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The Effect of Online Delivery on Graduate Enrollment

James C. Flowers
Ball State University

Online education continues to grow. As noted in the latest report from the Sloan Consortium (Allen and Seaman, 2004), "the expected average growth rate for online students for 2004 is 24.8%, up from 19.8% in 2003" (p. 1). "Schools do not believe that enrollments have reached a plateau" (p. 5). With this growth, it is not surprising that "the majority of all schools (53.6%) agree that online education is critical to their long-term strategy" (p. 2).

Industrial and technical teacher education, likewise, is seeing an increase in online education as reported in the 2005 yearbook on distance and distributed learning environments from the Council on Technology Teacher Education (Havice and Havice, 2005) and a growing number of articles concerning online education. However, Zirkle (2002) noted a shortage of literature focused on online degree programs in industrial teacher education compared to the greater amount of literature examining individual online courses. Some of the literature includes descriptions of a particular institution's experience in placing education online, often in the form of a case study or recommendations from an author who has been closely connected with that process (Gilberti, 2005; Sinn, 2004), and sometimes as an effort to publicize the program rather than describe the process that led to its online delivery (Flowers and Sheetz, 2002; Flowers and Cotton, 2003). The purpose of the present article is to provide a case study of what is believed to have been the first master's degree in technology education (TE) to be offered completely online, and the online offering of a sister program in career and technical education (CTE). This case study looks at the

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impact this move to Internet delivery had on student enrollment and discusses the lessons learned in this process.

Going Online

Program Development

The institution where this study took place is a Midwest state university with an approximate enrollment of 18,000 and a history of on-campus education in technology education both at the undergraduate and master's level. In the late 1990s, the institution saw a drop in enrollment in the face-to-face master of arts in technology education program to the point that many courses were under-enrolled (i.e., with fewer than 6 students). A second master of arts, in what is now career and technical education, was listed in the university's catalog but had no students enrolled.

When the idea was first entertained in 1999 of offering the master of arts in technology education completely over the Internet, there were no other online degree programs in technology education to serve as models. Yet proponents felt this signaled an opportunity to draw from an untapped pool of potential distance education students. Even more recently, technology education has been cited as lagging behind some other fields in distance learning offerings. Ndahi and Ritz (2002) noted that ten institutions in their survey reported offering a degree via distance education in "Occupational, Vocational, and Technical, and Trade and Industrial Education" (p. 66) at the associate's, bachelor's, or master's level, yet only one reported offering a degree in technology education, and that was at the master's level.

Pilot Course

To explore the possibility of offering online graduate education, a new graduate elective course was proposed to the institution's office of distance education as a pilot online course. This office provided support to the course developer prior to initial online implementation by providing a reduction in teaching load and assistance from an instructional technologist. The developer was also required to take an online class as a student. The online graduate course was first offered in the fall of 2000,

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then redeveloped and re-offered in the fall of 2001. In its initial online offering, the pilot course had an enrollment of 26 students, while the two equivalent on-campus courses that semester had only 3 and 4 students enrolled. In the fall of 2001, an average of 6 students was enrolled in each of the three on-campus graduate courses, while the online course had 23 students enrolled.

Needs Assessment

Prior to the pilot offering in 2000, a needs assessment was performed (Flowers, 2001) to determine the perceived need for online education in technology education, using the International Technology Education Association professional and student membership lists as a survey sample. This uncovered that the "perceived need is noteworthy and indicates an opportunity for universities considering offering online education" (p. 22). During that needs assessment, other information was gleaned to inform program design and delivery.

Decision to Go Online

Near the end of the 2001-2002 academic year, in the face of declining on-campus graduate enrollments, eight graduate program faculty members unanimously approved a decision to transition to a completely online master's program with no changes to the program specifications as outlined in the graduate catalog. Shortly after the decision to transition to online delivery, the department realized that the success of the new online program would require local administration and support and that this support should be provided well before the first student enrolled. The author was appointed as the director of online education to provide this support.

