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Perceived Demand for Online and Hybrid Doctoral Programs in Technical Education

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Data from the recurring Sloan-C snapshot of the status of online education in the US indicate that online education is becoming increasingly a part of the long-term goals and strategies of many institutions (Allen & Seaman, 2005). Fifty-nine percent of schools surveyed in 2005 indicated options for online education as a critical part of their long-term plan, up from 49% in the 2003 survey. Online enrollments increased 18% in 2004, with over 2.3 million students taking at least one online course in fall 2004.

However, online education is not growing uniformly across degree levels or program disciplines. Penetration rate is defined as the “proportion of institutions that offer a particular type of face-to-face course or program [and] provide the same type of offering online” (Allen & Seaman, 2005, p. 5). Online program penetration rates in 2005 were 29.9%, 43.6%, and 12.4% for bachelor’s, master’s and doctoral programs, respectively. But degree programs in education at public institutions were found to lag behind all six other major program areas analyzed by Allen and Seaman, with an online penetration rate of 30.4%, a finding which is paradoxical since online programs stem from educational innovation. Moreover, even though doctoral programs have lower overall penetration rates than other degree programs, the highest penetration rates for each level (associate’s, bachelor’s, master’s, and doctoral) were seen at doctoral institutions. One may conclude from this fact that it is at institutions offering doctoral degrees where most changes have occurred in transitioning to online education.

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Technical education, defined here to include technology education and other areas typically covered under the career and technical education umbrella, has begun taking advantage of the online market by offering online education at the bachelor's and master's level (Bouchillon & Muga, 2005; Flowers, 2005). However, the critical need is at the doctoral level for technical education students who are enrolled in programs designed to promote research and to train faculty researchers (Reed, 2002; Brown, 2002). In his 2002 study, Brown focused on faculty searches in technical education. He found a 34% search failure rate in 2000-2001, which he contrasted to earlier studies that found failure rates of 24% in 1997-1998 and 27% in 1998-1999. According to Brown, the number of applicants per position in 2002 was 8.5, down from 9.6 in a 2000 study, and down from 17.3 in a 1987 study. In addition, Brown found that 75% of his subjects thought the applicant pool to be "inadequate" (Difficulty in Filling Positions, ¶ 1), concluding, "We should seek ways to increase numbers of qualified applicants for faculty positions." (Discussion and Conclusions, ¶ 5). His study provides evidence that technical education needs more doctoral graduates. If this need is to be met, the field may be positioned to benefit from a new way of reaching and educating those doctoral students. In other fields, both online doctoral programs and hybrid programs (i.e., those combining distance and face-to-face delivery) have appeared (Adams & DeFleur, 2005). Although some doctoral programs in the technology education field include distance education elements, it is ironic that a field based in technology has lagged behind non-technical fields in taking advantage of the new technologies available for delivering doctoral studies online.

Study Purpose

While there has been an analysis of online learning needs in technology education (Flowers, 2001), there has been no study focused specifically on online doctoral education in technical education. In order to provide information for institutions planning to implement an online or hybrid doctoral program in technical education, a four-part study was designed to characterize

1. The perceived need for new hires and hiring attitudes towards those who earned their doctoral degree online (analyzed through data collected from a survey of coordinators and chairs of bachelor's and master's programs in the field) (Flowers & Baltzer, 2006);
2. The perceived demand for an online or hybrid doctoral program in technical education (gathered through a survey of perspective students);
3. The status of current doctoral programs in technical education (determined from a series of telephone interviews with doctoral program directors at selected universities); and
4. Models for online and hybrid doctoral education (designed with input from a series of telephone interviews with directors of online or nearly online doctoral programs, mostly in other fields).

This article details the second phase of this study. The purpose is to characterize the reported demand for online and hybrid doctoral programs in technical education and the attitudes and recommendations of prospective students. It also explores attitudes held toward this type of degree by those who have completed a traditional face-to-face doctoral degree in the field of technical education.

