

Online Occupational Education in Community Colleges: Prevalence, Programming, and Connection with Workforce Development Needs

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Abstract

This study examined the current state of online occupational programs in community colleges and explored issues related to institutional, economic, and social indicators that influence (a) the offering of online programs and (b) the programmatic connection to workforce development needs. The study is based on a random sample of 321 institutions in the United States. This project is the first national study categorizing online occupational programs according to the Career Clusters and Career Pathways classification scheme. Although research has shown that most institutions offer online occupational courses, only 47.5% of colleges in the sample offered credit-granting online occupational programs. Additionally, despite research finding that skill-based programs requiring manipulative skill development can be successfully taught online, this study found that few such programs exist. Finally, our research indicated that occupational program development is not driven by statewide economic indicators, such as the state's fastest growing occupations, suggesting a moderate responsiveness to states' workforce development needs.

Keywords: distance education, e-learning, community and technical colleges, workforce development

Introduction

Increasing numbers of students rely on the access and convenience afforded by online education to develop job skills and achieve economic mobility. While online education permeates community colleges, some colleges offer more online programs than others. Some programs, like office systems, are offered widely, while others, like manufacturing technology, are less prevalent. This project sought to understand the possible factors that influence such differences by examining the connection between institutional, economic, and social indicators that influence (a) the prevalence of online occupational programs and (b) the connection of those programs to state workforce development needs.

Literature Review

Online Education in Community Colleges

Two-year colleges quickly became the most dominant providers of online education in response to their community-oriented and student-focused missions (Allen & Seaman, 2003). Ninety-six percent of public community colleges offer one or more online courses (Parsad & Lewis, 2008), and 41% of public community colleges offer entire degrees online (American Association of Community Colleges, 2008). Community colleges that responded to the Instructional Technology Council's annual survey (2008) indicated an 18% increase in online enrollment. Additionally, 67% of survey respondents indicated that they offer non-credit online education courses, up 6% from the previous year. Despite the large number of online courses available, 70% of survey respondents indicated that their college is not keeping pace with students' demand for online courses.

Workforce Development and Social Equality: The Role of the Community College

As the U.S. economy continues to transition, employers need the ability to tap into a workforce with the required skills to meet new demands. Occupational education is continuing to adapt to economic demands, and community colleges play an especially important role in this process. Community colleges are perceived as providing flexible, low-cost, job-specific, and high-quality opportunities for diverse groups of students and have been called upon repeatedly in current economic recovery efforts.

Community colleges have made substantial contributions toward increasing access to education and increasing overall social equality through enhancement of individual opportunity (Cohen & Laanan, 1997). A two-year degree can increase average worker income by 20% to 30% when compared to high school graduates (KnowledgeWorks Foundation, 2002). Ideally, community colleges provide job-specific programs that allow students to enhance their existing job skills or move directly into the workforce. According to a large-scale examination of employment and education data of 144,545 Florida residents, for students from lower income families who also have weaker academic backgrounds, certificates in occupational fields from community colleges provide the most effective opportunity for economic mobility (Jacobson & Mokher, 2009). Further, postsecondary certificates were the only credential to significantly increase earnings for low-performing high school students when compared to those without credentials. Among other degree seekers, strong positive earnings effects were limited to high-performing high school students. Despite the opportunity afforded by occupational certificates, Jacobson and Mokher found that most disadvantaged students took community college courses that were unlikely to affect their earnings, if completed. This finding suggests increasing the availability and promotion of occupational certificate programs as attractive pathways for increasing economic mobility.

Workforce Development through Online Education

A previous national study found that 76.3% of responding community colleges offered occupational courses through technology-enabled distance learning (Johnson, et al., 2003). As community colleges seek to fulfill their missions to contribute to workforce and economic development, online education may contribute to that goal by offering online credit, non-credit, and employer-sponsored programs. Online learning is also becoming an increasingly relevant means of fulfilling the social goal of providing individual educational and economic

opportunities. Online courses provide more convenient access to those who cannot attend face-to-face courses, particularly working adults and single parents (Floyd, 2003; Johnson, et al., 2003). Credit-granting programs and non-credit online programs provide students and employers with both opportunity and flexibility.

Contextual Issues in Online Occupational Education

Using data from a multi-state study from 2000-2002, Cox (2005) found that six interrelated components determined the extent to which institutions offered online courses: (a) administrative commitment, (b) online student support services, (c) the availability of a full-time online coordinator, (d) internal/external financial and technological resources, (e) adequate faculty participation, and (f) online professional development. Cox concluded that the extent of online course offerings depended upon institutions providing relatively basic components in each of these six areas. This study builds on Cox's findings by considering larger contextual issues such as institutional, workforce, and economic factors affecting the offering of online occupational programs. In the last 40 years, higher education in the United States has increasingly focused on outcomes, market concerns, and responsiveness to workforce needs as part of the public investment in education (Education Commission of the States, 1997). In particular, the focus on the economic and workforce development has impacted the way in which community colleges interact with local communities.

Conceptual Framework

In order to consider the structural, cultural, and social factors in a theoretically sound manner, a coherent framework was used to provide a lens for understanding the internal and external influences that help determine the extent to which community colleges offer online occupational programs. Astley and Van de Ven (1983), in their classic metaframework for viewing organizations, explained that organizations can be viewed along two analytical dimensions. The first dimension relates to whether organizations exist and respond to stimuli at the *macro level* (as groups of organizations) or *micro level* (as individual organizations). The second dimension addresses whether organizations possess agency and function in *deterministic* or *voluntaristic* ways. A deterministic orientation reflects the view that behavior is determined through reactions to structures and constraints that control and stabilize the system. A voluntaristic orientation reflects the view that individuals and organizations are "autonomous, proactive, self-directing agents" (Astley & Van de Ven, 1983, p. 247).

Their meta-framework is presented in a four-quadrant model that provides four views of organizations:

- If organizations exist primarily as *individual entities* (micro perspective) functioning *voluntaristically*, then they "are continuously constructed, sustained, and changed by actors' definitions of the situation" (p. 249). In such cases, both the environment and the organization can be changed through political negotiation.
- If organizations exist primarily as *individual entities* (micro perspective) responding in a *deterministic manner*, then "organizational behavior is...shaped by a series of impersonal mechanisms that act as external constraints on the actors" (p. 248). In such a system, change means adapting to external influences in a technical manner at a local level.