Placing the program online seemed to be in the best interest of the institution according to its strategic plan. It also fit within the distance education strategic plan that identified four criteria for new distance education offerings in order for them to receive top consideration. These were that (a) the program is offered completely through distance education (rather than requiring one or more campus visits that would severely limit the pool of potential students); (b) the program is delivered via the Internet (rather than to remote video locations within the state,

by correspondence, or by traveling to remote sites); (c) the program is offered at the graduate level (thereby alleviating the need to provide a much greater number of undergraduate courses through distance education); and (d) the program targets a niche market where there is documented need and demand. Approvals to offer the master's in technology education were granted by the department chair, the dean, the office of distance education, the institution's committee on graduate education, and the state's commission on higher education. Shortly afterward, the department's other master's degree in what is now called career and technical education went successfully through an identical approval process.

Course Development

Faculty received assistance from instructional technologists, the department's director of online education, and each other as they engaged in a thorough analysis of existing instructional design and material, modifying it to take better advantage of online delivery. Accreditation standards (The Higher Learning Commission, 2003) and best practices for online education (Innovations in Distance Education, 1998; The Institute for Higher Education Policy, 2000) were used as a guide to both develop and assess each course as well as the program as a whole.

In order to facilitate the transition from face-to-face to online presentation, the plan called for each previous instructor of record to be the first offered the opportunity to teach the new online course version. In addition, each instructor would receive a $1500 stipend for initial online implementation, plus $50 for each student over the minimum section enrollment of six (during each offering). Further, numerous workshops would be offered to assist faculty in becoming proficient online educators. For each of the 14 courses to be transitioned to online delivery, $3000 per course would be allotted in support of course development. Finally, each online course would be reviewed by others according to a department protocol.

A number of marketing initiatives were executed to market the new online program. These included Website development, brochures, magazine advertisements,

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advertisement on association Websites, presentations about the online programs, direct mailings to teachers in the state, promotional items, and contact with associations and state specialists in technical education and career and technical education. In addition, faculty presentations and publications on related issues, though not intended as marketing initiatives, were found to be somewhat effective in marketing the new programs.

Program Logistics

Both the online technology education program and the online career and technical education program require 30 graduate hours of coursework, with an optional thesis that is rarely selected. There is a core of classes offered from the department, including a research class, and there is a professional education requirement from outside the department (which may also be taken online), along with electives. Two of the courses are "laboratory" courses that make use of the student's remote setting. Students can transfer in up to nine hours, subject to approval by an advisor assigned from among the graduate faculty. While the applicant must have an earned bachelor's from an accredited institution with a grade point average above a specified minimum, unlike some other programs in these fields there is no requirement as to the area of an applicant's bachelor's degree nor is the applicant required to possess a teaching license. Neither program uses a cohort approach, so students may take the online courses in various orders. This provides greater flexibility, though it does not provide the advantages of greater peer bonding seen in cohort groups. The technology education courses are offered at least once a year, while core courses in the career and technical education degree are offered on a two-year cycle Each program's courses take place during 15-week fall or spring semesters, or shorter summer sessions.

Impact on Enrollment

This transition to online education had broad impact within the university, such as faculty reports of improved course quality due to detailed course review and increased levels of collaboration among faculty who were working to overcome similar problems in the development and delivery of online

education. Of special note is the impact this transition had on enrollment.

In April 2005, course enrollment data was obtained from one of the institution's enrollment databases for all course sections and compared to enrollment data obtained from prior years' databases. In addition, program enrollment figures were obtained, by program, for the fall and spring semesters and added to data compiled from previous years and obtained in the same way. These program enrollment figures were "headcounts" and included only students who were both majoring in a program and taking at least one class in that semester.

In order to determine the trends in program enrollment, a polynomial trend line was fitted to program headcount data from spring 2002 (the semester prior to going online) through spring 2005, as follows:

$$y = b + c_1 x + c_2 x^2 + c_3 x^3 + c_4 x^4 + c_5 x^5 + c_6 x^6$$

so as to maximize R^2, where

$$R^2 = 1 - \frac{SSE}{SST}$$

$$SSE = \sum \left(Y_i - \hat{Y}_i \right)^2$$

$$SST = \left(\sum Y_i^2 \right) - \frac{\left(\sum Y_i \right)^2}{n}$$

Where
x = Time Period
y = Enrollment
R= Multiple Correlation Coefficient
SST = Total Sum of Squares
SSE = Sum of Squares Due to Error
Y = Observed Value for Enrollment
□ = Predicted Value for Enrollment
n = Number of Observation Periods

These trend lines were extrapolated to six future periods (i.e., fall and spring semesters). However, with so many factors influencing future enrollment, such as emerging competition, faculty size, or growing word-of-mouth marketing, the resulting

trend extrapolation is intended to serve only as a rough indication of what may happen in the upcoming semesters.

