Fully online principal preparation: prevalence, institutional characteristics, geography

Frank Perrone
Department of Teacher Education, Educational Leadership and Policy, University of New Mexico, Albuquerque, New Mexico, USA

Mary F. Rice
Department of Language, Literacy and Sociocultural Studies, University of New Mexico, Albuquerque, New Mexico, USA, and

Erin A. Anderson and Sajjid Budhwani
Department of Educational Leadership and Policy Studies, University of Denver, Denver, Colorado, USA

Abstract

Purpose – Principal preparation program pedagogy and course delivery are critical to principal candidates' preparedness to lead. Research around online program delivery, however, is relatively sparse. This study examined the extent to which university-based educational leadership programs offered fully online (FOL) pathways to the principalship, as well as program geographic locations and institutional characteristics most associated with FOL offerings.

Design/methodology/approach – Data were collected through website reviews and coding checks, and then merged with national postsecondary data. Data were analyzed using descriptive statistics, classification tree analysis, and geographic information system (GIS) mapping.

Findings – Roughly 43 percent of all reviewed programs offered an FOL pathway to licensure, which suggests substantial growth in FOL offerings over the last 10 years. While a number of factors were deemed important, geographic characteristics were most associated with FOL status. GIS mapping further illustrated findings with a visual landscape of program FOL offerings.

Research limitations/implications – This study considered only programs for which degrees or certificates could be earned without ever visiting campus in-person for classes. Hybrid programs were excluded from the analysis.

Practical implications – Findings make a clear call for more research into online principal preparation program design and course delivery.

Originality/value – This study provides the first overview of fully online university-based principal preparation programs in the United States while also offering a previously unavailable landscape of all programs specifically leading to licensure. It is also the only higher education study to map or investigate factors associated with FOL offerings and raises questions about prior FOL higher education research.

Keywords Online learning, Principal preparation, Leadership preparation, Higher education, Online degrees, Principals

Paper type Research paper

Background

Principals affect student learning (e.g. Leithwood *et al.*, 2010; Leithwood *et al.*, 2004) and are inextricably related to the overall health of school environments (e.g. Branch *et al.*, 2013) as well as critical teacher attitudes and behaviors (e.g. Boyd *et al.*, 2011). Further, quality principal preparation is directly related to principal candidates' abilities to lead (e.g. Clayton *et al.*, 2013). Principal leadership abilities are supported by identified preparation program components (e.g. Darling-Hammond *et al.*, 2009). Specific integral program components include effective

mentoring and internships (e.g. Clayton *et al.*, 2013), university–district partnerships (Davis and Darling-Hammond, 2012), quality faculty (Hackmann and McCarthy, 2011), and coherent curricula (e.g. Orphanos and Orr, 2013). Pedagogy and program delivery also matter in ensuring candidate preparedness (e.g. Bowers and Murakami-Ramalho, 2010; Cosner *et al.*, 2015).

The importance of well-prepared principals and specific program components has been documented, but limited research has focused on various delivery modes, specifically *online* principal preparation (Crow and Whiteman, 2016). Similar to broader trends in graduate-level course enrollment (Moloney and Oakley, 2010), some research suggests that online educational leadership preparation program (ELPP) offerings are increasing (e.g. Anderson *et al.*, 2018; Hackmann and McCarthy, 2011). Such expansion of online ELPP principal pathways may have implications for access to, and quality of, preparation. Furthermore, fully or mostly online principal preparation has some potential to address principal shortages in impacted areas of the country, such as rural or large urban districts, or in hard-to-staff schools (Peters-Hawkins *et al.*, 2018; Podolsky and Sutcher, 2016). If online principal preparation has the potential to increase the pool of principals in the United States, more information is needed about online principal preparation programs, specifically the geographic distribution and institutional characteristics of fully online programs.

Research questions
This study addressed the following research questions:

(1) How many ELPPs offer any fully online degree/certificate (i.e. certificate, master's, specialist, certificate of advanced study) with eligibility for building-level licensure?

(2) Which institutional characteristic(s) best determine whether an ELPP offers a fully online pathway to the principalship?

(3) What is the geographic distribution of ELPPs offering fully online pathways to the principalship?

This paper does not intend to take a position on the quality of FOL or to make an argument about the educational experience of face-to-face versus online learning. Instead, the purpose of this study was to provide a landscape of the program delivery options and to present trends in online ELPP programming.