- If *total populations* (macro perspective) of organizations are responsive as groups and respond in a *deterministic manner*, then individual organizations either “‘fit’ into a niche or are ‘selected out’ and fail” (p. 250). In such a system, there are limits to the degree of choice that can be exercised when faced with external influences and change occurs at a broad level.
- If organizations *collectively exist* (macro perspective) and *voluntaristically* collaborate, they “mediate the effects of the natural environment” (p. 251). In such cases, negotiation, conflict, and compromise result in organizations having symbiotic relationships and changing each other.

These four perspectives are not mutually exclusive; instead, tensions manifest themselves between the four emphases. Although the metaframework focuses on organizations, Astley and Van de Ven (1983) encourage its use when considering the interactions of individuals and groups within organizations and within populations of organizations. This lens helps to integrate issues related to organization design and workforce/economic factors by considering both internal and external stimuli and by considering the degree of agency that can be exercised by institutions, programs, and individuals.

Because this study is largely exploratory, this framework was used as a broad conceptual lens, as opposed to being used as a tight theoretical framework. As will be seen in our findings and conclusion sections, this conceptual lens helped us consider whether state and local variables, institutional variables, or program-level variables influence whether online programs are offered. For example, institutions in communities with a high unemployment rate might have an increased level of expectation that they should contribute to local economic development compared with institutions in areas with low unemployment. The increased level of expectation might result in increased scrutiny and responsiveness on the part of the institutions. Another example is that certain programs might lend themselves to being taught online. Alternatively, there might be a need to attract more students to certain fields. Online courses could help make certain programs more attractive because of their convenience.

Problem and Purpose

Within studies of distance education at community colleges, occupational programs have often been neglected. No study has systematically inventoried and analyzed the specific content areas of occupational online programs available in community colleges. An earlier study (Johnson, et al., 2003) examined the overall presence of online occupational programs in community colleges and some of the characteristics associated with those programs. However, that study’s analysis was not conducted at the program level. The current project builds on the Johnson et al. study by including program-level characteristics as a unit of analysis.

Another national study (Benson, et al., 2004) compared student outcomes in face-to-face and distance versions of the same courses. The researchers found no significant difference in outcomes associated with the two delivery mediums, which is consistent with findings of studies outside the CTE realm. For example, Fjermestad, Hiltz, and Zhang (2005) analyzed 30 such comparative studies and found that in 86% of cases, online or blended courses had the same or better outcomes when compared with traditional face-to-face courses. Issues surrounding institutional context, policies, and organizational structure are critical in determining the success and sustainability of online learning programs (Arbaugh & Benbunan-Fich, 2005; Vrasidas & Glass, 2002). However, these issues have received less attention in previous research studies

despite the high priority given to such institutional issues by community college practitioners (Instructional Technology Council, 2008).

In this current study, a database was developed using existing data from national, state, and institutional sources. After compiling the database, the data were examined to understand (a) the overall extent to which online occupational programs are offered in community colleges and (b) the institutional, social, and economic characteristics that increase or decrease the likelihood of community colleges offering online occupational programs.

Research Questions

This project is part of larger national project on online occupational education (Githens, Crawford, & Sauer, 2010). The portion of the project reported here addresses the following research questions:

1. What types of occupational programs are offered in an online format?
2. Is there a relationship between a community college's local context (e.g., economic indicators, state and local workforce development needs) and the number and types of online occupational programs offered?

Study Design

Our research questions were answered by compiling a database of online occupational programs and institutional characteristics for a sample of 321 community colleges.

Sampling Strategy

The sampling procedure replicates parts of the procedure used in the Johnson et al. (2003) study. The target population consisted of the 1,081 institutions in the database of the American Association of Community Colleges (AACC; i.e., community colleges, technical institutes, junior colleges). This population consists of single-campus colleges, multi-campus colleges, and colleges that are affiliated with a university. For the sample, 321 institutions were randomly selected to participate in order to achieve a confidence level of 95% and a confidence interval of 4.59. Complete data were available for 301 colleges.

Scope of Study

This study focuses on *online education*, which describes a specific medium through which *distance education* is offered. Distance education is a broader concept that encompasses “all forms of education in which all or most of the teaching is conducted in a different space than the learning, with the effect that all or most of the communication between teachers and learners is through a communications technology” (Moore, 2003, p. xiv). Programs were considered “online” if face-to-face instruction was reduced or eliminated by 50% or more as a result of online communication technologies. In other words, programs that include hybrid courses were included if they incorporate a small amount of on-campus or face-to-face lab work, which is similar to the scope of similar studies (Johnson, et al., 2003; National Center for Education Statistics, 2003).

Included programs were limited to *occupational programs*, as defined and classified in a National Center for Education Statistics (NCES) study (Phelps & Greene, 2001). The NCES study defined an occupational program as “a sequence of courses designed to prepare students

for an occupation (e.g., nurses' aide) that typically requires education below the baccalaureate level" (Phelps & Greene, 2001, p. A-7). The broad categories in that classification scheme were business/marketing occupations, technical/mechanical occupations, building trades, health/life science occupations, and service occupations. Their classification scheme also included more specific subcategories under each broad category.

Instrumentation

This study analyzed the types of online occupational programs offered at community colleges throughout the United States and the relationship program offerings have with institutional, social, and economic variables. Our database was compiled of institutional characteristics, social and economic characteristics of the county where the institution was located, and online occupational program offerings. Data were collected through national and statewide databases, institutional websites, and direct inquiries to community colleges.

The institutional, social, and economic data were gathered from several archival database sources including: AACC, NCES Integrated Postsecondary Education Data System (IPEDS), U.S. Census Bureau, U.S. Bureau of Labor Statistics, and U.S. Bureau of Economic Analysis. Online occupational program data were collected from state/district level virtual campus or online consortium websites, individual institution websites, and telephone/email correspondence with institutional admissions, curriculum, advising, and online learning staff.