Methods

Sample

The population for this study was intended to be those people currently involved in technical education and related fields as evidenced by their membership in the International Technology Education Association (ITEA), the American Technical Education Association (ATEA), or the Association for Career and Technical Education (ATCE). Following human subjects' protocol approval, invitations to participate in an online survey and facts informing subjects of their rights were e-mailed by the investigators in February 2006 to all 2737 professional members and 398 student members of ITEA. Seventy-five of these e-mails were rejected as undeliverable. A similar notice was sent by ATEA staff on behalf of the investigators to what the ATEA reported as "the approximately 700 members of ATEA" for whom there was a

working e-mail address. ACTE declined the investigators' request to survey their members. Due to this fact, the results obtained are skewed toward technology education because of the large number of respondents from ITEA.

The survey sample was partitioned into those who had earned a doctoral degree and those who had not. Survey respondents without a doctoral degree were asked how important it was to them to earn a doctoral degree. They rated their responses to this item on a five-point Likert scale ranging from 1- "not important" to 5- "extremely important." This question was used to filter out those respondents for whom pursuing a doctoral degree was of moderate or low importance. Only data from subjects without a doctorate who rated the importance of obtaining a doctoral degree as a 4 or 5 were used in the survey analysis. This was deemed appropriate in order to attain a clearer picture of demand from those who are more likely to enroll in a doctoral program rather than attempt to generalize to a population which includes those who consider undertaking doctoral studies unimportant. In this study, the non-doctorate group was used to characterize a "before" attitude of potential students, and the doctorate group to characterize an "after" attitude of those who had completed a face-to-face doctorate some time in the past.

Instrumentation

The researchers used an online survey method of data collection in order to maximize sample size while minimizing the time and cost required for data entry as well as minimizing data-entry errors. A preliminary instrument was pilot tested with a number of individuals whose highest degree was either a doctorate, a master's, or a bachelor's. The pilot test indicated that having a question worded in both the past and future tense on a single instrument was confusing. This led to a decision to divide the survey into two separate instruments, one comprised of 17 items for survey subjects with a doctorate and 23 items for those without a doctorate. The result was two shorter, more reliable instruments.

The survey instruments included items on demographics concerning job title, highest level of education earned, years to

retirement, and number of online courses taken. One section examined motivation for doctoral study with items concerning motivating factors and the perceived benefits of obtaining a doctoral degree. Another survey item investigated the relative appeal of online versus face-to-face doctoral programs. Those without doctorates were also asked a series of questions about their perceived likelihood of enrolling in doctoral programs based on the differing methods of delivery—face-to-face, hybrid, or online. Based on Rogers (2002) findings that the three most influential barriers to doctoral study perceived by technology teachers were time commitments, location to university, and financial constraints, these three factors formed the basis of several items on the current surveys pertaining to doctoral study obstacles.

Data Analysis

The overall return rate in this study was 14% (532 of 3760). Seventy respondents had doctorates (DOC group), and 462 did not. Of those not having doctorates, 181 indicated a desire to pursue a doctoral degree and made up the ND group. The data from the 281 respondents who did not indicate a desire to pursue a doctorate were discarded. Participates from ATEA made up 20% of the DOC group and 6% of the ND group, and ITEA participates made up the remaining 80% of the DOC and 94% of the ND groups respectively. Comparisons within and between samples were performed in order to better characterize attitudes and demand. Taking a conservative approach, non-parametric procedures for ranks were performed (using SPSS software) since normality could not be assumed. All tests for significance were two-tailed and considered to be significant at the $p < .05$ level. Analysis of open-ended items was performed by reading and classifying all responses, determining a general attitude for the majority of the respondents, and in some cases the attitudes of a strong minority, and choosing quotations that best portrayed the investigators' interpretations of those attitudes.

