Does Online Learning Deliver? A Comparison of Student Teacher Outcomes from Candidates in Face-to-Face and Online Program Pathways

Dawn Mollenkopf
University of Nebraska at Kearney
mollenkopfdl@unk.edu

Phu Vu
University of Nebraska at Kearney
vuph@unk.edu

Sherry Crow
University of Nebraska at Kearney
crowsr@unk.edu

Chilene Black
University of Nebraska at Kearney
blackc@unk.edu

Abstract

Although a growing number of students are accessing online learning programs, there are concerns about the quality of these programs. Multiple reports examined online program quality, but many of those studies had methodology and design issues that make it difficult to interpret the findings conclusively. This study attempted to address the methodological concerns by comparing the learning outcomes of college students enrolled in an online early childhood teacher education program pathway with students enrolled in a parallel face-to-face early childhood teacher education program pathway. The study examined the extent to which: (a) content knowledge from an earlier required applied instructional technology course would be retained at the student teaching level, and (b) a significant difference would be found in the learning performance outcomes of student teachers based on program pathway. Student teaching data analyzed over a three-year period indicate that student teachers met expectations in their technology use and in their overall lesson planning and teaching, and that there was no significant difference in student performance in the online program pathway when compared to student performance in the face-to-face program pathway.

Introduction

Online learning is popular with students, and is gaining popularity as its potential contributions to social and economic development are recognized (Allen & Seaman, 2016; Jaggars & Xu, 2016; Vu & Fadde, 2014; Wladis, Conway, & Hachey, 2016). A year-to-year 3.9% increase in the number of online students (Allen & Seaman, 2016) is evidence of the rise of online learning. However the 2016 closure of ITT Tech Institute, one of the largest online learning providers in the US, along with the massive open online courses (MOOC) falling on the trough of disillusionment of the Garner Hype Cycle blasted the public's confidence in online learning programs. Lingering concerns about the quality of online learning programs are also echoed in chief academic leaders' stances on online learning programs on their campuses as reported in the 2016 Online Report Card – Tracking Online Education in the United States. Accordingly, the percent of chief academic leaders who indicated

online learning was critical to their long-term strategy fell from 70.8% last year (2014) to 63.3% this year (2015). The proportion of those who rated the learning outcomes in online education as the same or superior to those in face-to-face instruction was now at 71.4%.

Although there have been thousands of reports on the quality of online learning programs, both qualitative and quantitative, critics have argued that most of the reports do not provide a concrete and reliable comparison between online learning programs and face-to-face ones. For example, among many important conclusions in their meta- analysis with 200 studies comparing the differences between online and face-to-face classes, Bernard et al. (2004) indicated that most of those studies had some flaws in research methodology and design. In the same vein, Means et al. (2010) raised their concern about the methodology and design of studies that compare online and face-to-face classes. Two years later, Bowen, Chingos, Lack and Nygren (2012) reached the same conclusion:

There have been literally thousands of studies of "online learning," but unfortunately the great majority is deficient in one way or another—often for reasons beyond the control of the principal investigators. Very few look directly at the teaching of large introductory courses in basic fields at major public universities, where the great majority of undergraduate students pursue either associate or baccalaureate degrees. (p. 9)

These researchers joined the call for more research with better design, analysis, and reporting, arguing that an apple should be compared with another apple (rather than with an orange) on the same tree to be able to tell the difference between the two apples. To that end, this study attempted to find the answer to this heated question by comparing the learning outcomes of college students enrolled in an online early childhood teacher education program pathway with students enrolled in a face-to-face early childhood teacher education program pathway taught by the same instructors at a Midwestern midsize university over the course of three consecutive academic years. Specifically, the study sought to answer the following questions.

1.   Can an online hands-on course be delivered as effectively as a face-to-face course?
2.   Is there any significant difference in the overall learning performances between students in the online early childhood program pathway and their counterparts in the face-to-face early childhood program pathway?

Literature Review

Decades of research on the quality of online learning has yielded mixed results, which has led to confusion among educational administrators, educators and students as to the efficacy of education in this format. Given the vast number of studies with diverse findings, along with the ever-changing nature of technology in general and online learning field in particular, we examined the two sides of the online studies coin reported in recent years within the scope of this study.