Additional information was furnished by an anonymous survey of majors in the TE and CTE programs in April 2005, according to an approved human subjects protection protocol. Twenty-eight responses (42%) were received from a pool of 66 students.

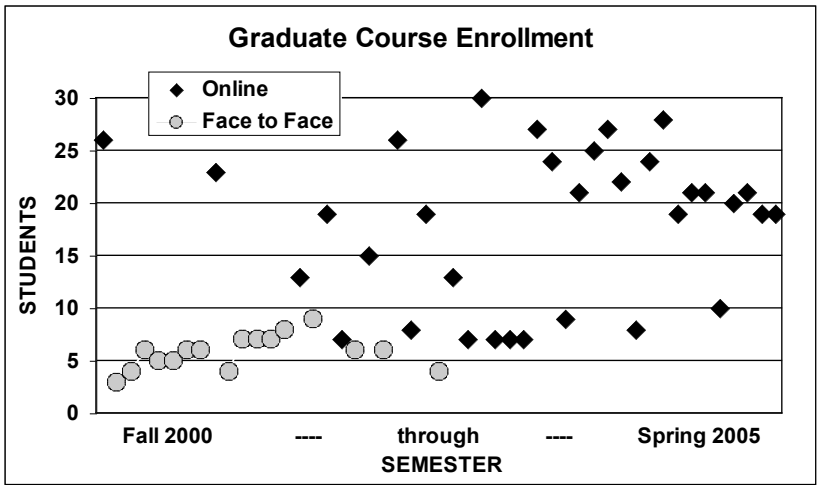
Results and Discussion

Implications for Enrollment

Placing technology education and career and technical education master's degrees online has resulted in a dramatic increase in course and program enrollment. Thirty-three online graduate course sections have been offered from fall 2000 through spring 2005, with an average enrollment of 17.9 students per course. Considering that the program committee set the maximum enrollment at 20 students for a graduate class section, this change is notable. In comparison, during this time there were 16 face-to-face graduate classes offered (and being phased out), with an average enrollment of 5.8 students per course, a low number in light of the minimum set at 6 for a graduate class section. As seen in Figure 1, face-to-face enrollment had dwindled, with the new online offerings typically attracting much larger numbers.

Program headcounts for the master of arts in technology education showed a marked increase in the fall 2002 period, when the programs began to be delivered online (see Figure 2). The master of arts in career and technical education went online one semester later than did the master of arts in technology education, yet that is not believed to be responsible for the difference in their headcount trends. The master of arts in CTE began with a much lower on-campus enrollment, and therefore little name recognition for the program. It originally had only one core professor, the core courses were offered on a two-year rotation (rather than a one-year cycle as in the master of arts in TE), and there was typically only one core course offered per semester. Furthermore, in the institution's state, as in and some other states, technology education teachers must have a bachelor's degree, but career and technical education teachers are