Results and Discussion

Some considerations must be kept in mind when reflecting on the study findings. First, because the sample was

self-selected, it is likely that those who felt strongly about online doctoral offerings, positively or negatively, may have responded in greater numbers than those with less extreme opinions. Second, while the results are the respondents' views on several factors that characterize demand for an online or hybrid doctoral program, their views do not predict the demand of the entire population. Lastly, this survey was conducted in the spring of 2006 on a topic that is in constant flux.

Demographics

The majority of the ND group of respondents consisted of secondary school technology education teachers, with minorities of lecturers, professors and graduate assistants. Most of the ND group had completed master's degrees (74% of the sample), while 24% had earned bachelor's degrees and the remaining 2% had earned degrees below the bachelor's level. Of the 61 ND respondents currently seeking a degree, 29 (48%) were enrolled in a master's program, 19 (31%) in a doctoral program, 3 (5%) in a bachelor's program, with the remaining 10 (16%) enrolled in education specialist or other unspecified programs. Most of the DOC respondents were employed as professors or deans of various ranks. For the DOC group, the mean number of years since the doctorate had been earned was 15 years.

The ND group's median number of years until retirement was in the 21-25 year range, and the median for the DOC group fell between the 5-10 and 11-15 year ranges. Both groups were asked how many classes they had taken online. The average for the ND group was calculated at 2.7 ($n = 173$). However, this is an under-estimation for this group since there were several answers such as "many" and "lots" that were not included in the calculations. The average number of online classes taken by the DOC group was 1.1 ($n = 69$). Using a Mann-Whitney U test, it was found that the ND sample had taken significantly more online classes ($z = -3.051, p = .002$) than the DOC group.

Motivation

The survey included questions pertaining to a subject's perceptions of the benefits of earning a doctoral degree, either in the past or the future. Respondents were asked how much a

doctoral degree would help or did help them advance in their current position. On a five-point Likert scale ranging from 1-“not at all” to 5-“very much,” the ND group responded with a mean of 4.0 ($n = 181$) and the mean for the DOC group was 4.1 ($n = 68$). This indicates both groups believed that earning a doctorate will be or was more than of modest benefit to them in their current positions.

Non-doctorates were also asked what their primary motivation would be for seeking a doctoral degree. The answer choices were “pay raise” “status/position advancement at current employer,” “to be eligible for a different job,” “personal fulfillment,” and “other” with multiple selections possible. (See Table 1.) Upon analysis of all choices except “other,” a Cochran’s Q Test identified a significant difference between at least two of the answer choices ($Q = 46.254$, $df = 3$, $p < .001$, $n = 181$). Upon pair-wise analysis, the critical level of significance ($p = .05$) was divided by 6 using a Bonferoni approach to control Type I error, resulting in $p = 0.008$ for each of the six comparisons. This analysis showed “personal fulfillment” and “eligibility for a new job” to be a significantly greater motivation than “pay raise” or “status.” However, no difference was found between “pay raise” and “status,” or between “personal fulfillment” and “eligibility for a new job.”

Table 1

Q Statistics for Pairwise Comparison Among Motivations for Doctoral Study for the ND Group Using a Cochran’s Test ($n = 181$). †

	Status	New job	Personal fulfillment
Pay raise	1.976	23.211***	11.215***
Status		28.582***	16.200***
New job			2.586

† Frequencies for each motivation: New job (126), Personal fulfillment (111), Pay raise (84), and Status (75).

*** $p \leq .001$

Cochran's Q was similarly used to identify any significant differences between two or more of the motivations in the DOC groups' responses to the same question (asked in the past tense). The results for the DOC group are shown in Table 2 with $Q = 45.655$, $df = 3$, $p < .001$, $n = 70$. Pair-wise comparisons of the choices in the DOC group revealed the same significant differences found in the ND group, also at the $p = .008$ level.

Table 2
Q Statistics for Pairwise Comparison among Motivations for Doctoral Study for the DOC Group Using a Cochran's Test (n = 70). †

	Status	New job	Personal fulfillment
Pay raise	1.800	27.457***	26.471***
Status		15.244***	16.000***
New job			.029

† Frequencies for each motivation: New job (46), Personal fulfillment (45), Status (21), and Pay raise (15).