Cases against online learning

According to the result of the Survey of Online Learning, an annual report about tracking online education in the United States by Babson Survey Research Group, there have been consistent lingering concerns of faculty about online learning. Its most recent 2016 report revealed that only 29.1% of academic leaders thought that their faculty accepted the "value and legitimacy of online education". Faculty valued face-to-face interaction with students, the kind of engagement that had been a long-standing and prized tradition at their institution. In line with that finding, Bowen, Chingos, Lack and Nygren (2012) observed that there were concerns among educators that some kinds of online learning were low quality and that online learning in general de-personalized education. Faculty's concerns about online learning can be summarized by what Edmunson (2012),

a professor of English expressed:

Online education is a one-size-fits-all endeavor. It tends to be a monologue and not a real dialogue. The Internet teacher, even one who responds to students via e-mail, can never have the immediacy of contact that the teacher on the scene can, with his sensitivity to unspoken moods and enthusiasms. This is particularly true of online courses for which the lectures are already filmed and in the can. It doesn't matter who is sitting out there on the Internet watching; the course is what it is. (p. A 23)

Another concern regarding online learning is that hands-on activities are difficult to implement in the virtual learning setting (Lombardi, Hicks, Thompson, & Marbach-Ad, 2014; Book, 2014). Traditionally, in courses involving hands-on activities or lab sessions, students are able to observe instructors' demonstrations, and in turn, the instructor can monitor and review their work. The opinion is that online learning could hardly offer students that authentic experience, especially in clinical practice. McCutcheon, Lohan, Traynor and Martin (2015) explained that one of the fundamental components of the undergraduate nursing curriculum under study was clinical practice, with emphasis placed on the importance of the practitioner developing clinical skills and competence in the authentic environment. The traditional teaching of those skills had historically consisted of a "face to face" lecture followed by a practical demonstration; students were then given the opportunity to practice those skills in the classroom environment under the instructors' supervision.

Not only have faculty been skeptical of the quality of online learning, American public perception about online learning has been found to be negative. According to the result of a Gallop poll (2013) about American public perception regarding online education, Americans tend to think online learning provides less rigorous testing and grading, and utilizes less qualified instructors than face-to-face learning. In addition, the perception is that the former has less credence with employers than the latter. Another survey from Public Agenda, a nonprofit organization, also supports this conclusion. Its survey of 656 human resources professionals revealed that although nearly half of employers said online learning required more discipline, fifty-six percent said they still preferred applicants with traditional degrees from an average university over those with an online degree from a top university.

While perception-based survey studies reporting concerns about the quality of online learning were numerous, results on this topic based on data from students' experiences and performances were rare. A study by Xu and Jeggars (2012) was among the very few investigating the academic outcomes of the students in online learning compared with face-to-face learning. The researchers compared the academic outcomes, specifically the students' withdrawal and completion rate, in online, hybrid, and face-to-face courses over five years among learners who enrolled in Washington State community and technical colleges in the fall of 2004. The results showed that students were more likely to fail or withdraw from online courses than from face-to-face ones. In addition, students who took online coursework in early terms were also slightly, but significantly less likely, to return to school in subsequent terms. Finally, students who took a higher proportion of credits online were slightly, but significantly less likely, to attain an educational award or transfer to a four-year institution.

Another study that focused on comparing students' academic performances in online learning and face-to-face learning, but specifically on learning outcomes, is an experimental design study conducted by Couch, Harmon, and Alpert (2014) with students who took a course about the principles of economics. The researchers found that participants in the control face-to-face learning group achieved higher exam scores at a statistically significant level than their peers in the treatment group, pure online learning. Students who were randomly assigned to the face-to-face learning control group met with an instructor once in a lecture session and once in a discussion session while students who were assigned to the treatment group, pure online learning, viewed online lectures as their course instruction and had access to extensive online materials developed to be consistent with

a set of external standards for best practices in online learning. According to the authors, as higher education moves forward into the online learning arena, more instructional resources should be directed toward online, relative to traditional instruction, if equivalence of learning outcomes is the goal.