Figure 1
Enrollment for Each Graduate Course from Fall 2000 through Spring 2005

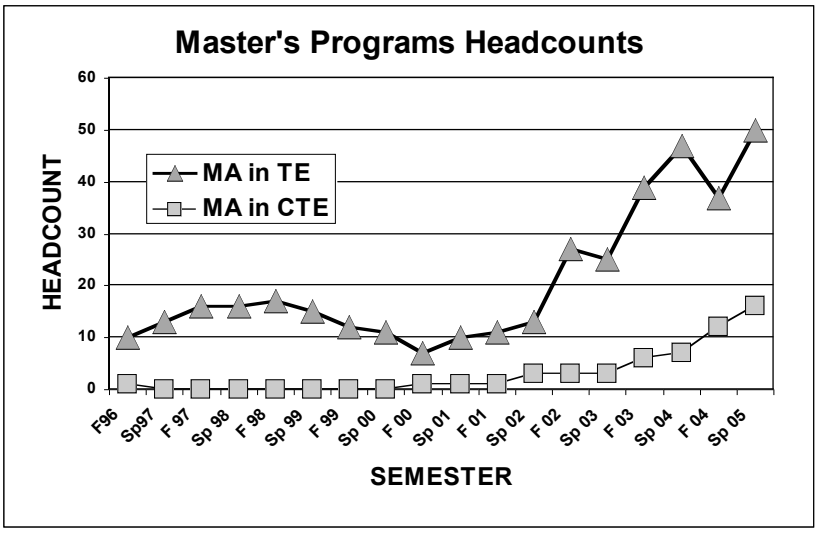


often licensed without having earned a bachelor's degree, limiting the number of potential students who were eligible for admissions into the CTE master's program.

Although the headcount is greater in TE than in CTE, the two trend lines, as shown in Figure 3, are cupped in opposite directions indicating a leveling off of headcounts for TE possibly far sooner than for CTE. Polynomial curves were fitted to the headcount data from spring 2002 (just prior to online program implementation in May 2002) to spring 2005, and then extrapolated three years into the future. However, there are many factors that influence future enrollment, so the purpose of trend line extrapolation here was not to predict what would happen if no intervening actions were taken as much as to point toward potentials that could influence program planning and enrollment management.

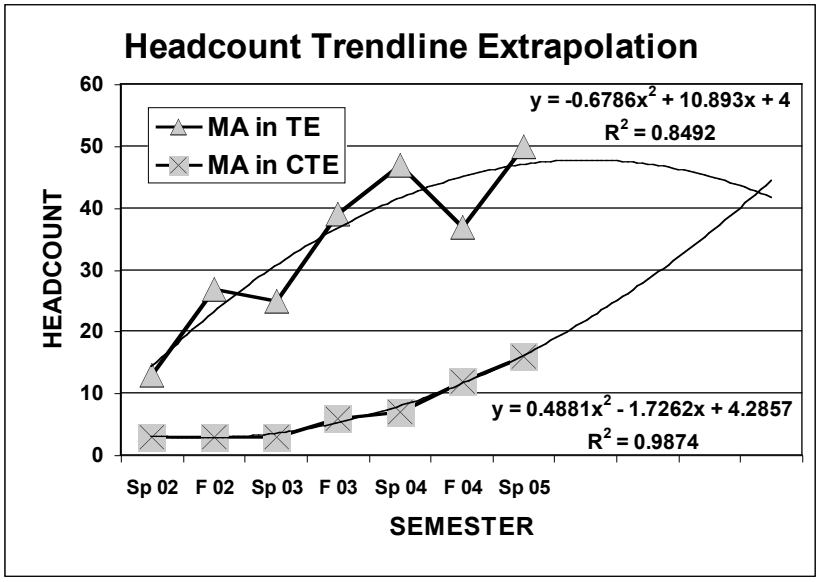
In the case of the master-of-arts-in-technology-education headcount curve, the trend line predicts a leveling off and downturn within the upcoming year. Since this program was

Figure 2
Program Headcounts for the MA in Technology Education and the MA in Career and Technical Education for Spring and Fall Semesters



among the first of its kind to be offered online, it has enjoyed initial market advantage that may soon give way to increased offerings by competitors. There may also be the natural release of accumulated demand, as those who might have waited many years to enroll in an online program have now gotten the chance to do so. Furthermore, the course enrollment data in Figure 1, which shows many courses now near their maximum enrollment level, indicates that unless there is an increase in the number of sections offered, the program may have nearly reached its enrollment capacity. The charge to program faculty is to sustain the TE enrollment, and ensure that it levels off at a manageable and sustainable number rather than declines, as predicted in the forecast shown in Figure 3. Action to sustain this enrollment may have implications for faculty size, faculty assignment, class size, course cycles, and number of course offerings, with resulting repercussions on program quality.

Figure 3
Extrapolating Trends in Program Headcounts



In the case of the master of arts in CTE, the headcount curve, as shown in Figure 3, is at a lower position, but unlike the TE curve it is still rising rapidly and is projected to continue to rise. However, with fewer faculty and fewer offerings per semester and with current CTE courses running at or over maximum enrollment, the implication for this program is that additional faculty and section offerings are needed if actual growth is to reach predicted growth.