Online principal preparation
In the fall of 2016, there were 6,359,121 postsecondary students taking at least one fully online course, comprising 31.6 percent of all higher education enrollments (Seaman *et al.*, 2018). This represents an increase of almost four percentage points from 2013. Online career preparation has become common in many courses of study, including teacher preparation. Most universities and colleges of education in the United States already offer, or are planning to offer, online teacher certification, endorsements, and even graduate degrees (Dell *et al.*, 2008). According to the most recently available data about teacher preparation, the American Association of Colleges for Teacher Education (2013) reported that nearly 75 percent of universities offered online teacher preparation courses. Despite some knowledge about online teacher preparation, the extent to which building-level principal preparation is offered in online environments has been largely unknown.

There is evidence to suggest that principal preparation programs are also using online learning as a primary delivery mode. Robey and Bauer's (2013) study of ELPP redesign provides some suggestion of online instruction's prevalence in principal preparation. The researchers received survey responses from 181 of 361 (52 percent response rate) program

chairs regarding the prevalence of 24 principal preparation program features in 2002–2003 and 2009–2010, as well as how those features were redesigned during that time period. Roughly 25 percent of these respondents reported that their programs offered online courses in 2002–2003, with statistically significant differences by types of degrees and institutions. No significant differences existed in 2009–2010, though, when approximately 73 percent of respondents offered online courses. Although these select findings are helpful, they do not differentiate by programs offered entirely online or provide the full landscape of principal preparation.

Overall, two studies have worked to provide initial insight into the fully online (FOL) ELPP landscape. Together, these studies suggest that online principal preparation learning opportunities of all types have been steadily increasing. First, Hackmann and McCarthy (2011) surveyed ELPPs and found that substantial online delivery was already taking place a decade ago. The researchers received responses from 217 of the 590 ELPP heads they surveyed in 2008 (36.8 percent response rate). They found that 18 percent of these programs offered most or all of their courses online, 17 percent offered some courses via interactive video, and 60 percent offered some blended/hybrid courses. Overall, 73 percent of the program heads reported using some form of distance learning (*not* exclusive to online) in 2008. The researchers also disaggregated results by University Council for Educational Administration (UCEA) member programs (65 percent response rate) and non-member programs (32 percent response rate). Though differences by UCEA member status were deemed negligible, it is worth noting that 65 percent of UCEA respondents offered some blended courses and 14 percent offered most or all of their courses online.

More recently, Anderson *et al*.'s (2018) study of UCEA ELPPs described program delivery models for nearly 100 programs between 2013–2014 and 2015–2016. The researchers surveyed all UCEA programs leading to school building administrator licensure, including branch programs within the same institutions, yielding a 92 percent response rate. Participants responded to a Likert-scale question (none, a few, some, most, all) asking how many program courses employed various delivery options (only face-to-face, only online using digital technologies, hybrid, other). They found that 84 percent of the UCEA programs offered principal candidates at least a few hybrid learning opportunities, which was 19 percentage points higher than that found by Hackmann and McCarthy (2011), and that 35 percent offered most of their courses online. Further, Anderson *et al*. (2018) found that 16 percent of UCEA respondents offered, "online instruction all or most of the time," and 14 percent *only* offered online course delivery. Assuming a program is less likely to provide online offerings at multiple branches, the percentage of *institutions* offering fully online instruction between 2013–2014 and 2015–2016 is likely higher than the 16 percent finding, which is slightly higher than Hackmann and McCarthy's earlier results showing 14 percent offering *most or all* instruction via distance learning (which could include off-campus, face-to-face meetings).

Together, Anderson *et al*.'s (2018) and Hackmann and McCarthy's (2011) studies demonstrate that various forms of online learning are thriving in ELPPs. They may also suggest that UCEA online offerings have become more prevalent over a short time span, though such changes, over time, should be interpreted with some caution because of differences in survey response rates and items. It should also be noted that UCEA institutions only accounted for roughly 20 percent of all *K*-12 educational leadership master's degrees (including degrees not leading to licensure) earned in 2016 (Perrone, 2019), meaning that much more is unknown than known about the prevalence of online principal preparation delivery today.

Implications for online principal preparation
Fully online principal preparation has the potential to affect rural schools, where there have been consistent concerns about educational quality (Johnson and Strange, 2009). In such cases, strong educational leadership takes on greater importance. Unfortunately, rural

principals have a higher turnover rate than non-rural principals (e.g. Pendola and Fuller, 2018), and rural schools experience difficulties recruiting and retaining new principals (e.g. Browne-Ferrigno and Maynard, 2005). Consequently, rural schools and districts often employ a "grow your own" approach to filling principal positions (Wood *et al.*, 2013). However, it is possible that rurality itself could prevent the "grow your own" administrator approach from succeeding, or at least make it more difficult in many rural settings. If traditional delivery is the only principal preparation medium available and there are no universities within close proximity, how then, are principals prepared? Enter online programs. Online distance education is becoming an increasingly popular way to provide access to programs and courses to students in remote rural places (Mulcahy *et al.*, 2016). At the same time, fully online course delivery may be the only viable means of attaining principal licensure for many teachers working in rural schools.