Cases against online learning

Given its well-recognized benefits, such as learning flexibility anytime and anywhere learning and cost saving for both the educational institutions and learners (Allen & Seaman, 2016; Cowen & Tabarrok, 2014; Dell, Low & Wilker, 2010; Deming, Goldin, Katz & Yuchtmen, 2015; Vu & Fadde, 2013), studies comparing students' learning outcomes in online learning with face-to-face learning have been arguably positive for the former. In this regard, studies reporting the positive results of online learning outnumbered those reporting the concerns of faculty about the quality of online learning and its negative effect on students' academic performance. There have been so many studies on this topic that meta-analysis researchers have identified and gathered hundreds or even thousands of empirical studies to analyze the data. For instance, Means, Toyama, Murphy, Bakia and Jones (2010) collected more than a thousand empirical studies of online learning published from 1996 through July 2008 for their meta-analysis. The researchers selected and analyzed 45 studies that met their analysis standards including rigorous research design, comparing online learning with the traditional format, quantitatively measuring student learning outcomes, and providing enough information to calculate an effect size. They found that, on average, learners in online learning conditions performed modestly better than their peers who were in face-to-face instruction. Five year later, another meta- analysis report by McCutcheon, Lohan, Traynor and Martin (2015) was released. Data included in this study were reported from 1995 to August 2013. While Means, Toyama, Murphy, Bakia and Jones investigated the cross-disciplinary outcomes at different levels, McCutcheon, Lohan, Traynor and Martin specifically examined the effectiveness of teaching clinical skills in undergraduate nursing. Out of 197 published reports about nursing program-related students' performances in online learning, the researchers identified only 19 studies eligible for their meta-analysis. Their results suggested that online e-learning for teaching clinical skills is no less effective than face-to-face learning.

In summary, numerous studies have attempted to examine the impact of online learning on students' academic performance with mixed results. Generally, the case for online learning has dominated the literature. However, concerns about research methodology and design in many of the earlier studies calls for more rigorous research on this topic in order to answer the question of the quality of online learning in general, and specifically, whether or not courses with hands-on activities can be taught as effectively in the virtual environment as in the face-to-face setting.

Online and Face-to-Face Program Description
The researchers chose to examine an early childhood teacher education program because the program is rigorous to meet accreditation standards for the Council for Accreditation of Education Programs (CAEP) and its online and face-to-face pathways have been designed to be equivalent on a variety of factors, which allowed greater control of program variables. These include: admission to the university, registration and course completion, admission to Teacher Education, program-specific curriculum with related field experiences, and student teaching. As far as the admission process, all students, regardless of program pathway, enroll at the university through an online application process and are offered the option of visiting the campus. At the time of enrollment, students select whether they will be in the online or the campus program pathway. However, unlike some online university program pathways, this does not take them to a separate portal but is, instead, used to make sure that they are assigned to the advisor for the online program pathway. The campus students are assigned to one of two advisors for the face-to-face program pathway. All three advisors are housed in teacher education and regularly collaborate on student advising and program issues for both program pathways.

Once students are admitted, they receive advising on courses for the incoming semester and are assisted with the registration process. Courses are broken down into the following categories: general studies, professional sequence, program-specific courses, field experiences, and student teaching. Online courses in each of these categories are offered on the same schedule, require the same prerequisites, use the same syllabus, require the same readings and assignments, use the same grading procedures, and are taught by the same instructors as the face to face courses. All students may access the 24-hour technology help desk for technology-related issues to courses and online courses have a link to tutorials students can access to become familiar with the online course environment.

 Online courses also undergo a rigorous course development process at the university. Prior to designing any online course, a faculty member must complete a university-provided training on online course development and delivery. To be allowed to design a course, the faculty member submits a request for the course and provides a syllabus. Once the course is approved the faculty develops the course, using assistance as needed, from the instructional designer in technology assigned to their college. When the faculty member believes that course development is complete, the faculty member then requests to have the instructional designer evaluate the course. The instruction designer uses a three-page checklist to analyze features of the course and ensure a minimum standard of program quality. If there are any deficits, the faculty member must fix these before the course is approved. The faculty member developing the course is generally the one teaching the course so that there is cohesion between development and delivery.