*** $p \leq .001$

Obstacles

Rogers (2002) investigated reported obstacles to completing a doctoral degree in technology education. The present study expanded on the top three obstacles revealed in that study (time commitments, location to the nearest university, and financial costs) in order to gain a better understanding of how critical each obstacle was. The present study confirmed the findings of Rogers, with all three obstacles rated as "moderate" by the ND group, but with no statistically significant differences found among them.

Respondents were asked how a university might help a student overcome the obstacle that was most insurmountable for them of the three. Most of the DOC group's suggestions centered on alleviating the financial burden on the student and allowing more flexibility in the time allotted for completion. The ND

group's responses to the same question overwhelmingly recommended that the university find ways to make a program more flexible regarding time and space for the student, although this response might have been influenced by attention in the survey instrument to online education. There was also a strong indication of the need to make doctoral programs more attainable financially. Interestingly, there were also responses from both groups indicating that the student alone, not the university, is responsible for creating the conditions under which it is possible to pursue an advanced degree. One response from the DOC sample illustrates this:

A doctorate should be neither cheap nor easy—the top professionals in our field should ONLY be those who are willing to invest enormous amounts of personal time and resources and forgo self interests for a few years...

The survey posed several questions about financial concerns. When asked whether they would be more likely to consider an online program if it offered reduced tuition, 90% ($n = 181$) of the ND group said yes. However, when the DOC group was asked if they would have been more likely to consider an online doctorate if reduced tuition had been offered, only 41.1% ($n = 68$) said yes. Those in the DOC group are understandably less likely than the ND group to consider a less costly doctoral program since they are among those who were able to overcome the financial obstacles in obtaining a doctorate, possibly with the help of tuition waivers from assistantships that might have made the cost of tuition irrelevant to the student. Also contributing to this result was the fact that doctoral degrees for this sample were earned, on average, 15 years ago, when online doctorates were not an option. On the other hand, the ND result may be due in part to recent increases in tuition rates.

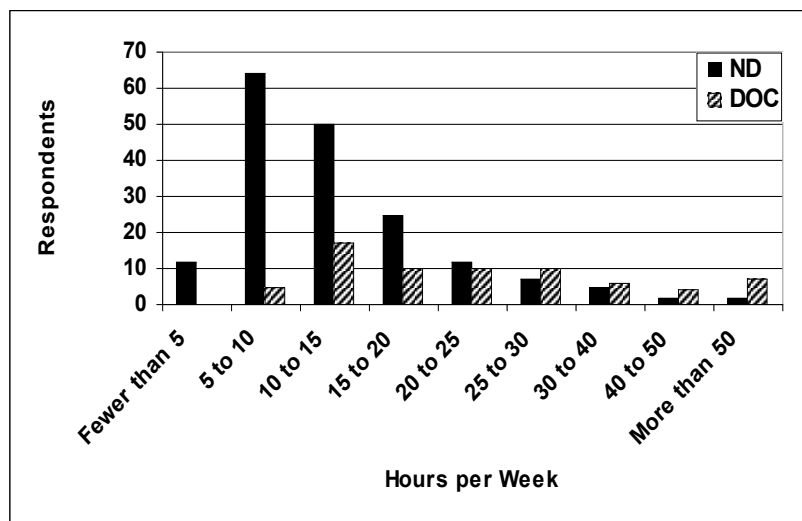
Questions on the survey asked both groups whether they would be, or were, limited to an institution that awarded graduate assistantships to students pursuing a doctorate. Thirty-four percent ($n = 180$) of the ND group said yes, whereas 51.5% ($n = 68$) of the DOC group said yes. This item may indicate that many in the ND group do not wish to leave or postpone their already established careers in order to pursue a doctoral degree, possibly making the time constraints involved in fulfilling a

graduate assistantship a deterrent for these individuals. Hence this new set of potential students should be recognized as established professionals by those offering doctoral programs in technical education. Furthermore, this item suggests this group is still financially constrained when attempting to pursue doctoral studies, but that increased graduate assistantships may not be the best way to help address this concern.