There have been other important consequences for enrollment due to the programs' transition to online delivery. Among these is a change in the nature of the students who enroll in the program. Prior to going online, it was common for small graduate classes of about six students to be made up of two groups: in-state, part-time students who held full-time teaching positions within local schools and full-time, on-campus students, mostly from this state or region. After going online, the graduate

classes are commonly much larger and have much greater geographic diversity. In addition to the benefits of diversity that accompany classes with students from different places, the online students have an added benefit due to the fact that they are typically working as full time teachers in their own schools; this facilitates timely application of what they are currently learning in their online classes, an advantage not shared by full-time, on-campus graduate students. Geographic freedom, which, along with the convenience of time flexibility, has been mentioned as the most appealing aspects of online education (Flowers, 2001), has allowed students to enroll in classes in which they would otherwise not have been able. This was the case with a student who attended online classes while in Kosovo on a military deployment. This case and other reports from students indicate that the choice is often not between online education and face-to-face education. Rather, the choice for some is between online education and no education.

Discussions among faculty have indicated that the greater number of students per class coupled with their experiences in a greater variety of settings and with greater cultural and individual diversity has had a positive impact on the quality of education, since fellow students can play so integral a part in graduate education. For example, students in a course on curriculum development have shared examples and ideas with others in the class who are teaching under very different systems in different states in the US. The questions and frustrations of one teacher have sometimes been answered by solutions noted by another and, more than just sharing an idea from a reading, the student offering the suggestion often does so from the experiences of their own teaching situation and their state's curriculum framework. Thus, an insider's view is afforded to each student in the class from the many states represented by the students. This insider's view extends beyond curricular issues to student management, cultural appreciation, resources, and many other areas.

Lessons Learned

Fitting the Mission

Early in the proposal phase, it was realized that in order to gain institutional support, it would be necessary for the proposed online program to fit the mission of the institution, and, more specifically, the institution's strategic plan for distance education. This required that the online program serve the needs of the state residents and also serve a population that would not be served by an on-campus program. While the needs assessment revealed a pool of potential students for the online technology education master's program, the state in which the program was proposed does not require teachers to eventually earn a master's degree. Yet conversations with other states' departments of education uncovered that teachers in at least fifteen other states are required to do so. Therefore out-of-state residents were among the pool of candidates for enrollment in the new online program. Though not state residents, these candidates were likely those who would not be served by an on-campus program at this institution. Thus a re-thinking of the nature of the institution was needed to justify a course that would extend its reach beyond state boundaries.

On a smaller scale, numerous offices at this institution have gradually adjusted their protocols to adapt them to the conditions of distance education. For example, the international student application typically asks students to guarantee that they can pay tuition, room, and board. Seeing that there was now a need to allow international students to be admitted to distance programs, an alternative application form was created that did not require room and board funds for these applicants. So while a proposed program should fit the institution's current mission and goals, it may be necessary for many institutions to adapt in order to embrace distance education as an essential component.

During the transition to online delivery, the current programs were placed online without changing official program requirements or course descriptions. However, it was soon realized that the students enrolling in these programs were different from those who previously enrolled in on-campus courses. For example, class discussions of licensing requirements, which previously had revolved around just one state, now

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expanded greatly in scope. Due to the different characteristics of online and traditional students, it is recommended that programs be redesigned as they are adapted to online delivery to best address the needs of the new population.

Faculty Support

Early discussions with faculty in other online programs indicated resentment when some were forced to teach online. Ideally, the faculty would be willing and eager participants in the decision to go online. Only faculty who are truly excited about teaching online should be asked to do so. Ndahi (1999) has identified barriers to the use of distance learning technology by industrial and technical teacher education faculty, and there is much that could be done to assist faculty in both technical and pedagogical areas. However, assigning a faculty member who does not want to teach online to an online course may diminish both program quality and faculty morale.

Faculty need time to develop and deliver quality online offerings (Lorenzetti, 2003). A variety of financial support options were available to faculty in these programs. Of these, the increased time requirements were found to be best met when a faculty member received both a course reduction during planning, and another course reduction during initial online implementation, as compared to receiving a stipend and no course reduction.