The quality of the course development and delivery, however, does not guarantee student success. Students need to have the skills to manage their time, learn the material, and successfully pass the course. Online environments only add to the challenges of course completion. Students who don't do well in individual courses are likely to drop out of a program. Therefore, the university provides supports for students to improve study and time management skills, receive tutors for difficult course materials so they can pass their classes, and improve their writing and math skills. Some student may also have personal or life issues that affect course completion during a specific semester and may need a counsellor. All of these student supports are available to both online and face-to-face students through its Student Support center. Online tutors, success coaches, or counsellors meet with individual students through Skype, Face Time, by phone, or whatever works best for that student.

As mentioned earlier, online program-specific courses are offered on the same schedule, require the same prerequisites, use the same syllabus, require the same readings and assignments, use the same grading procedures, and are taught by the same instructors as face-to-face courses. Instructors ensure all students are placed in appropriate field placements. Face-to-face students are assigned placements near the university and online students are assigned placements in their geographic locale. Both online and face-to-face students may use one field experience placement in their place of employment if they work in an early childhood program or elementary school. The remaining field experience placements are intentionally assigned to multiple types of programs to meet state guidelines for diverse field placements.

Both online and face-to-face program pathways also use the same types of placements: center-based infant/toddler and preschool programs such as those in Head Start, state-funded center-based infant/toddler and preschool programs such as those for children with disabilities or multiple risk factors (e.g. low-income families), and elementary schools. Cooperating teachers must have an early childhood degree appropriate with their position and university supervisors must have a Master's in early childhood education, teaching certification in early childhood education, and a minimum of two-year's teaching experience. Faculty members who teach the field-based courses supervise all of the face-to-face students and may also supervise online students. Additional university supervisors are assigned to geographic regions of the state and supervise students in their region. All university supervisors and faculty members serving as supervisors have received

university training in supervision and meet periodically to update this training and make revisions as needed to ensure supervision quality.

The culminating experience for students is student teaching. The process is the same for both online and face-to-face students. Students are assigned a 16-week placement in a public school or other state approved early childhood program with a cooperating teacher who has teaching certification in early childhood education and a minimum of two-year's teaching experience. They are also assigned a university supervisor who is a retired teacher in early childhood education. Students complete an orientation to student teaching (this can be online). Cooperating teachers and university supervisors receive training to use the evaluation materials and forms required for assessment of student teachers. Because the university uses a co-teaching model, students get quality teaching experience and constructive feedback right away so that they can refine their skills. Cooperating teachers complete formal mid-term and final evaluations of the student teachers' performance. University supervisors conduct five visits, document their observations, provide feedback, and complete the same mid-term and final formal evaluations of the teachers' performance. Supervisors and cooperating teachers collaborate to provide constructive feedback and guide the student teachers in reflection of their performance, so student teachers can master the competencies needed to be effective teachers. Student teachers also complete the PRAXIS II subject exam for Early Childhood Education, and when they have passed this and their student teaching, are ready to graduate. Students can access study materials and resources for the PRAXIS II subject exam from the Educator Certification office website.

In summary, the online and face-to-face pathways in the early childhood teacher education program have been designed to be rigorous and be equivalent on a variety of factors, including admission to the university, registration and course completion, admission to Teacher Education, program-specific curriculum with related field experiences, and student teaching. This has allowed the researchers greater control of program variables. Variables that cannot be controlled are the characteristics and backgrounds of the students in the two pathways. Many students in the online pathway are in their late 20's to early 40's, married, employed, raising families, and living at a distance from the university while students in the face-to-face pathway are in their early 20's, single, have part-time employment, and live at or near the university. Online students also more likely to attend part-time while face-to-face students are more likely to be full-time. Even with the variables controlled in course development and delivery, students in an online course will not have the exact learning experience as a student sitting in a face-to-face class. Online students will also experience greater flexibility in choosing their field experience hours than face-to-face students who are assigned specific times and days. Also, although the university supervisors for student teaching observe both online and face-to-face students, those assigned for field experiences do not. Therefore, these limitations should be taken into account when considering the data results of this study.

