman, a noted researcher from Cornell University, states

Information technology can improve teaching and learning, but my advice to my academic peers is that they should put their efforts elsewhere until their faculty peers and administration commit fully to supporting, recognizing, and rewarding innovative work in this area (p. 2).

Despite significant developments in instructional technologies and the possible benefits technology-based instruction may offer, some faculty members may view the current trend toward online instruction as a "fad" which will go away at some point in the future. Those charged with encouraging online course development find that many higher education instructors balk at the task due to the amount of time it takes to develop a quality online course (Tarr and McDaniel, 2005). Another issue fueling faculty resistance is the lack of hard evidence in support of technology–based instruction (West, 1999). Whether technology–enhanced instruction provides any real learning advantage to students is still a topic for debate, but its discussion will be moot if universities fail to implement instructional technologies effectively or fail to support and assist faculty engaged in online course development.

Research has shown that educational institutions' failure to support teachers in using instructional technology limits students' ability to learn with the technology (Ronnkvist, Dexter, and Anderson, 2000). Institutional support must go beyond building infrastructure and maintenance into the budget. Lan (2001) makes the case for a revised focus for research in the area of technology integration:

Although accessing the Internet might be relatively easy; learning to harness its full potential is not so simple. It is apparent that to achieve the potential the Internet portends, we must look beyond the simple issue of access. With the mounting interest in Web-based teaching and learning, it is imperative that we consider the requirements of those faculty who are ready to venture into the realm of Web-based instruction and other more sophisticated uses of technology in their teaching (pp. 386).

Despite these warnings, experience suggests that universities often take a minimalist view of support, providing one or two training sessions aimed at building technical competence with whatever course management tool is at hand.

With Internet access on the rise and demands for non-traditional teacher education programs increasing, it is important for higher education administrators to understand the ways in which they can assist teacher education faculty make use of instructional technology. According to a report from the Center for Research on Information Technology and Organizations, technology support in schools consists of support in both technical and instructional content (Ronnkvist, Dexter, and Anderson, 2000). Furthermore, interventions within these categories can be delivered via a variety of methods, ranging from providing computer experts to handle technical problems to granting release time for instructional development. Lanahan's (2002) research also shows that faculty who received both classroom-level access and support were more likely to use the Internet for instruction.

Although research indicates that support should occur at multiple levels and should go beyond providing technical support aimed at solving hardware and software problems, Helliwell and Fowler (1994) note that there is, nevertheless, a tendency to treat technology integration as solely a "technical" concern, while overlooking its social, organizational, and political aspects. Yet, research suggests that a performance support system is most effective when it is linked with the organizations strategy and culture (Gephart, 1995). It seems reasonable, therefore, to assert that when planning support for online course development in higher education, faculty attitudes should be taken into consideration.

The issues surrounding faculty productivity have proven to be controversial and complex, as evidenced by the differing definitions administration and faculty have of the term. Administration tends to view faculty productivity in terms of the bottom line. Studies dating back some three decades have suggested that high unit costs in higher education have been associated with higher faculty salaries coupled with low teaching loads and smaller class sizes. Accordingly, "some major public

universities have established minimum enrollment standards to ensure that each class scheduled has a sufficient enrollment to justify the costs incurred in providing the instruction" (State University of New York, 1991, p.141).

Faculty, on the other hand, define productivity by the number of research publications generated over a specific period. Most faculty balk at the theory of producing at high levels as if they were factory workers, whose increased output would somehow pass on cost savings to the institution (Massy and Wilger, 1995). A current dilemma for colleges and universities is how to best reconcile and measure faculty's definition of productivity with conventional measures of resource allocation based on the number of academic programs and class size. This issue is compounded by economic and public pressure being exerted on colleges and universities, particularly in public institutions, for more faculty accountability. (pp. 12–14)

Faculty productivity, therefore, is related to the faculty member's definition of the construct. Productivity in online course development may also be a function of the amount of support offered and of the faculty members' attitudes toward the work of developing online courses and toward online learning in general. By understanding trends in usage and support, higher education personnel can better plan and may thereby increase productivity as well as the likelihood that instructional technologies will be implemented effectively.