After the program data were collected, each program was classified using the Career Clusters and Career Pathways classification scheme, developed by the States' Career Clusters Initiative of the National Career Technical Education Foundation (States' Career Clusters Initiative, 2008). The 16 Career Clusters (e.g., Business, Management, and Administration) offer a broad categorical distinction whereas Career Pathways provide more precise distinctions within individual Career Clusters (e.g., Administrative and Information Support; Human Resources; Management). The process of coding the programs occurred in stages, with the researchers classifying and discussing the appropriate coding approaches in three rounds with a smaller number of programs. After agreement was reached on the appropriate coding approach, one researcher coded the remaining programs. After the entire sample of programs was coded, a second researcher, who was followed by a third researcher, verified the accuracy and appropriateness of the entire coding process. Disagreements regarding coding were reconciled through consensus.

Analysis

Various analyses provided an understanding of the relationship between program offerings and institutional characteristics (e.g., institutional, social, and economic indicators). Table 1 contains the analyses conducted in the study.

Table 1
Analysis Techniques Used in the Study

Analysis Description	Analysis Type	Independent Variable(s)	Dependent Variable(s)
Profile of institutions in sample	Descriptive statistics	n/a	n/a
Online occupational programs classified by Career Pathways and Career Clusters	Descriptive statistics	n/a	n/a
Type of degree offered through online occupational programs	Descriptive statistics	n/a	n/a
Determining whether institutional, social, and economic variables predict the number of institutional programs in the state's five fastest-growing occupations	Forward entry multiple regression	Institutional, social, and economic indicators	Number of online occupational programs per 10,000 students ¹
Determining whether institutional, social, and economic variables predict the number of institutional programs in the state's top 10 occupations with the most projected openings	Forward entry multiple regression	Institutional, social, and economic indicators	Number of online occupational programs

¹Using the number of programs per 10,000 students accounted for differences in enrollment between institutions. For example, one institution has 28 online occupational programs but has less than 1300 total students, whereas another has four programs and nearly 20,000 total students. Although many community colleges do not have 10,000 students, data were normalized to the 10,000-student level in order to increase understandability.

Limitations

There are several limitations that should be considered when interpreting our findings. The number of online programs included in this sample was limited to programs identified by the institution as being “online programs” and as allowing for 50% or more of the program requirements to be fulfilled online. Regarding the first requirement, there were cases in which no official online program was available. However, online courses could be pieced together in such a way as to allow a student to take 50% or more of program requirements online. Such programs were not included in the sample because of (a) the importance of only counting programs that clearly indicated that they were online to potential students and (b) reliability issues related to

piecing together data to determine whether enough online courses existed that would allow a student to take 50% or more of the requirements online. Additionally, we measured the number of online occupational programs rather than the percentage of occupational programs offered online at each institution. An examination of the percentage of total programs offered online would have accounted for differences in total occupational program offerings between institutions. In some ways, such a percentage measure would have been preferable. However, such a measurement would not have accounted for programs that offer specialized online certificates under one program umbrella. Such tracks are sometimes offered only through the online medium or are not promoted as being available face-to-face. Therefore, to increase data reliability, online programs were simply counted rather than considered as a percentage of total programs. In order to account for the variability of institution size, the program variable was normalized by considering the number of online occupational programs per 10,000 students (based on overall headcount). This variable accounted for size differences among colleges.

Another set of methodological concerns relates to the institutional, economic, and social indicators included in the study. Most institutional data are limited to those data included in IPEDS. Although IPEDS is a standard database used by higher education researchers, its reliability can be limited because the data are compiled by hundreds of institutional researchers at various institutions. Next, when using secondary data sources, errors in the aggregation and interpretation of data may occur because the analysts were not involved in the planning or collection of data (Church, 2002). The last concern relates to economic and social indicators. Many of the indicators are based upon the county in which the institution is located. Because rural and suburban community colleges often serve multiple counties and urban community colleges sometimes serve only small portions of counties, these data do not perfectly reflect the communities that these institutions serve.

Findings

First, descriptive statistics profile the sample institutions and the number and types of online occupational programs provided by institutions included in the sample. Second, the analysis includes both descriptive statistics and two regression models that examined the connection between (a) offering online occupational programs in high-demand, high-growth fields and (b) the institutional, social, and economic variables of each college.

Profile of Sample Institutions

Data were available for 301 colleges, of which 47.5% ($n = 143$) offered online occupational programs. The 143 colleges that provide online occupational programs offered 1,201 individual programs with a mean of 8.6 (Mdn = 5, $SD = 10.3$, Range from 1 to 59) online occupational programs per college. Forty-five states were represented in the random sample as well as one independent island nation associated with the United States (Palau). The institutions represent the entire spectrum of the 12 locale types, with the highest frequencies being “rural: fringe” (17.7%), “suburb: large” (14.7%), and “city: small” (14.3%) locales.

The average student enrollment was 7,689 students with the majority of students enrolled part time (58.7%), female (59.7%) and White (64.6%). The overall retention rate for first-year students was considerably higher for full-time students (57.6%) than part-time students (40.8%). The average median age for the county in which the college resides was 36.1, slightly higher than the national median age of 35.3 (U.S. Census Bureau, 2000). Educational attainment for the

areas in which the institutions are located was slightly less than national averages. The percentage of the population with a high school diploma or higher (25 years and older) was 80% compared to the national rate of 80.3%. The percentage of the population with a bachelor's degree or higher (25 years and older) was 22% compared to the national rate of 24.4% (U.S. Census Bureau, 2000).

Programs Types

Of the 301 colleges represented in the sample, 143 (47.5%) offer at least one online occupational program. Those 143 institutions offered 1,201 individual programs ($M = 8.4$ programs per institution). All of the 16 Career Clusters were represented in the sample of online occupational programs (see Appendix A), and the vast majority of institutions with online occupational programs offer at least one program in Business Management and Administration (75.89%). Other common clusters include Information Technology (41.84% of institutions), Health Science (39.72%), Human Services (33.33%), Law, Public Safety, Corrections, and Security (34.75%), and Education and Training (24.82%).

When considering which colleges offer at least one program in particular Career Pathways (a subcategory under Career Clusters), the top five pathways were Management (62.41% of colleges with online programs had at least one program), Business Financial Management and Accounting (36.88%), Administrative and Information Support (35.46%), Information Support and Services (31.21%), and Health Informatics (29.08%). Outside of the business and technology areas, programs in Teaching/Training (24.82%), Early Childhood Development and Services (23.4%), Law Enforcement Services (21.28%), and Therapeutic Services (21.28%) were offered at relatively high numbers of institutions (see Appendix A).