In addition, many candidates in principal preparation programs work full-time for the school system. Therefore, work schedule demands require preparation programs to provide flexible coursework (Anderson *et al.*, 2018). FOL programs might appeal to those with competing professional and personal demands, regardless of rural status. However, there remains a question around whether hiring committees will ultimately accept the degree or continue to believe that an online degree is an alternative to traditional means of preparations and traditional requirements. For example, Richardson *et al.* (2011) found that a randomly selected sample of U.S. superintendents perceived online principal preparation degrees to be of lower quality than traditional degrees. Some states, though, seem more accepting of online preparation. In California, Marcos and Loose (2014) documented the rise of the iPrincipals program design to entice millennial generation educators to become innovative principals. California is also a state with a substantial educator shortage, which is particularly acute in rural areas (Podolsky and Sutcher, 2016).

Given the opportunity that FOL programs may offer aspiring school leaders and the disproportionate difficulties that high-poverty and low-achieving schools tend to have finding high-quality principals (e.g. Béteille *et al.*, 2012), more investigation into the access channels graduate students have for FOL principal preparation is needed. The present study identified which university-based educational leadership preparation programs (ELPPs) offer FOL degrees and certificates leading to the principalship. The study also uncovered which institutional characteristics were most associated with programs offering FOL degrees and certificates leading to administrative licensure, and the geographic location of these programs. The focus was on university-based ELPPs in non-profit institutions with master's, education specialist, and certificate programs. We did not examine doctoral programs. Findings have implications for future principal preparation research that considers online delivery as a method of preparation distinct from traditional preparation. The study is also the first to contribute understandings about general higher education trends in online education for professionals that require more advanced degrees and/or who work in fields with high accountability demands for licensure maintenance.

Theoretical framework

This study drew on the principle of *institutional isomorphism* (DiMaggio and Powell, 1983). Institutions make great efforts to set themselves apart from one another, while simultaneously relying on similar institutions and outside resources, especially the government, for funding and support. Because of this mutual dependence, institutions are more likely to be indistinguishable, rather than distinct. Institutional isomorphism suggests the potential for substantial differences and/or similarities in principal preparation program offerings to be based on institutional characteristics outside of geographical proximity to potential students. Arguably, the most important resources that institutions of higher

education compete for are students and their tuition money, followed by other influential factors such as faculty and grants. Two underlying assumptions of institutional isomorphism are especially pertinent to FOL principal pathway offerings. First, DiMaggio and Powell hypothesized that higher levels of isomorphism should exist when an organizational field relies upon one central source of support (e.g. students) for resources (e.g. tuition dollars). Second, when there are fewer alternative organizational/delivery models (e.g. in-person, hybrid, FOL) in a field (e.g. principal preparation), institutional isomorphism should occur at a faster rate.

Prior research suggests that institutional isomorphism may have taken place at a high rate in the mid- to late-2000s. If Robey and Bauer's (2013) survey respondents' answers mirror those of non-respondents, ELPP online course offerings significantly differed by program institutions' Carnegie Classification in 2002–2003. However, online principal preparation courses and FOL pathways were only negligibly different by institution type later that same decade (Hackmann and McCarthy, 2011; Robey and Bauer, 2013), suggesting that the field of principal preparation may have quickly undergone institutional isomorphism in regard to online and FOL offerings. Institutions would have had to compete for tuition revenue with the few delivery models at their disposal, meaning faster FOL adoption. The present study sought to understand national ELPP FOL prevalence, by determining whether institutions with a FOL principal licensure pathway look more or less alike by a number of institutional characteristics; however, it did not study specific components that might contribute to institutional isomorphism. If evidence of isomorphism is present, future research can look more closely at these components.

Methods
Below are the data sources and analysis techniques for this study.