Method

The overall goal of this study was to gather data related to the level of online course development within technical teacher education programs in the United States. To do so, a review of literature was conducted to identify key issues related to online course development and a survey instrument was designed and administered to gather information about (1) the participants and their institutions, (2) the amount of online instruction offered, (3) the equipment used in online instruction, (4) the level and type of university support for online course development, and (5) the participants' opinions concerning online instruction.

Before administering the survey, the proposed survey instrument, along with the research questions, was evaluated by

a panel of experts in the field of online instruction in higher education in order to finalize the "TTE Online Course Development Survey" (OCD). The OCD survey instrument was mailed to department chairs representing all 189 institutions listed in the *2003 National Association of Industrial and Technical Teacher Educators (NAITTE) Directory*. Follow-up procedures were initiated, leading to an overall response rate of 56% (n = 105). Measures of central tendency were used to describe the level of online instruction, technologies used, participants' ratings of university support, and opinions about online instruction.

Results

Survey Respondents

In an effort to understand the respondents' institutions and departmental affiliations, each participant was asked to report the institutional enrollment and the number of full-time faculty within his or her department. Table 1 shows that the majority of respondents were employed at institutions with greater than 10,000 students. Because the number of respondents was very close to 100 (n = 105), frequency of responses is approximately the same as percentages. Therefore, rather than percentages, frequencies are reported within tables.

Table 1
Institutional Enrollment

Estimated Institutional Enrollment	Frequency
≤ 5000	9
5,001–7,500	14
7,501–10,000	6
10,001–15,000	21
> 15,000	51

Table 2
Number of Full-time Faculty

Number of Full-time Faculty in Department	Mean	*SD*	Range
	7	7.5	34

The mean number of full-time faculty (7) with a standard deviation of 7.5 represents a significant level of dispersion in responses (see Table 2). This is indicative of a wide range in department size represented within the data.

Online and Technology-enhanced Instruction

To better understand the amount of fully online and Web-enhanced instruction that is delivered within TTE programs, participants were asked to estimate the percentage of coursework that was offered either fully online or Web-enhanced. Courses offered fully online were defined as those in which greater than 50% of the course content and interaction is delivered via online instruction. A Web-enhanced course was defined as one in which between 10% and 50% of the course content is delivered via online instruction. Survey participants' responses are shown in Tables 3 and 4. As shown in these tables, a majority of the participants reported that less than 25% of coursework was offered fully online or Web-enhanced.

In order to further understand trends in the use of online instruction within technical teacher education programs, participants were asked whether specific technologies were used as part of online courses offered by their departments. The specific technologies named in the survey are frequently used to deliver high-end technology-enhanced instruction in a variety of settings and included course management systems (CMS), Web sites or Web pages, threaded discussions, print-based instructional material, ListServs, and videoconferencing. Table 5 shows the number of respondents reporting specific technologies that were used within their programs' online offerings. A large majority of the respondents indicated the use of online course management systems as well as course Web sites/pages, threaded

Table 3
Percent of TTE Coursework Offered Fully Online

Amount of Online Coursework	Frequency
None	21
Less than 25 %	67
26 %–50 %	13
51–75 %	3
76–100 %	1

Table 4
Percent of TTE Coursework Offered as Web-enhanced

Amount of Enhanced Coursework	Frequency
None	10
Less than 25 %	50
26 %–50 %	24
51–75 %	15
76–100 %	1

discussions, and print-based instructional material. Live video-conferencing was the technology least often used as a component of online courses.