Examining the number of separate programs offered at each institution, the Business, Management and Administration Career Cluster (i.e., broad category) accounted for the most individual programs at all institutions (41.2%). Information Technology (14.8%) and Health Sciences (13.7%) each accounted for about 15% of the programs. In other words, 41.2% of online occupational programs in our national sample were in the Business Management and Administration Career Cluster. Eight percent of programs were classified in the Human Services cluster and an additional 7% were categorized in the Law, Public Safety, Corrections, and Security cluster. The Arts, STEM, Finance, Government and Public Administration, and Transportation, Distribution, and Logistics clusters each represented less than half of one percent of the total program sample ($n = 1,201$; see Appendix A).

Management (19.6%), Administrative and Information Support (10.9%), and Business Financial Management and Accounting (8.7%) were the most common Career Pathways represented among the individual programs offered by the sample of institutions. These three pathways exist within the Business, Management, and Administration Career Cluster. Health Informatics (8.5%) and Information Support and Services (6.9%) round out the top five Career Pathways (see Appendix A).

Degree Type

The majority of the programs in the sample award a certificate or diploma (52.4%). Forty-seven percent of the online occupational programs award an associate's degree. The most common associate's degree was the associate of applied science (27.9%), followed by the associate of science (9.8%) and associate of arts (7.7%). Two percent of the programs award

associate degrees in particular academic areas such as associate of nursing or associate of business. The programs were not disaggregated into distinct certificate and diploma categories because of variation in the definitions and name of the academic awards. Less than 1% of the online programs awarded other credentials such as an achievement award, endorsement, or letter of recognition.

Relationship with Workforce Development Needs

The states' five fastest-growing occupations (2006-2016 estimate) and top 10 occupations with the most projected openings (2006-2016 estimate) were examined to assess the degree to which the colleges' online occupational program offerings matched local workforce and economic demands. Among the sample of community colleges offering online occupational programs ($n = 143$), close to 26% of the colleges offered one or more online programs (mean of .65 offerings per school) in the Career Pathways associated with the state's five fastest-growing occupations. Nearly 39% of the colleges offered one or more online programs (mean of .89 offerings per school) in the Career Pathways associated with the state's top 10 occupations with the most projected openings. Of the entire sample of individual online occupational programs ($n = 1,201$), 7.7% were in the state's five fastest-growing occupations ($n = 93$), and 10.6% were in the state's top 10 occupations with the most projected openings ($n = 127$).

A multiple regression was conducted to determine which of the 20 institutional, social, and economic predictor variables (see Table 3) were significant predictors of the number of online occupational programs offered by a college in the state's five fastest-growing occupations. We used a forward entry selection, in which the first predictor that has an opportunity to enter the equation is the one with the largest correlation with the dependent variable. If this predictor is significant, then the predictor with the largest semipartial correlation with the dependent variable is considered. This process continues until there are no remaining significant predictors (Stevens, 2001). Zero-order correlations revealed that four of the predictor variables were significantly related to the dependent variable (see Table 4). Correlations between the dependent and predictor variables were negligible to low (Franzblau, 1958).

Table 3
Four-Predictor Regression Model Coefficients

Variable	Unstandardized Coefficients		Standardized Coefficients
	<i>B</i>	<i>SE</i>	β
College: Degree of centralization	.249	.086	.230
College: Percent part-time students	.031	.010	.242
College: Percent female students	-.048	.017	-.227
County: Median household income	.000	.000	-.162

Table 4
Significant Zero-Order Correlations Between Dependent and Predictor Variables

Variable	Five Fastest-Growing Occupations
Number of programs in five fastest-growing occupations	--
College: Degree of centralization	.24*
College: Percent of part-time students	.23*
County: Percent high school or higher	-.17*
College: Percent of female students	-.16*
County: Unemployment rate	.15*
College: Full-time student retention rate	.15*
County: Median household income	-.14*

* $p < .05$

The four-predictor model (see Table 3) was statistically significant at the .05 alpha level, $F(4, 135) = 6.81, p = .000$. The forward entry solution (criteria of $p < .05$ to enter variables) resulted in four predictors entering the regression equation: degree of centralization of the statewide community college system, percentage of part-time students, percentage of female students, and median household income. Approximately 14% of the variance in the number of online occupational program offerings in the state’s five fastest-growing occupations was predicted by (a) the degree of centralization, (b) percentage of part-time students, (c) percentage of female students, and (d) median household income. R^2 for the four-predictor model was .168, with an adjusted R^2 of .143. This is considered to be of minimal practical significance (Gall, Gall, & Borg, 2003).

An examination of the individual relationships between the predictor variables and dependent variable revealed that the degree of centralization ($t = 2.89, p = .004$), percentage of part-time students ($t = 3.05, p = .003$), percentage of female students ($t = -2.84, p = .005$) and median household income ($t = -2.04, p = .043$) each significantly predicted the number of online occupational program offerings in the state’s five fastest-growing occupations. The percentage of part-time students was the most important predictor of the number of online occupational program offerings in the state’s five fastest-growing occupations. The standardized β for percentage of part-time students was $\beta = .242$.

A forward entry multiple regression was conducted to determine which of the same 20 institutional, social, and economic predictor variables (see Table 5) were significant predictors of the number of online occupational programs offered by a college in the state’s top 10 occupations with the most projected openings. Results indicated that none of the predictor variables were statistically significant predictors of the number of online occupational programs offered by a college in the state’s top 10 occupations with the most projected openings.