The survey posed a more detailed question pertaining to the time commitments required to earn a doctorate degree. Both groups were asked how many hours per week, not during the summer months, they would be able to spend, or did spend, on doctoral class work. The results can be seen in Figure 1. For the DOC group, the median number of hours per week they had spent doing class work while pursuing a doctorate was reported as 20-25 hours ($n = 69$), whereas the median number of hours that the ND group indicated that they could spend on doctoral class work was 10-15 hours ($n = 181$). Results from a Mann-Whitney U test for a between-groups comparison, showed that the DOC group

Figure 1

Total Hours Per Week the Respondent Could/Did Devote to the Pursuit of a Doctoral Degree.



indicated that they spent significantly more hours per week doing class work than the ND group indicated they would be able to spend ($z = -6.806, p < .001$). The account from the DOC group was more realistic, possibly because they had experienced how much time doctoral studies actually require. The responses to this item suggest that individuals similar to the ND group may be more able to enroll in part-time, rather than full time, doctoral programs and that flexibility in time commitments should be considered by institutions intending to attract these doctoral candidates.

Appeal

One means of increasing program flexibility and helping reduce tuition costs is to add online elements, including courses or even entire degree programs. This survey documented the appeal reported by the study participants for an online doctoral program. All subjects were asked, "Compared to a face-to-face doctoral program, how much less or more appealing is an online doctoral program?" Respondents placed their answer choices on a five-point Likert scale ranging between 1-"much less appealing" and 5-"much more appealing." The resulting data were tested for significance against the midpoint of the scale (i.e., neutral) using a Wilcoxon Signed Ranks test. The ND sample indicated that the appeal of an online doctoral degree over a face-to-face degree was significantly greater than neutral (mean = 3.71, $z = -6.244, p < .001, n = 180$). In contrast, the DOC sample indicated that the appeal of an online doctoral degree over a face-to-face degree was significantly less than neutral (mean = 2.24, $z = -3.801, p < .001, n = 68$). These results demonstrated a strong dichotomy between those who have and those who have not completed a doctoral program when considering the appeal of an online doctoral degree. Despite the appeal reported by possible prospective students of online doctoral programs, if those in a position to create such offerings do not find them appealing there may be little chance online doctoral programs will be created.

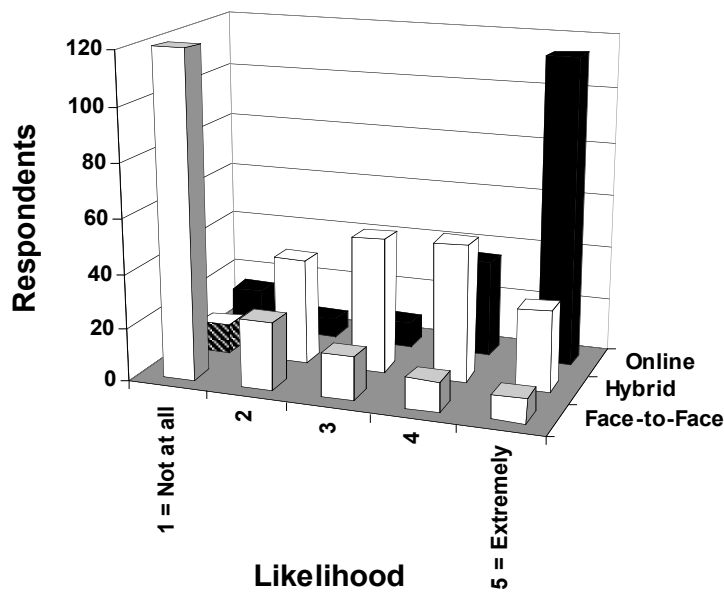
Likelihood to Pursue

The survey asked the ND group three questions concerning their likelihood of pursuing a doctoral degree by three different