Data sources
This study used multi-staged data collection techniques. First, researchers used the National Center for Education Statistics' Integrated Postsecondary Education Data System (IPEDS) data to determine the sample parameters. There is no existent data set of accredited institutions that prepare aspiring school administrators eligible for building-level licensure. However, IPEDS provides the number of degrees and certificates awarded by institution, year, and Classification of Instructional Programs (CIP) Code (i.e. program of study) for all postsecondary institutions receiving U.S. federal student aid. These data were used to compile a list of all institutions that awarded at least one degree or certificate *below the doctoral level* (e.g. master's, education specialist, certificate) in any of IPEDS' seven *K*-12 educational leadership Classification of Instructional Programs (CIP) Codes (i.e. programs of study) from 2012–2013 to 2016–2017, the most recent year available. The seven CIP Codes utilized were "Educational Leadership and Administration, General," "Administration of Special Education," "Educational, Instructional, and Curriculum Supervision," "Elementary and Middle School Administration/Principalship," "Secondary School Administration/Principalship," "Urban Education and Leadership," and "Educational Administration and Supervision, Other." There were 709 unique institutions granting certificates and awards in these *K*-12 leadership-related programs of study across the most recent five-year IPEDS time span available.

Between December 2018 and February 2019, researchers searched each of the 709 respective institutions' program webpages to determine whether they offered degrees and/or certificates leading to the building-level leadership and whether they provided evidence of offering one or more programs fully online. Coding processes included checking available

program-related links contained therein (e.g. course of study, degree descriptions) and searching department and college of education websites. Programs were coded as offering fully online delivery if all coursework in any program offerings leading to licensure eligibility could be completed entirely online, with the exception of the internship. Requirements for coming to campus for orientation, advising, or testing did not count as coursework or impact a program's otherwise fully online status, consistent with National Center for Education Statistics' (NCES) definitions for fully online classes (U.S. Department of Education, n.d.). Following IPEDS' definition and consulting, program websites offered more accurate online offering data than were available through NCES; several glaring discrepancies existed between self-reported responses to IPEDS' newer survey question around fully online delivery and publicly available program data. Program entrance requirements (e.g. years teaching experience, prior education attainment) and courses of study (e.g. internship, number of credit hours) were also matched against those listed on respective state department of education documents to determine whether a program led to building administrator licensure, regardless of whether the program described itself as leading to licensure. Program website coding was subsequently checked by a trained and independent coder, resulting in 87 percent agreement between original and independent coders. In cases of disagreement, the original coder reexamined the websites and provided updated evidence to support the final code. In some cases, the whole research team resolved discrepancies.

Website coding led us to drop 111 institutions, because evidence overwhelmingly indicated that these colleges and universities did not have, or no longer had, programs leading to school administrator licensure (e.g. website descriptions explicitly stating program did not lead to public school building-level licensure, notice the program had suspended admission for 2018–2019 for redesign or reconsideration). Such a drop was expected given the breadth of our initial IPEDS inclusion criteria of all degrees (excluding the doctorate) across seven CIP codes and five years of data. The new list had 598 ELPPs.

Third, researchers checked results through online and phone correspondence with contacts listed on program websites (e.g. department chairs, program heads) as well as other institutional contacts (e.g. university admissions, information representatives). One researcher asked whether the programs offered fully online pathways to licensure required attendance in face-to-face classes on campus, with the exception of the internship. In cases where it was unclear as to whether a program led to certification, further questions were asked to inform the final code decision. Through this process, researchers learned that 22 institutions had closed, did not in fact lead to licensure, or were not enrolling any new students in summer and fall of 2018–2019 due to program restructuring. In total, the final data set included 576 non-profit postsecondary ELPPs that led to building administrator licensure (fully online or not). Of these 576, researchers confirmed 560 (97 percent) as fully accurate.

Researchers last merged results with released IPEDS's 2016–2017 Institutional Characteristics data and School Point Location data. The Institutional Characteristics data provide information regarding various features of each IPEDS institution, and the Point Location data included latitude-longitude location for all postsecondary institutions across the United States.

Measures
This study measured several characteristics: existence of fully online programs, institutional characteristics, and geographic dispersion and centrality.

Fully online. The variable of interest was a binary measure of whether an institution offered one or more fully online (FOL) (1 = yes, 0 = no) degrees or certificates that lead to building-level leader licensure below the level of the doctorate. To align with IPEDS' fully online definition, this FOL measure only considered whether all of the classes in a program,

with the exception of the internship, could be completed without having to attend class on campus. Campus attendance for advising, testing, and orientation (unless the orientation entailed course credit) did not count against fully online status. A program was *not* considered FOL if it required hybrid or in-person classes.

Institutional characteristics. Researchers used IPEDS' 2016–2017 Institutional Characteristics file to provide an overview of the profiles of the institutions in which programs are eligible for licensure and determine which characteristics may predict a program's fully online status. These were binary and categorical variables commonly used in higher education research, specifically (1) undergraduate admissions selectivity (obtained from undergraduate profile classification variable), (2) Bureau of Economic Analysis (BEA)-defined region, (3) core-based statistical area (CBSA), (4) urbanicity, (5) public/private status, (6) institution enrollment size, and (7) 2010 Carnegie Classification. Binary variables were also created for institution flagship status and UCEA member status.