Table 5

Social, Economic, and College Variables Used in Multiple Regression

Predictor Variable
College: Percent part-time students
College: Percent female students (Fall 2007)
College: Percent American Indian/Alaskan students (Fall 2007)
College: Percent Asian/Pacific Islander students (Fall 2007)
College: Percent Black students (Fall 2007)
College: Percent White students (Fall 2007)
College: Percent Hispanic students (Fall 2007)
College: Percent nonresident alien students (Fall 2007)
College: Percent unknown ethnicity students (Fall 2007)
College: Student enrollment
College: Full-time first-time student retention rate
College: Part-time first-time student retention rate
County: Percent high school or higher (25 or older; 2000)
County: Percent Bachelors or higher (25 or older; 2000)
County: Percent in labor force (16 and older; 2000)
County: Median age (2000)
County: Unemployment rate (2007 annual)
County: Median household income (2007)
County: Per capita income average annual growth rate (1996-2006)
State: State economic growth

Conclusions and Implications for Policy and Practice

The evidence from this study has expanded on theoretical and practical knowledge in the CTE field about workforce development needs, institutional issues, and economic conditions affecting online occupational programs. In this section, we interpret our key findings, consider their intersection with the study's theoretical framework, and connect them with policy and practice implications.

Prevalence of Programs

Online occupational programs are much less common than online courses overall. The number of community colleges offering credit-granting online occupational programs (47.5%) is impressive at first glance. However, the percentage of institutions offering online *programs* (i.e., programs in which 50% or more of the courses are offered online and the institutions identifies the program as being "online.") is much lower than the percentage of institutions offering individual online *courses*. Other studies have found that 76.3% of community colleges offer online credit-granting CTE courses (Johnson, et al., 2003), and 96% offer online credit-granting courses of any type (Parsad & Lewis, 2008). Despite that high percentage, past research has found that two-year colleges are less likely than other institutions to offer fully online degrees (Piña, 2008). Because many students seek to take multiple courses online due to scheduling constraints (e.g., Dobbs, Waid, & del Carmen, 2009), their options are severely limited when institutions do not promote cohesive online or hybrid programs rather than simply offering a limited number of online courses. Considering the study's conceptual framework, this finding suggests that institutions are able to support *individual instructors* in creating online courses.

These courses could be (a) responses to the external demand for online courses or (b) reflections of the internal desire to increase accessibility for students. However, it appears that the institutions or departments are not able to support or encourage this innovation at the program level (e.g., through offering entire online programs) to the same degree as they can for individual instructors offering online courses.

The most common online programs are in subjects that are more easily taught online.

Although online occupational programs exist in every Career Cluster, they are concentrated in a few Career Clusters and Career Pathways that lend themselves to online delivery. Subjects requiring development of manipulative skills, labs, or fieldwork require significant resources before quality instruction can occur in an online medium (Bourne, Harris, & Mayadas, 2005; Mars & Ginter, 2007). Within the sample, 43.6% of all online occupational programs were part of the Business Management and Administration and Marketing Career Clusters. When compared to the overall national distribution of students (face-to-face or online), there might be an overemphasis on Business Management and Administration and Marketing because only 22.1% of occupational students seeking a two-year degree or less are enrolled in those fields (Levesque, et al., 2008). By contrast, 13.7% of the online programs in the sample were in the Health Science Career Cluster, whereas 31.7% of students seeking a two-year degree or less are enrolled in a program in health care (Levesque, et al., 2008). These findings should be interpreted with caution because this study did not look at actual enrollment, only at numbers of programs, unlike the study by Levesque et al.

Programs in Business Management and Administration were offered at 75.89% of institutions; Information Technology at 41.84%; Health Science at 39.72%; Human Services at 33.33%; Law, Public Safety, Corrections, and Security at 34.75%; and Education and Training at 24.82%. When looking at the specific Career Pathways within those broad Career Clusters, the focus is on programs that can be more easily taught online. For example, within the Health Science Career Cluster, the most common Career Pathway was Health Informatics rather than clinically focused programs. These findings are similar to Zirkle's (2003) preliminary finding regarding distance education in community colleges being focused around business and information technology. Using individual programs as a level of analysis, it is clear that business programs and others that lend themselves to online delivery have responded as a group to the educational market that desires online programs. However, that same responsiveness has not occurred among skill-based technical programs. This finding provides evidence that institutions are taking a reactive system-structural view, in which individual institutions are heavily influenced by structural constraints. In this case, the institutions could be bound by the difficulties of designing online labwork or field experiences for online students in regions outside of their immediate service area. They might also be bound to having face-to-face labwork due to inadequate resources for purchasing or developing online lab tools.

In an earlier study of exemplary online occupational programs, no meaningful differences were found between online and on-campus sections of the same skill-based course (Benson, et al., 2004). Those courses were part of programs that should have been more difficult to teach online (e.g., an Embalming course within a Funeral Service Education program, Animal Nursing and Medicine Lab within a Veterinary Technology program). However, the current study found no evidence of widespread adoption of online programs in these subject areas or others that are more challenging to deliver online. Because the Benson et al. study dealt with exemplary programs, perhaps those programs included highly committed faculty—early adopters who worked hard to ensure the success of the program. Cox (2005) concluded that institutions need

significant administrative and overhead investments in order for community colleges to facilitate widespread online adoption. High levels of dedication, easily accessible vendor content, or significant support are needed to transform face-to-face skill-based courses into quality online courses. Additionally, arranging for clinical experiences or fieldwork outside the college's traditional service area requires substantial coordination and effort. This level of commitment can be difficult to duplicate when programs spread beyond dedicated early adopters. For institutions that desire to expand their online presence, it is easier to transform more traditional discussion- or lecture-based courses into an online format, as opposed to the more hands-on, skill-based types of occupational programs that require the development of manipulative skills. Institutions, states, and vendors need to provide the resources necessary to develop online occupational programs, especially in high-need areas such as the Health Sciences and Green Technologies (President's Council of Economic Advisers, 2009). The second phase of this project will examine institutions that offer online programs in hands-on, skill-based fields of study in order to understand how institutions have fostered online program development.

Online certificates programs are the most common type of online occupational program. A small majority of online occupational programs in the sample award a certificate or diploma (52.4%), whereas a comparable number offer an associate's degree (47%). Since 1990, certificate programs have declined in popularity. According to 2004 NCES statistics, the vast majority of occupational students seeking two-year degrees or less are working toward an associate's degree (81.5% in 2004, 64.6% in 1990) as opposed to a certificate (18.48% in 2004, 35.3% in 1990; see (Levesque, et al., 2008). Although this shift would seem to suggest that online occupational programs are failing to meet students' needs, a recent study funded by the Gates Foundation (Jacobson & Mokher, 2009) found that students from weaker economic and academic backgrounds are (a) more likely to complete a certificate program than an associate's degree and (b) will receive a larger earnings boost from an occupational certificate than an occupational associate's degree. Considering this important finding, the Jacobson and Mokher study found that institutions are providing some valuable online options for students from less advantaged academic and economic backgrounds. Although possibly controversial, the evidence from Jacobson and Mokher suggests that institutions should consider ways to create more opportunities for enrolling more low-income, lower academically performing students in certificate programs associated with high-demand, high-growth jobs. Such a suggestion should be considered in light of community colleges' goal to increase access and equity (Cohen & Laanan, 1997). Jacobson and Mokher's study provides evidence that, for some students, the best path to social mobility is through certificate programs. However, policymakers and educators need to consider the influence of larger social values and goals before making any decisions regarding such moves.