methods of delivery: face-to-face; hybrid (requiring several on-campus visits but no extended stay); and completely online (no extended on-campus visits). Survey participants used a five-point Likert scale ranging between 1-“not at all likely” and 5-“extremely likely” to respond to each question. A Wilcoxon Signed Ranks test showed the reported likelihood of pursuing a face-to-face doctoral degree was significantly lower than moderate, or 3.0 (mean = 1.70, $z = -9.952$, $p < .001$, $n = 181$). The reported likelihood of pursuing a hybrid doctoral degree and a doctoral degree that required no on-campus visits were both

Figure 2

Reported Likelihood for ND Group of Pursuing a Doctoral Degree by Delivery Method



significantly above moderate (means = 3.28 and 4.25, $p = .001$ and $< .001$, respectively, $n = 181$), as seen in Figure 2. Thus, a decrease in the required on-campus time increases the reported likelihood of doctoral enrollment.

It is notable that 150 individuals indicated the top two levels (4 or 5 on the Likert scale) of likelihood to pursue a doctoral degree that requires no campus visits, with 114 of those individuals reporting they were “extremely likely.” In contrast, those individuals indicating the top two levels of likelihood for a hybrid program numbered 81, with 30 indicating “extremely likely.” This number fell to 20 respondents indicating the top two levels of likelihood to pursue a face-to-face doctoral degree, with only 9 indicating “extremely likely.” These numbers suggest a strong demand for completely or partially online doctoral programs.

Respondents' Comments

Another section of the survey asked respondents to include any additional comments that might help clarify the demand for an online doctorate in fields related to technical education. The ND group's views varied through an entire spectrum from greatly supportive, to totally against online doctoral programs:

- I think it is an excellent idea!!!
- I consider this the promotion of another means of acquiring [*sic*] something that will mean nothing. [These are] people that want the honor without the sacrifice and schools willing to bastardize the value for the sake of commercial appeal and greater revenues.

However, the majority of respondents fell somewhere in the middle, with a cautious, but not completely negative attitude towards the idea of an online doctoral degree in technical education. Areas of concern included the quality and accreditation of the program, financial constraints, and the loss of student-to-student interaction. Most respondents seemed to think a partially online, or hybrid degree, would be a better solution:

- A program [where] core course work could be completed online and elective course work was completed in workshops and summer residencies would be ideal for

many working student/educators.

- Online degrees may have an inherent debate surrounding them as to the validity and integrity of their promise. Too much is lost if the entire degree/course is online...

In contrast, the comments of the DOC group were mainly negative. In general, they doubted that the quality of an online program could match that of a face-to-face degree:

I am aware there is potential for several people to pursue [*sic*] an on-line doctoral program. How will this on-line program prepare the graduates for the professorship without mentorship? Will this only be a doctoral degree in name or will it be quality? If you are going to compete with the current doctoral programs then you need to insure there is quality and the product needs to be equal or better...

There were also some negative feelings expressed from this group concerning job eligibility for a person who had earned their doctoral degree online:

I sense that the main goal of online programs is to mass produce graduates as quickly and efficiently as possible. I feel any program that is 100% online cannot possibly be as effective as one that involves face-to-face interactions with colleagues UNLESS the goal is to produce graduates who will teach online courses exclusively.

This again speaks to the perceived lack of quality in an online program but also hints at a potential willingness to have at least some online elements, as long as face-to-face contact is not completely eliminated. There were also a few supportive responses from this group, mainly indicating that online education may help address the need for a greater supply of professors and researchers in the technical education field:

I recognize the need for leadership in our profession (and others) and hope the on-line experience can provide the human-to human experience(s) necessary...