Geographic distribution. Spatial statistical analysis in the form of geographic distribution was used to measure and identify spatial patterns and directional trends within the data set. Geographic distribution examines and summarizes the distribution pattern of a data set which represent a certain characteristic based on distance and direction (de Smith *et al.*, 2007; ESRI, n.d.). This study focused on two spatial distribution methods (i.e. directional distribution analysis, central feature analysis) to measure and identify geographic directional trends of institutions offering FOL and non-FOL programs. Directional distribution analysis in the forms of dispersion and centrality analyzes and examines directional trends within the contiguous U.S. geographic region. Examining directional patterns allowed researchers to determine whether FOL and non-FOL programs exhibit any discernible variation in regional direction that might be otherwise undetected using the categorical BEA region variable.

Measures of dispersion. For summarizing the distribution of institution location points around a mean center, directional distribution provided the directional orientation trend of mapped features (de Smith *et al.*, 2007). Using the *x*- and *y*-coordinates of all the institutions, a one-standard deviation ellipse was created to summarize each spatial directional trend (all programs, FOL programs, non-FOL programs) from its respective mean center.

Measures of centrality. The central feature tool was used to identify the central location for the given data set. For measuring geographic distributions, the central feature tool helps identify the most centrally located feature (institution) which has the smallest accumulated distance from all other institutions within the given data set. This tool considers the distances from the centroid of each institution location with every other institution's centroid. These distances are then summed, and the institution associated with the shortest accumulative distance to all other institutions is selected as the central feature location.

Analysis
To answer RQ1, descriptive analyses at each level of categorical institution variables were calculated, both in aggregate and differentiated by FOL value. Chi-square tests of independence were used to determine group differences between FOL and non-FOL programs using an alpha level of 0.05. In cases in which there were statistically significant differences between groups, subsequent post-hoc chi-square tests of independence were conducted to determine at which categorical levels the variables were significantly different using Bonferroni correction to account for potential type I error.

RQ2 utilized a classification and regression tree (CART) approach. CART methodology finds the best predictor of the dependent variable while using some or all of the explanatory variables and possibly interactions between the variables. As such, CART performs both variable and model selection while also allowing for an easily interpreted result. In this setting where there were no prior beliefs as to (1) which variables are important, and (2) how they may

interact with each other, variable selection is incredibly valuable. In sum, CART allows researchers to identify which of many independent variables can be deemed most important by first conducting univariate regressions on each independent variable. Here, there are 11 categorical variables in the data. Creating an indicator variable for each possible type within these 11 categories results in 49 indicator variables. Identifying a separate effect for each of these 49 indicators requires the regression of 576 observations on 49 variables. At worst, the least-squares coefficient estimates over-fit the data, and out-of-sample predictions are worthless; at best, the least-squares coefficient estimates are difficult to interpret.

All CART analyses were conducted using the rpart and randomForest packages in R. CART analyses used a classification tree model in which FOL was the binary dependent variable, and the same categorical variables examined in RQ1 (see Table I) served as potential explanatory variables. We bounded our initial classification tree to partitions counting 5 percent or more toward the total R^2. The tree was then pruned to have terminal nodes of no less than 30 observations due to the relatively small sample. RandomForest bootstrapping with trained data did not yield any discernible differences from the initial classification tree. Series of subsequent linear probability and logistic regressions confirmed the significance of the factors in our final tree model.

Geographic information system analysis was used to answer RQ3. In analyzing how geographic phenomena behave, it is important to identify geographic patterns within the area under study. ArcGIS Pro software was used to facilitate spatial mapping of FOL and non-FOL institutions, with the collected non-spatial data of the universities offering pathways to principal licensure(s). To analyze the geographic distribution of universities offering fully online ELPPs, descriptive statistics using point-pattern analysis extracted these universities from the ones that were not offering such programs. Point-pattern analysis identifies patterns for analyzing spatial distribution within the given dataset, that is, whether the data points are random, uniform/dispersed, or clustered within the study's geographic region (Yamada and Rogerson, 2003). For analyzing spatial point distributions, spatial statistics tools measured geographic distribution for determining central feature and directional trends within the data set. Geographic statistical analyses were applied on the contiguous United States (48 lower states and the District of Columbia). Hawaii and Alaska were excluded from this analysis to prevent their distances from contiguous land from influencing the directional distribution trends and the central feature locations within the study region.

Findings
Findings from analyses are reported with reference to research questions.

> *RQ1.* How many ELPPs offer any fully online degree/certificate (i.e. certificate, master's, specialist, certificate of advanced study) with eligibility for building-level licensure?