This issue connects to the study's conceptual framework through considering how colleges can creatively market these certificate programs to counter the popular conception that certificate programs are inferior to associate's or bachelor's degrees. Programs and institutions will need to communicate the real value of these programs. This activity responds to the external evidence (e.g., wages) that certificate programs are valuable for individuals, but seeks to voluntarily innovate and change popular perceptions of what students need.

Connection to Workforce Development Needs

Online occupational programs show modest responsiveness to states' workforce development needs. Among the colleges offering online occupational programs, 26% offered one or more online programs in the Career Pathways associated with the state's five fastest-growing occupations. Among the 143 institutions offering online occupational programs, they offered an average of .65 online programs per college in the state's five fastest-growing occupations. A better indicator of workforce development needs is found in the state's top 10 occupations with the most projected openings. Among institutions offering online programs, 39% offered one or more online programs in the top 10 occupations (overall average of .89 programs per college offering online programs). For the entire sample, 7.7% of online programs were in the state's five fastest-growing occupations and 10.6% were in the state's top 10 occupations with the most projected openings. These findings show that online occupational programs provide some responsiveness to states' needs, which illustrates a connection between the institution and the economies in which they exist.

It is important to note that these indicators are based on statewide data rather than local data, which could have caused the numbers to be relatively low because many states have diverse needs in various regions. One could conclude that individual institutions are responding to local, micro needs rather than operating from a macro perspective in a "one-size-fits-all" approach. Lastly, these indicators included some jobs that could not be attained through an occupational certificate or occupational associate's degree.

Minimal connection between offering online programs in high demand, high growth fields and institutional, social, and economic variables. A decision was made to determine whether there was a connection between the institutional, social, and economic variables and whether colleges offered online programs in the state's top five fastest-growing occupations or in the state's top 10 occupations with the most projected openings. For example, we wanted to understand whether colleges in areas with higher unemployment were more likely to offer online programs in high-demand, high-growth fields. Although there was no connection with the state's top 10 occupations, there were some variables that minimally predicted whether institutions offered programs related to the state's top five fastest-growing occupations. The strongest predictor was the percentage of part-time students in a particular institution. This finding would be logical if it related to the number of online programs offered overall; however, it seems to have little meaningful connection to the number of programs related to the top five fastest-growing occupations. The next most important predictor was the degree of centralization, which seems more logical because centralized state control could lead to more emphasis on responding to emerging statewide workforce development needs. A negative predictive relationship was found for the percentage of female students in the institution, which seems to be of minimal relevance. Last, there was a negative connection between the median household income in an institution's county and the offering of programs in the fastest-growing occupations. These four predictors accounted for 14% of the variance in the number of online occupational programs in the state's five fastest-growing occupations. This is considered to be of minimal practical significance.

The overall finding from this regression model is that there is minimal connection between (a) the offering of online programs in high-demand, high-growth areas and (b) these specific institutional, social, and economic variables. For example, it does not appear that institutions in counties with high unemployment are any more likely to offer online programs in high-growth occupations than institutions in counties with low unemployment. This finding could result in a

rejection of the deterministic orientation at the institutional level (e.g., individual institutions respond to their environment in an automatic, mechanistic manner). Instead, it suggests that institutions' responsiveness to economic development needs could be based upon proactive voluntaristic, stakeholder-specific tendencies in which actors work to mediate and shape the effects of the economy. For example, internal institutional stakeholders and their characteristics are likely the forces shaping how the institutions respond to economic development needs.

Relevance to Policy, Practice, and Future Research

As online education plays an increasingly important role in the nation's workforce development efforts, this study provides institutions and policymakers with national data to influence future decisions. Additionally, the study provides a unique contribution to the research by applying an organizational design and theory framework to online education in community colleges.

Although the number of online occupational education programs available nationwide has reached respectable levels, additional growth is needed in key areas to more fully meet workforce development needs. In order to promote additional availability and accessibility to students, coherent online occupational programs (fully or partially online) need to be offered, rather than simply offering hodgepodes of online courses.

Research regarding online workforce development has taken on increased relevance because it reflects two of the four areas prioritized in the Obama administration's emphasis on community colleges: workforce training and online education (Jaschik, 2009b; Khadaroo, 2009). Additionally, as community college enrollment reaches record levels and many face severe space shortages (Gonzalez, 2009; Jaschik, 2009a), online courses provide colleges with an opportunity to expand enrollment without building new facilities. As these emerging policy priorities are realized, institutions, policymakers, and researchers will be called upon to help realize the vision of workforce development as a central component of the nation's economic development.

Future research should seek to understand the processes for fostering online program development within institutions and states, especially in skill-based fields. Such research could help institutions and policymakers create more optimal conditions for fostering online program development. Additionally, future research needs to examine the relationship between course delivery options in occupational programs, specific subject matter, learning outcomes (e.g., development of manipulative skills and content knowledge), and workforce outcomes (e.g., employment statistics, earnings, employer satisfaction). Such research will provide educators, administrators, and policymakers with additional evidence for improving the quality of online instruction, which is becoming increasingly vital to the missions of community colleges.

References

- Allen, I. E., & Seaman, J. (2003). Sizing the opportunity: The quality and extent of online education in the United States, 2002 and 2003 Retrieved February 4, 2005, from http://www.sloan-c.org/resources/sizing_opportunity.pdf
- American Association of Community Colleges (2008). CC Stats. Retrieved September 11, 2008, from <http://www2.aacc.nche.edu/research/index.htm>
- Arbaugh, J. B., & Benbunan-Fich, R. (2005). Contextual factors that influence ALN effectiveness. In S. R. Hiltz & R. Goldman (Eds.), *Learning together online: Research on asynchronous learning* (pp. 123-144). Mahwah, NJ: Lawrence Erlbaum.