Table 6 describes the availability of course management systems as reported by the survey respondents. The number of respondents indicating that faculty in their departments maintain personal and/or professional Web sites is shown in

Table 5
Specific Technologies Reported To Be Used Within TTE Programs

Technologies	Frequency
Course Management System	90
Course Web Site or Web Pages	86
Print-Based Instructional Materials Delivered Via Course Web Site or CMS	73
Threaded Discussions or ListServs	62
Videoconferencing	25

Table 6
Availability of a Course Management System (CMS)

CMS	Frequency
WebCT	48
Blackboard	48
None	9

Table 7
Number of Faculty Reported to Maintain a Personal and/or Professional Web Site

Do faculty in your department maintain a personal or professional web site?	Frequency
No	64
Yes	41

Table 7. It is noteworthy that many respondents reported use of these varied technologies, while at the same time estimating the percentage of online coursework within their programs at less than 25%.

University Support for Online Learning

To understand the availability of technical support in relation to its proximity to the faculty who might need it, participants were asked to indicate the availability of support for online course development using the following scale:

4   Faculty have this technology or service available within their offices

3   Faculty have access to this technology or service within the department or office

2   Faculty have access to this technology or service within the university

1   Faculty do not have access to this technology or service

Thus, the higher the rating, the closer the technology or service is to the faculty member. Table 8 shows the study participants' overall perception of the availability of support for online course development in descending order of availability.

These data indicated a high level of access to basic technologies such as digital cameras, high speed internet, and course management systems. Also noted, however is that services such as instructional design assistance, short courses, and mini-grants, while available, were more removed from direct access by faculty members.

Opinions about Online Course Development and Instruction

To gather information concerning technical teacher educators' attitudes toward online course development and online instruction in general, participants in the OCD survey were asked to rate their agreement with a number of statements representing issues found to be relevant to online course development. Table 9 provides an overview of participants' ratings of statements in descending level of agreement with 4 = strongly agree, 3 = generally agree, 2 = generally disagree, and 1 = strongly disagree.

Table 8
Availability of Support for Online Course Development

Technology or Service	Mean Rating	SD
High Speed Connection	3.91	0.37
Course Management System	3.59	0.77
Web Site Creation Software	3.35	0.76
Digital Camera	3.07	0.47
Audio and Video Production Equipment	2.95	0.56
Technical Assistance	2.90	0.68
Digital Imaging (i.e. Photo-editing)	2.76	1.08
Video Conferencing Equipment	2.46	0.67
Animation	2.41	1.07
Short Course on How to Develop Online Courses	2.33	0.66
Assistance with Instructional Design for Online Courses	2.31	0.54
Mini-Grants or Stipends to Support Online Course Development	2.15	0.83

Discussion

Taken as a whole, the results of this study provide a picture of online course development in technical teacher education programs in the United States. The results of this study also provide insight into trends in development and use of online instruction. Those charged with supporting faculty efforts to develop online courses can use the results of this study to design a support infrastructure that takes into account faculty attitudes toward online instruction.

Table 9
Participants' Ratings of Agreement with Opinion Statements

Opinion Statement	Mean Rating of Agreement	SD
Faculty should be given release time to develop online courses.	3.32	.764
TTE programs should be fully (100 %) online.	3.22	.500
TTE programs should offer online courses.	3.29	.718
My university could do more to help faculty to develop online courses	3.12	.787
The development of online courses and programs is driven mostly by financial concerns rather than benefits to students.	3.06	.504
My university supports online course development.	2.83	.914
Faculty should develop online courses as part of their regular teaching load.	2.58	.799
The extra time required for faculty to develop online courses is justified by the potential benefits.	2.58	.882
The quality of online courses is the same as for traditional face-to-face courses.	2.56	1.046
The number of students enrolled in an online course should be about the same as face-to-face courses.	2.54	.852
The skills required to learn in online courses are about the same as for face-to-face courses.	2.48	.773
Generally, faculty have the technical skills necessary to design and deliver effective online courses.	2.00	.852

A majority of research participants reported that less than 25% of coursework in their departments was offered fully online or Web-enhanced. This indicates a relatively low usage of online coursework in technical teacher education programs. One may conclude, therefore, that technical teacher education

programs rely more upon traditional classroom-based instruction rather than online coursework. If so, opportunity may then exist to find ways to more fully integrate online instruction into these programs.