Many issues arose that required attention early in the planning phase and throughout delivery of the program. These included contacts with other offices in the institution, hardware and software support, help with online pedagogy, and marketing. Early in the decision process, planners created the position of director of online education whose duties included dealing with these issues. This freed the faculty to concentrate on course-related issues, and provided both them and the students with a primary contact for support. Those considering a similar move should also recognize that although faculty contracts may typically extend nine or ten months, the need for this support is ongoing and year round.

Initially faculty tended to focus on the software tools needed to teach online. While these tools were found to be quite

valuable, for some faculty the emphasis on software evolved into the need to re-think their instructional practices. Online education works differently than much face-to-face instruction. Instructors should be helped to craft new learning experiences that take the best advantage of the online environment and dissuaded from translating a previous lesson or activity from face-to-face to online delivery without regard for its appropriateness in this new environment (Flowers, 2005).

Another result of the move to online education was the new opportunity for research for many faculty members. Faculty interest in online education research may translate into course and program improvements and increase program recognition while informing the field in an area ripe for research.

Attracting and Retaining Students

As noted, a variety of marketing initiatives were piloted to inform potential applicants of the new online program. Recently, 28 majors in the program were asked how they had gained information about the program. Topping their list was the program Website and word of mouth. When it was discovered that some of the marketing had been unsuccessful, for example, that magazine advertisements were not attracting many students, funds were re-allocated. Many contacts were made through professional associations (International Technology Education Association, the Association of Career and Technical Education, and related state associations.) However, on that same survey of majors, 9 of the 28 respondents indicated that they did not belong to any of these associations. Marketing efforts have not yet identified a good vehicle for reaching potential students who are not members of professional associations.

Prior to applying for admission, potential online students should be helped to determine if online education is appropriate for them. Students who then make the decision to enroll should also be counseled on how to get the most out of online learning. An online degree program may not be the best choice for every program or every context, and some individuals might not be good candidates for success in an online program (Dupin-Bryant, 2004).

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It can be easy to confuse learner difficulties with poor program usability and other barriers that make a program less accessible to students, such as those noted by Zirkle (2002). To address these factors and to assure program quality, assessment is important (Sinn, 2004). A rigorous review process based on best practices and standards should be developed that looks at areas that might enhance the program, such as developing more powerful tools of communication that foster student-student communications in online classes. This may lead to a more user-friendly or learner-centered approach.

Conclusions

Online education offers a new dimension to industrial and technical teacher education and has been shown to greatly increase graduate program enrollment in the institution where this study took place. However, the current opportunity for traditional non-profit higher education institutions to reap the benefits of these programs is not guaranteed to continue, especially with the increasing market share won by for-profit institutions, which "account for about 8 percent of the 20 million students enrolled at the 6,000 American colleges that are eligible for federal aid… [and] more than one-third of online enrollments" (Blumenstyk, 2005, A11). Additional research is needed on the impact of this trend, but in the meantime those considering online offerings should not hesitate to begin a planning process. The results may be both increased enrollments and program evolution.

Another relevant trend in technology education concerns scholarly activity in the field. Petrina's 1998 look back on research in technology education led him to conclude that "those who have done research on research in technology education, or on the episteme of this profession, have described it as a malfunctioning process" (p. 28). More recently, Reed (2002) notes, "The steady decline in graduate research after the name change from industrial arts to technology education (1985-2000)" (p. 68), and cites "fewer graduate programs requiring research" or "fewer graduate students pursuing advanced degrees" as likely causes. The master's degrees mentioned in the present article do include a required research course, but a thesis is optional. Since many

are drawn to online education because of convenience and flexibility, it is not surprising that during the time of this study there were no graduates of either the TE or the CTE online programs who selected the thesis option. Thus, it seems reasonable to conclude that an online master's degree that is more convenient and does not include a required thesis may contribute to the problem of a decrease in scholarly work in the field. Yet this compares the option of pursuing such an online master's degree as opposed to pursing a face-to-face degree with a required thesis, and for many in this program that is not a valid comparison. A number of students have commented that their choice was between an online degree or no degree. Thus, a program of study that includes elements of research may sow the seeds to encourage increased scholarship in the field, even though no thesis is required. Still, it is recommended that those considering placing graduate degrees online consider redesigning their programs so as to encourage students to engage in original research.

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