Both the ND and the DOC groups expressed concerns about the different attributes of online doctoral programs versus face-to-face programs. Issues dealing with the quality of the program and the perceived lack of contact with professors and other students predominated these concerns. In their comments,

the ND group was a bit quicker to endorse online doctoral programs than the DOC group, but again, the ND group seemed to lean more toward a hybrid version. However, even with the reservations, overall, these results indicate that many of the professional association members surveyed recognize the value of a new avenue for pursuing a doctoral degree in technical education.

Summary and Conclusions

Results of this study show that there is demand from prospective students for online or partially online doctoral programs in technical education. In this study, 150 of the 181 ND respondents reported they are likely to pursue an online doctoral degree. Also, 81 of the original 181 said they are likely to pursue a hybrid doctoral degree. While this is not a representative sample and cannot be generalized to the entire population, the responses of these individuals are evidence of demand for such programs.

At the same time, there are serious concerns about the quality of online programs in general. Some of these concerns may be alleviated for potential students if a program is regionally accredited under standards that include guidelines for distance education programs (The Higher Learning Commission, n.d.). Despite the existence of these guidelines, there is still unease about the quality of accredited online doctoral programs among higher education faculty (Adams & DeFleur, 2005) and those seeking jobs in technical education at the university level may find an online doctorate a disadvantage in the eyes of those making hiring decisions (Flowers & Baltzer, 2006). Future providers of online or hybrid doctoral degrees should attempt to insure that their programs have sufficient quality to be valued outside of their own institution so that their graduates are considered on a par with other prospective employees. Providers should take steps to document program quality, and disburse that information widely.

The survey revealed that the ND and DOC groups had many similarities. The primary motivations of both groups for earning a doctoral degree were personal fulfillment and job eligibility. Both the ND and DOC groups agreed on the perceived benefits of a doctoral degree. The ND group's perceptions of the

benefits they anticipated a doctoral degree would bring them corresponded to the benefits that the DOC group reported the degree had, in fact, provided them.

Although there were similarities between the two groups, this survey revealed several key differences as well. The survey disclosed a discrepancy between the number of hours prospective doctoral students reported they would be able to devote to coursework, and the number of hours actually invested by those who have completed a doctoral program. This is one of several factors related to time commitment, which was found by Rogers (2002) to be the most severe barrier reported to enrollment in a doctoral program in technology education. Also contributing to time commitment concerns are residency requirements, years to complete a degree, and time lost in transportation. Online and hybrid programs may be effective in addressing some factors related to time commitments, though any quality doctoral program would necessarily entail substantial commitment by serious students.

The survey question concerning graduate assistantships reveals another key difference between the ND and DOC groups. The low number of prospective students in the ND group (34%) who reported they would be limited to an institution that offered graduate assistantships, along with concerns regarding location, calls on doctoral degree providers to consider a potential pool of students who may be atypical compared to those in traditional, on-campus programs. Many may not want to give up their current positions to pursue a doctoral degree. The investigators argue that this group of potential doctoral students is not the same as a group of doctoral students seeking face-to-face degrees, and their different concerns should be addressed if they are to be attracted to doctoral studies.

The following recommendations are offered for doctoral degree providers:

- Quality assurance for online education must be rigorous.
- Online elements might be best incorporated as a hybrid degree.
- Providers should realize that the population of those who may be able to pursue an online or hybrid degree

has different characteristics than those who attend on-campus programs.

- Greater time flexibility will likely be attractive to online doctoral students, both in time allowed for completion of the degree and in the academic calendar.
- Eligibility for a new or advanced position and the personal fulfillment from doctoral study should be emphasized in marketing, though with considerations concerning the view some in higher education might have as to the acceptability of an online doctorate.

The four-phase project exploring online doctoral degree programs, of which this is the second part, will next investigate current doctoral programs in the field of technical education and explore models for online/hybrid doctoral program delivery. Other researchers are encouraged to further study online elements in technical education and explore how they can be best incorporated into their own institutions' programs.

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