Descriptive statistics appear in Table I. The FOL variable of interest had a mean value of 0.43, meaning that 246 (43 percent) of ELPP programs providing degrees and certificates needed for principal credentials offered a fully online pathway to licensure. As this exploratory study is the first to examine how multiple institutional characteristics may be linked to fully online offerings of any type, it was difficult to distinguish which of the findings in Table I were most noteworthy. However, chi-square tests of independence revealed differences between the FOL and non-FOL ELPP groups along the following characteristics: urbanicity ($X^2(4, N = 576) = 22.10, p < 0.001$), CBSA type ($X^2(2, N = 576) = 16.27, p < 0.001$), region ($X^2(7, N = 576) = 37.18, p < 0.001$), and undergraduate selectivity ($X^2(3, N = 576) = 8.32, p < 0.05$). Subsequent chi-square tests using Bonferroni adjusted alpha levels showed that ELPPs offering FOL paths to the principalship were significantly more likely to appear in the

|	Fully online		Not fully online		Total	
	#	%	#	%	#	%
Any Level FOL	247	43%	329	57%	576	100
Urbanicity						
City: Large *	46	19%	97	29%	143	25%
City: Medium	31	13%	52	16%	83	14%
City: Small	44	18%	48	15%	92	16%
Suburb: Large	41	17%	68	21%	109	19%
Sub: Med-Rural: Remote *	85	34%	64	20%	149	26%
CBSA (Micropolitan / Metropolitan)						
Not applicable	8	3%	5	2%	13	2
Metropolitan *	190	77%	294	89%	484	84
Micropolitan *	49	20%	30	9%	79	14
Region						
New England *	5	2%	25	8%	30	5
Mideast	37	15%	67	20%	104	18
Great Lakes	28	11%	63	19%	91	16
Plains	31	13%	32	10%	63	11
Southeast*	80	32%	73	22%	153	27
Southwest*	40	16%	25	8%	65	11
Rocky Mountains	10	4%	7	2%	17	3
Far West	16	6%	37	11%	53	9
Selectivity						
Inclusive	55	22%	66	20%	121	21
Selective	121	49%	157	47%	278	48
Most Selective*	47	19%	89	27%	136	24
Other	24	10%	17	5%	41	7
Control						
Public	143	58%	172	52%	315	55
Private (non-profit	104	42%	157	48%	261	45
Flagship Status						
Not flagship	225	91%	307	93	532	92
Flagship	22	9%	22	7	44	8
UCEA						
Non-member	208	84%	265	81%	473	82%
Member	39	16%	64	19%	103	18%
Carnegie Classification						
Research 1	33	13%	39	12%	72	13%
Research 2	26	11%	48	15%	74	13%
Research 3	35	14%	29	9%	64	11%
Masters-Large	92	37%	129	39%	221	38%
Masters-Med	38	15%	43	13%	81	14%
Masters-Small	10	4%	15	5%	25	4%
Other (*not* Research or Masters)	13	5%	26	8%	39	7%
Institution Size						
N/A	0	–	1	–	1	–
Under 1,000	5	2%	7	2%	12	2%
1,000–4,999	80	32%	117	38%	197	34%
5,000–9,999	51	21%	74	22%	125	22%
10,000–19,999	60	24%	63	19%	123	21%
20,000+	51	21%	67	20%	118	20%

Note(s): * denotes significant difference in means between groups; All percentages do not add up to 100% due to rounding; *Regions key*. New England = CT, ME, MA, NH, RI, VT; Mideast = DE DC MD NJ NY PA; Great Lakes = IL IN MI OH WI; Plains = IA KS MN MO NE ND SD; Southeast = AL AR FL GA KY LA MS NC SC TN; Southwest = AZ NM OK TX; Rocky Mountains = CO ID MT UT WY; Far West = AK CA HI NV OR WA

Table I.
Descriptive statistics for institutions offering at least one fully online (FOL) pathway at the certificate, master's, specialist, or certificate of advanced study level leading to building-level leader licensure in summer and/or fall of 2019

following locations: locales in the "Suburb: Medium to Rural: Remote" range, micropolitan areas, the Southeast, and the Southwest. Conversely, FOLs were significantly less likely to be located in large cities, metropolitan areas, and the New England region. Also, FOL programs were more likely to have the most selective undergraduate admissions as compared to non-FOL programs.

RQ2. Which institutional characteristic(s) best determine whether an ELPP offers a fully online pathway to the principalship?