- Astley, W. G., & Van de Ven, A. H. (1983). Central perspectives and debates in organization theory. *Administrative Science Quarterly*, 28(2), 245-273.
- Benson, A. D., Johnson, S. D., Taylor, G. D., Treat, T., Shinkareva, O. N., & Duncan, J. (2004). *Distance learning in postsecondary career and technical education: A comparison of achievement in online vs. on-campus CTE courses*. St. Paul, MN: National Research Center for Career and Technical Education.
- Bourne, J., Harris, D., & Mayadas, F. (2005). Online engineering education: Learning anywhere, anytime. *Journal of Engineering Education*, 94(1), 131-146.
- Church, R. M. (2002). The effective use of secondary data. *Learning and Motivation*, 33(1), 32-45.
- Cohen, A. M., & Laanan, F. S. (1997). *Multiple measures of success: American community colleges' contribution to workforce training, economic benefit, community, and business* (ERIC Document Reproduction Service No. ED471172).
- Cox, R. D. (2005). Online education as institutional myth: Rituals and realities at community colleges. *Teachers College Record*, 107(8), 1754-1787.
- Dobbs, R. R., Waid, C. A., & del Carmen, A. (2009). Students' perceptions of online courses: The effect of online course experience. *Quarterly Review of Distance Education*, 10(1), 9-26.
- Education Commission of the States (1997). *State postsecondary education structures sourcebook* (No. ED417671). Denver, CO: Education Commission of the States.
- Fjermestad, J., Hiltz, S. R., & Zhang, Y. (2005). Effectiveness for students: Comparisons of "in-seat" and ALN courses. In S. R. Hiltz & R. Goldman (Eds.), *Learning together online: Research on asynchronous learning* (pp. 39-80). Mahwah, NJ: Erlbaum.
- Floyd, D. L. (2003). Distance learning in community colleges: Leadership challenges for change and development. *Community College Journal of Research and Practice*, 27(4), 337-347.
- Franzblau, A. N. (1958). *A primer of statistics for non-statisticians*. New York: Harcourt.
- Gall, M. D., Gall, J. P., & Borg, W. R. (2003). *Educational research: An introduction* (7th ed.). Boston: Allyn and Bacon.
- Githens, R. P., Crawford, F. L., & Sauer, T. M. (2010). *Online occupational education in community colleges: Prevalence and contextual factors*. Louisville, KY: National Research Center for Career and Technical Education.
- Gonzalez, J. (2009). State directors of community colleges see bleak financial times ahead. *Chronicle of Higher Education*. Retrieved from <http://chronicle.com/article/State-Directors-of-Community/48586/>
- Instructional Technology Council (2008). 2007 distance education survey results: Tracking the impact of e-learning at community colleges. Available from <http://4.79.18.250/file.php?file=/1/ITCAnnualSurveyMarch2008.pdf>
- Jacobson, L., & Mokher, C. (2009). *Pathways to boosting the earnings of low-income students by increasing their educational attainment*. Washington, DC: Hudson Institute Center for Employment Policy.
- Jaschik, S. (2009a). Defining the enrollment boom. *Inside Higher Ed*. Retrieved from <http://www.insidehighered.com/news/2009/12/18/enroll>

- Jaschik, S. (2009b). The Obama plan. *Inside Higher Ed*. Retrieved from <http://www.insidehighered.com/news/2009/07/15/obama>
- Johnson, S. D., Benson, A. D., Duncan, J., Shinkareva, O. N., Taylor, G. D., & Treat, T. (2003). *Distance learning in postsecondary career and technical education*. St. Paul, MN: National Research Center for Career and Technical Education.
- Khadaroo, S. T. (2009). Obama directs \$12 billion to community colleges. *Christian Science Monitor*. Retrieved from <http://features.csmonitor.com/politics/2009/07/14/obama-directs-12-billion-to-community-colleges/>
- KnowledgeWorks Foundation (2002). *Building bridges to opportunity and economic growth in Ohio: The important role of the state's community and technical colleges in educating low-wage workers* (ERIC Document Reproduction Service No. No. ED473305). Cincinnati, OH: KnowledgeWorks Foundation.
- Levesque, K., Laird, J., Hensley, E., Choy, S. P., Cataldi, E. F., & Hudson, L. (2008). *Career and technical education in the United States: 1990 to 2005* (No. NCES 2008-035). Washington, DC: National Center for Education Statistics.
- Mars, M. M., & Ginter, M. B. (2007). Connecting organizational environments with the instructional technology practices of community college faculty. *Community College Review*, 34(4), 324-343.
- Moore, M. G. (2003). This book in brief: Overview. In M. G. Moore & W. G. Anderson (Eds.), *Handbook of distance education* (pp. xiii-xxiii). Mahwah, NJ: Erlbaum.
- National Center for Education Statistics (2003). *Distance education at degree-granting postsecondary institutions: 2000-2001* (No. NCES 2003-017). Washington, DC: U.S. Department of Education.
- Parsad, B., & Lewis, L. (2008). *Distance education at degree-granting postsecondary institutions: 2006-07* (No. NCES 2009-044). Washington, DC: National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education.
- Phelps, R. P., & Greene, B. (2001). *Features of occupational programs at the secondary and postsecondary education levels* (No. NCES 2001-018). Washington, DC: National Center for Education Statistics, U.S. Department of Education.
- Piña, A. A. (2008). How institutionalized is distance learning? A study of institutional role, locale and academic level. *Online Journal of Distance Learning Administration*, 11(1).
- President's Council of Economic Advisers (2009). *Preparing the workers of today for the jobs of tomorrow*. Washington, DC: Executive Office of the President.
- States' Career Clusters Initiative (2008). Career Clusters Models Retrieved April 15, 2009, from <http://www.careerclusters.org/resources/web/16ccall.php?action=models>
- Stevens, J. (2001). *Applied multivariate statistics for the social sciences* (4th ed.). Mahwah, NJ: Erlbaum.
- U.S. Census Bureau (2000). Census 2000 demographic profile Retrieved February 10, 2009, from <http://www.factfinder.census.gov>
- Vrasidas, C., & Glass, G. V. (2002). A conceptual framework for studying distance education. In C. Vrasidas & G. V. Glass (Eds.), *Distance education and distributed learning* (pp. 31-55). Greenwich, CT: Information Age Publishing.
- Zirkle, C. J. (2003). *Distance education: The state of the art in career and technical education*. Dublin, OH: National Council for Workforce Education.