When asked whether specific technologies are used as part of online courses offered by their departments, a majority of study participants (73%) indicated that course management systems were used to deliver online coursework. An almost equal percentage of faculty (86%) indicated that Web sites or Web pages were used to deliver online coursework. The fact that course management systems (CMS) use Web pages to deliver content makes it difficult to determine whether online coursework was offered via Web pages outside of the CMS or as part of the CMS. However, given that a large percentage of faculty indicated having access to a CMS, one may conclude that the use of Web pages to deliver online coursework occurred inside of the CMS rather than as stand-alone Web sites.

In addition to the presence of course management systems, the faculty members' willingness to develop and maintain personal and/or professional Web sites may be indicative of the availability of Web-development technologies as well as (at least) a moderate level of technical expertise in this area. This expertise is important since both the Blackboard and WebCT course management systems use Web pages to deliver content. Further, existence of this expertise may indicate a tendency toward acceptance of online course development.

A majority of respondents indicated they had access to either the WebCT or Blackboard CMS. Likewise, basic technologies such as digital cameras, high-speed Internet access, etc., were reported as plentiful. The existence of these systems represents major financial investments from the respondents' universities and may indicate some level of institutional commitment to online instruction. Such investments, however, may still represent a "technological" approach to technology integration, with the assumption that the development of high quality online coursework is largely a matter of providing access to hardware and software.

Also noted is that services that support the development of online coursework, such as instructional design assistance,

short courses, and mini-grants, were not localized and readily accessible to faculty members, but tended to be institution-level resources that are removed from the individuals who may be developing the online courses. Murdock (1996) reported that the closer the technology is to the faculty member, the more likely it is that the technologies will be integrated into instruction. Faculty may be less willing to take advantage of technologies and services that are more removed. Also, offering mini-grants and instructional design expertise at the university level may not be as appealing to faculty and may result in less of a program-level focus than is desired. Faculty development practices that utilize a more individualized approach may lead to a higher level of implementation of Web-based courses. Therefore, if such resources are included as part of an institution's support infrastructure, they should be readily available to the faculty member. This will increase the likelihood that resources are used to support programmatic needs and goals.

Many researchers have noted that attitudes toward a specific technology will influence the level of use of that technology (Carey, Chisholm, Ines, and Irwin (2002), Glasgow and Keim, (2005), and Kirkley and Stein (2004)). It follows that a faculty member's attitudes influence his or her willingness and ability to develop online coursework. The results of this study suggest that, generally, faculty believe that technical teacher education programs should offer online coursework. At the same time, a majority of study participants indicted they believed that the institutions' incentives to implement online coursework are driven by financial concerns, rather than benefits to student learning. Generally, faculty reported negative attitudes toward the benefits of online learning for students. The idea that faculty work should primarily provide a financial benefit to the institution may be perceived as minimizing the faculty's role in education and may, therefore, create ambivalence in faculty attitudes towards online learning. In addition, a significant number of faculty indicated they felt that release-time should be granted for online course development work. These attitudes may signal faculty members' concerns about the effects online course development has upon their regular work load.

Implications for Practice

This study is significant in that it describes the status of online course development within technical teacher education programs within the United States. The study is unique in that it addresses online course development as a function of faculty support and attitudes. Those planning for the use of technology in higher education institutions should use the results of this study to provide appropriate support and shape faculty's attitudes toward online course development and instruction. This, in turn, may lead to more rapid and effective infusion of technology into teaching. Specifically, it is recommended that institutions

- continue to investigate online course development technologies that are user-friendly
- identify ways that support mechanisms can be delivered closer to faculty members
- reduce the negative impacts of online course development on faculty workload
- disseminate information detailing the benefits of online learning for students, the faculty, and the institution.

In the future, colleges of education will be under increasing pressure to expand their enrollments as a means to address teacher shortages and to serve non–traditional student populations. There will likely, however, be fewer funds available to support the development of physical improvements to the on–campus infrastructure (e.g. buildings and grounds). Hence, it is important to continue the line of research conducted in this study in order to understand the phenomena associated with online course development in all areas of higher education.

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