Research Method

The researchers chose to answer the research questions by analyzing existing early childhood teacher education data from the student teaching database housed in a student data management system that prepared reports for CAEP accreditation. The lesson plan assessment was specifically selected because it measured culminating performance that showcased student competencies. It could also serve as a reliable measure of learning quality because it was evaluated by two independent trained evaluators, cooperating teachers and university supervisors, who were not students' instructors in their teacher education program. In addition, students' performances during their student teaching was also one of the indicators for excellence in educator preparation suggested by CAEP.

The lesson plan assessment measures student teacher outcomes on the following indicators: (a) the quality of their lesson plan, (b) how well prepared they were to teach, (c) their ability to link new concepts to previous knowledge, (d) their ability to plan for, and teach to, a diverse range of

learners, (e) their ability to plan for, and incorporate student's cultural backgrounds and interests, (f) the diversity of their resources to help individualize instruction, and (g) their use of technology to enhance instruction. These seven indicators are rated using a 4-point scale, with 0 representing a beginning level, 1, progression, 3 basic, and 4 as proficient. Therefore, the highest score for any individual indicator is four and a student would need to get a score of 3 (basic level) to meet expectations. The highest score possible on a lesson plan is 28. Students must meet a score of 21 (basic level) to meet expectations. Student teaching data are entered each fall and spring semester.

The researchers accessed the student data management system and disaggregated the data to include only the student teachers in the early childhood teacher education program. Since the online pathway did not go into effect until 2010, only data from 2013-2016 were included in the study. The researchers used a second, existing early childhood teacher education database in Excel to identify which students were in the online pathway and which were face-to-face. This resulted in final scores of 123 students (74 face-to-face students and 48 online ones) who graduated from an Early Childhood program at the University between the academic years of 2013 and 2016. The data were then analyzed using a statistical calculation program. Welch's t-test, instead of Student's t-test, was used to find the answers to the research questions because it is more reliable when the two samples have unequal variances and unequal sample sizes.

Findings

Research question 1. Can an online hands-on course be delivered as effectively as a face-to-face course?

The researchers used students' scores on the technology indicator in the lesson plan assessment to find the answer to this question. The highest score possible for this indicator was a 4 (proficient). Students would need to score a 3 (basic) to be rated as meeting expectations. This score was of interest to the researchers because all students would have completed the instructional technology course early in their professional sequence. This was an applied course in which students were involved in practical experience of trying instructional software and programs under the instructors' supervision and support. It is believed that students' technology competences demonstrated in their student teaching could be a reliable and valid measure of the retention of the learning outcomes from this earlier instructional technology course when applied to lesson planning and instruction during student teaching.

Table 1

Comparison of Mean Scores on the Technology Indicator from the Student Teaching Lesson Plan

Group	Face-to-face	Online	
Mean	3.62	3.55	
SD	0.57	0.54	$p = .52$
N	74	48	

The mean scores of both groups exceeded 3, which is the minimum score for meeting expectations. This is a reasonable indicator that student teachers are meeting or exceeding the competencies required for CAEP accreditation in infusing technology into their teaching. Data analysis indicates that although there is a small difference in the mean scores (face-to-face students performed slightly higher than online students); however, this difference is considered to be not statistically significant. In another words, early childhood students in the face-to-face setting (M = 3.62, SD = 0.57) were able to demonstrate the same technology competences as their peers in the online learning setting (M = 3.55, SD = 0.54), $t = 0.64$, $p = .52$. This statistical result suggests that learning from the instructional technology course taken earlier online or face-to-face appears to be retained at a level that allows students to demonstrate technology competencies at the student teaching level

Research Question 2. Is there any significant difference in the overall learning performances between students in the online early childhood program pathway and their counterparts in the face-to-face early childhood program pathway?