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Appendix A

Table A
Online Occupational Program Offerings

Career Cluster	Career Pathway	Colleges Offering at Least One Program		Total Number of Programs at All Colleges	Percentage of Total Online Occupational Programs Offered (%) ³
		Number ¹	Percent (%) ²		
Agriculture, Food, and Natural Resources		13	9.22	28	2.3
	Agribusiness Systems	6	4.26	6	0.5
	Environmental Service Systems	4	2.84	7	0.6
	Natural Resources Systems	1	0.71	3	0.2
	Plant Systems	2	1.42	3	0.2
	Power, Structural, and Technical Systems	5	3.55	9	0.7
Architecture and Construction		10	7.09	14	1.2
	Design/Pre-Construction	8	5.67	12	1.0
	Maintenance/Operations	2	1.42	2	0.2
Arts		3	2.13	5	0.4
	Journalism and Broadcasting	3	2.13	4	0.3
	Visual Arts	1	0.71	1	0.1
Business Management and Administration		107	75.89	495	41.2
	Administrative and Information Support	50	35.46	131	10.9
	Business Analysis	1	0.71	1	0.1
	Business Financial Management and Accounting	52	36.88	105	8.7
	Human Resources	9	6.38	11	0.9
	Management	88	62.41	235	19.6
	Marketing and Communications	10	7.09	12	1.0
Education and Training		35	24.82	49	4.1
	Teaching/Training	35	24.82	49	4.1
Finance		2	1.42	3	0.2
	Banking Services	1	0.71	2	0.2
	Business Finance	1	0.71	1	0.1
Government and Public Administration		1	0.71	1	0.1
	Public Management and Administration	1	0.71	1	0.1

¹ The bolded rows refer to the number of colleges offering at least one program in that Career Cluster. Other rows refer to colleges offering at least one program in each Career Pathway. Colleges may have a program in more than one Career Pathway, under a particular Career Cluster.

² Of the 143 institutions in the sample, the percentage offering a program in each Career Cluster and Career Pathway.

³ Of the 1,201 programs represented in the sample, the percentage of programs offered in each Career Cluster and Career Pathway.

Table A (continued)

Career Cluster	Career Pathway	Colleges Offering at Least One Program		Total Number of Programs at All Colleges	Percentage of Total Online Occupational Programs Offered (%) ³
		Number ¹	Percent (%) ²		
Health Science		56	39.72	164	13.7
	Diagnostic Services	6	4.26	12	1.0
	Health Informatics	41	29.08	102	8.5
	Support Services	1	0.71	1	0.1
	Therapeutic Services	30	21.28	49	4.1
Hospitality and Tourism		8	5.67	14	1.2
	Lodging	1	0.71	1	0.1
	Recreation, Amusements, and Attractions	4	2.84	5	0.4
	Restaurants and Food/Beverage Services	1	0.71	1	0.1
	Travel and Tourism	6	4.26	7	0.6
Human Services		47	33.33	101	8.4
	Consumer Services	3	1.42	3	0.2
	Counseling and Mental Health Services	5	3.55	6	0.5
	Early Childhood Development and Services	33	23.40	66	5.5
	Family and Community Services	20	14.18	23	1.9
	Personal Care Services	3	2.13	3	0.2
Information Technology		59	41.84	179	14.9
	Information Support and Services	44	31.21	83	6.9
	Network Services	1	0.71	40	3.3
	Network Systems	17	12.06	1	0.1
	Programming and Software Development	17	12.06	22	1.8
	Web and Digital Communications	15	12.06	33	2.7
Law, Public Safety, Corrections, and Security		49	34.75	89	7.4
	Correction Services	4	2.84	5	0.4
	Law Enforcement Services	30	21.28	42	3.5
	Legal Services	14	10.64	17	1.4
	Security and Protective Services	6	4.26	6	0.5

¹ The bolded rows refer to the number of colleges offering at least one program in that Career Cluster. Other rows refer to colleges offering at least one program in each Career Pathway. Colleges may have a program in more than one Career Pathway, under a particular Career Cluster.

² Of the 143 institutions in the sample, the percentage offering a program in each Career Cluster and Career Pathway.

³ Of the 1,201 programs represented in the sample, the percentage of programs offered in each Career Cluster and Career Pathway.

Table 4 (continued)

Career Cluster	Career Pathway	Colleges Offering at Least One Program		Total Number of Programs at All Colleges	Percentage of Total Online Occupational Programs Offered (%) ³
		Number ¹	Percent (%) ²		
Manufacturing		7	4.96	15	1.2
	Health, Safety and Environmental Assurance	2	1.42	3	0.2
	Maintenance, Installation and Repair	2	1.42	3	0.2
	Manufacturing Production Process Development	2	1.42	2	0.2
	Production	1	0.71	1	0.1
	Quality Assurance	2	1.42	6	0.5
Marketing		18	12.77	29	2.4
	Marketing Communications	5	3.55	6	0.5
	Marketing Management	13	9.22	21	1.7
	Merchandising	2	1.42	2	0.2
Other		9	6.38	11	0.9
Science, Technology, Engineering, and Mathematics		2	1.42	4	0.3
	Engineering and Technology	1	0.71	3	0.2
	Science and Math	1	0.71	1	0.1
Transportation, Distribution, and Logistics		1	0.71	1	0.1
	Transportation Operations	1	0.71	1	0.1

¹ The bolded rows refer to the number of colleges offering at least one program in that Career Cluster. Other rows refer to colleges offering at least one program in each Career Pathway. Colleges may have a program in more than one Career Pathway, under a particular Career Cluster.

² Of the 143 institutions in the sample, the percentage offering a program in each Career Cluster and Career Pathway.

³ Of the 1,201 programs represented in the sample, the percentage of programs offered in each Career Cluster and Career Pathway.