A final classification tree model appears in Figure 1. The tree's root code contains all 576 institutions (represented by the 100 percent in the root node box), which had an FOL prevalence (pr) of roughly 43 percent. The first split in the tree took place on the categorical BEA regions variable, meaning that region accounted for more FOL variance than any other explanatory variable explored in Table I. This split in the categorical region variable resulted in one group comprising the Far West, Great Lakes, Mideast, New England (FGMN) that had a lower FOL prevalence (pr = 31 percent) than the other grouping of the Plains, Southeast, Southwest, Rocky Mountains (PSSR) (pr = 52 percent). The former FGMN subgroup then split on the variable accounting for the second most FOL variance of all potential variables in Carnegie Classification status. This FGMN Carnegie Classification split resulted in one group
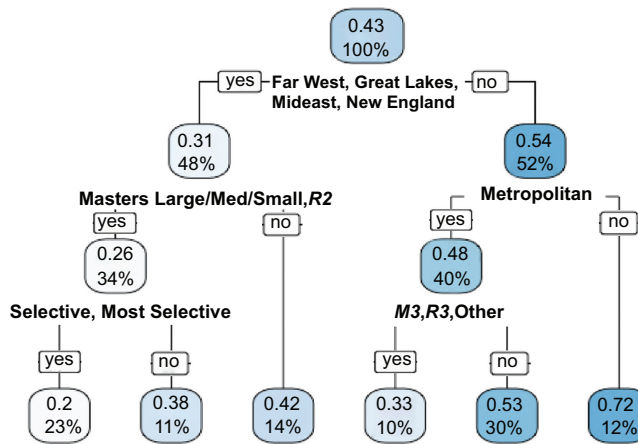
Note(s): Decimal at top of each node represents the proportion of FOL programs inside the child node classification. Percent at bottom of each node represents the percentage of all programs contained within the node classification. Label below each node represents value(s) of categorical variable upon which subsequent split occurs. A split to the left (labeled "yes") indicates the subsequent grouping has this categorical value(s); split to the right (labeled "no") indicates the grouping that does not have the same categorical value(s) as the label

For instance, the child node resulting from the "Far West, Great Lakes, Mideast, New England" split to the left ("Yes") reveals that (a) 31% (represented by 0.31 in diagram) of programs in the Far West, Great Lakes, Mideast, New England (FGMN) region grouping are FOL and (b) 48% of all programs (regardless of FOL status) fit the FGMN classification

Figure 1.
Final classification tree model

comprising Masters-Large, Masters-Medium, Masters-Small, and Research 2 institutions that had a lower FOL prevalence (pr = 26 percent) than the other resulting grouping of Research 1 and Research 3 institutions, which had an FOL prevalence (pr = 42 percent) close to the full FOL sample mean. The tree then partitioned again at undergraduate admissions selectivity, as only 20 percent of selective and highly selective FGMN programs were FOL, while 38 percent of the inclusive and other Master's and Research 2 FGMN programs offered FOL options.

Following the split to the right-hand side of the tree, the PSSR subgroup partitioned by CBSA status. Just 40 percent of metropolitan PSSR programs were FOL, while a full 70 percent PSSR micropolitan institutions were FOL. The metropolitan node then split again at Master's 3 / Research 3 status as these programs were less likely (33 percent) to be FOL than their counterparts. Most notably, selective and highly selective programs in FGMN Masters and Research 3 institutions had the lowest prevalence of FOL (pr = 20 percent), and PSSR ELPPs in micropolitan areas had the highest FOL rates (72 percent). Subsequent tests of importance showed that the most important factors in FOL offering were, in order of greatest to least: region, CBSA designation (i.e. metropolitan, micropolitan), Carnegie Classification, and undergraduate selectivity.

RQ3. What is the geographic distribution of institutions offering fully online degrees leading to the principalship?