Table 2
Comparison of Mean Total Lesson Plan Scores of Student Teachers

Group	Face-to-face	Online	
Mean	24.81	24.00	$p = .67$
SD	2.43	2.36	
N	74	48	

The mean scores of both groups exceeded 21, which is the minimum score for meeting expectations. This is a reasonable indicator that student teachers are meeting or exceeding the competencies required for CAEP accreditation in lesson planning and teaching. Data analysis results indicate that there is no significant difference in the overall learning performances between students in the online early childhood program pathway (M =24.00, SD = 2.36) and their counterparts in the face-to-face early childhood program pathway (M = 24.81, SD = 2.43), $t = .43$, $p = .67$). In other words, students in both online and face-to-face settings experienced the same learning quality in their early childhood teacher education program.

In summary, results of our data analysis indicated that there was no difference in terms of students' learning outcomes at the student teaching level between online and face-to-face pathways. In addition, students who took the hands-on instructional technology course, regardless of pathway, appear to be able to retain this knowledge equally well and apply this knowledge in their lesson planning and teaching during the student experiences.

Discussion

The finding to the first research question indicated that a hands-on course in instructional technology could be effectively offered in the online learning environment and appeared to be as effective as the face-to-face course in helping students retain this information when they infused technology into their lesson plans during student teaching. This finding was in line with previous reports about teaching hands-on course in the online learning environment (Kwang, 2006; McCutcheon, Lohan, Traynor, & Martin, 2015). However, it is also worth noting that while learners in the previous studies were traditional students who may be more comfortable and competent with technology, students in our study were non-traditional students whose technology competences were not their strength. However, after taking the online hands-on course in educational technology, they could catch up with their pathway and be equally effective in technology use during student teaching.

The answer to the second research question helps confirm that learning outcomes in online learning settings can be equivalent to those in face-to face learning settings (McCutcheon, Lohan, Traynor, & Martin, 2015; Means, Toyama, Murphy, Bakia, & Jones, 2010). While most of the results about the quality of online learning in previous research were either in the experimental design or short periods of time, or had issues with research design, which may had some effect on their findings (Anstine & Skidmore, 2005; Bernard et al., 2004; Bowen, Chingos, Lack, & Nygren, 2012; Gratton-Lavoie & Stanley, 2009; Means et al., 2010), our study used data generated from an authentic learning environment over a long period of time (between the academic years 2013 and 2016). Furthermore, the equivalent design of the online and face-to-face pathways helped control program variables that were not well-controlled in other studies.

Some may question why online learning is necessary if this learning format does not result in better learning outcomes for students, particularly if the investment in online learning infrastructure and

human resources will also put higher price tags on higher education institutions, given the fact that many of them are facing budget deficits. In the context of the early childhood program at the University in this study, being able to provide the same learning quality for students in the online learning setting as in the face-to-face setting is considered an advantage of online learning because it solves two issues for them.

The first issue for students in the online early childhood teacher education program is access. All of these students were non-traditional female students, most of whom had full-time jobs and families. They could not attend college on a regular learning schedule designed for traditional students in a face-to-face program. The flexibility of online learning format offered them chances to manage their learning to fit their own schedule. In addition, the online program in this study served a population of learners who were living in remote, rural areas in a Midwest state. Some of these students would have to drive over 200 miles round-trip to attend the nearest four-year college. Those learners could not commute to campus to attend the face-to-face learning program due to the conflict working schedule and long distance, especially in the wintertime. The convenience of online learning format provided them with opportunities to take their learning with them in their geographical locale.

A second issue for students in the online early childhood teacher education program building competencies that will address employment needs. Currently, there is a lack of standardization in educational requirements for early childhood jobs and large variations in the quantity, quality, and types of professional development options for early childhood professionals to obtain the skill levels they need. (Institute of Medicine and National Research Council of the National Academies, 2015). As more people realize the importance of quality educational experiences, those employed in early childhood programs are facing increased levels of state and federal requirements for certification requirements (Jacobson, 2007), forcing many of them to further their education to keep the jobs they have. The advantage of this university's online program is that it covers coursework and field experience across a variety of settings and age groups and builds teacher competencies; thereby, allowing graduates to have greater job security and opportunities for employment in the rural communities many of them live in. In summary, the flexibility and convenience of "anytime and anywhere learning" in a rigorous online program pathway addressed both issues, helped learners achieve the same learning quality that their traditional peers experienced in the face-to-face program pathway.

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