All 572 university-based ELPPs leading to principal licensure across the contiguous United States appear in Figure 2. As seen in this map, the spatial distribution of these universities, although showing a random spread, has a disproportionate concentration within the contiguous United States. This is further explained by the standard deviational ellipse that summarises its spatial distribution and the directional trend. The calculated standard deviational ellipse, using one standard deviation, shows that the distribution of the universities offering ELPPs is elongated in east and west directions. This elongated ellipse indicates that 397 universities (68 percent) fall within one standard deviation of the mean geographic center. Therefore, the distribution of these universities is largely clustered within a few specific geographic regions of the contiguous United States. The directional
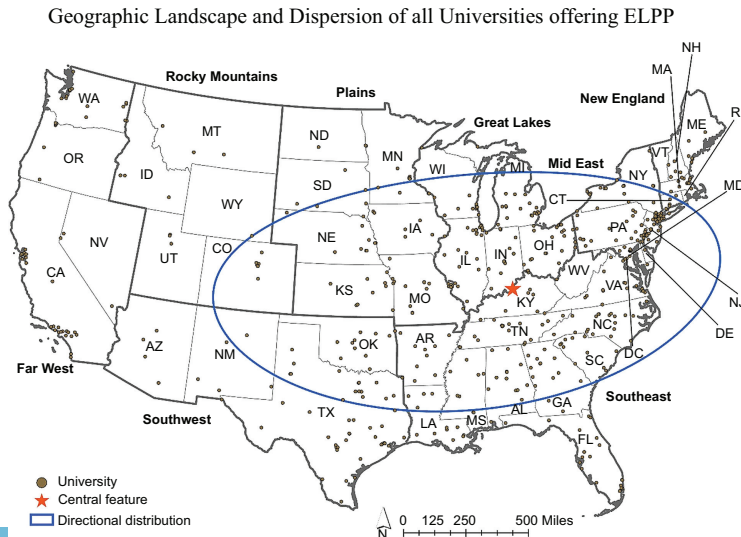

Geographic Landscape and Dispersion of all Universities offering ELPP

Figure 2.
Postsecondary institutions offering pathways at certificate, master's, specialist, or certificate of advanced study level leading to principal licensure across contiguous United States

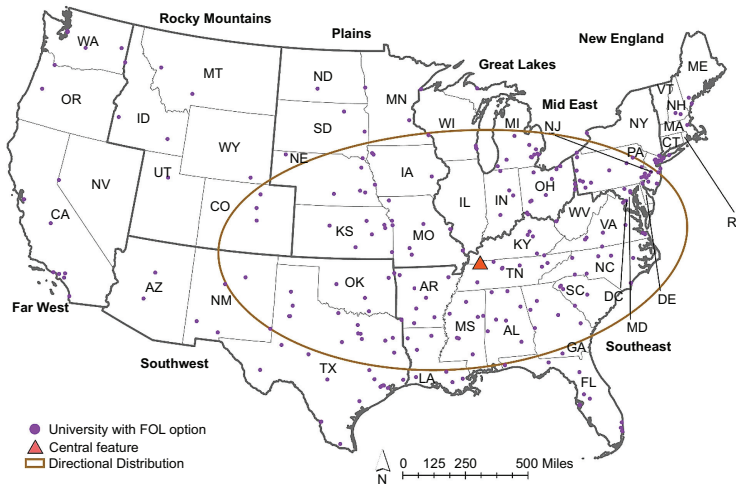Geographic Landscape and Dispersion of all ELPP Universities offering FOL option

Figure 3.
Postsecondary institutions offering FOL at certificate, master's, specialist, or certificate of advanced study level leading to principal licensure across contiguous United States

distribution trend indicates that these universities were predominately concentrated within the Great Lakes, Mideast, Plains, Southeast, and Southwest regions of the contiguous United States. The identified central feature point of all ELPPs across the 49 United States contiguous states is located at the University of Louisville in Louisville, KY.

Overall, 245 of the 572 institutions offering ELPPs within the contiguous United States provided an FOL pathway to the principalship (see Figure 3). The dispersion of these universities mirrors the overall trend as projected in Figure 2, meaning that the geographic distributions of FOL and non-FOL programs are highly similar, though the FOL institutions pull slightly in a southeastern direction. The central location point of universities offering FOL pathways also shows similar directional shift, with its mean location at Murray State University, near the western border of Kentucky. The one standard deviation directional distribution ellipse encompasses 164 universities (67 percent), which are largely concentrated in the southern region of the United States.

No universities in Rhode Island and Vermont with ELPPs leading to principal licensure were plotted, perhaps partly because of their small size. Additionally, university-based programs in Connecticut and Illinois offer pathways to the principalship, but not FOL pathways (see Figure 4 for map of FOL and non-FOL programs in contiguous United States). More information on these findings appears in the limitations section.

Discussion

Notably, roughly 43 percent (247 of 576) of university-based ELPPs provided one or more FOL pathways to the principalship in the summer and/or fall of 2019, which did not vary by most non-geographic institutional characteristics. This 43 percent figure is arguably conservative given that ten others were almost exclusively FOL, but considered non-FOL due to an intensive summer course on campus or one or two mandatory in-class attendances across the entire program. However, in keeping with IPEDS' definition, the field now has an accurate picture of FOL ELPPs. These FOL findings make a clear case for additional research and practice in online school administrator preparation.

Geographic Landscape and Dispersion of all ELPP Universities offering FOL or no FOL option

● University with FOL option
■ University with no FOL option

0 125 250   500 Miles
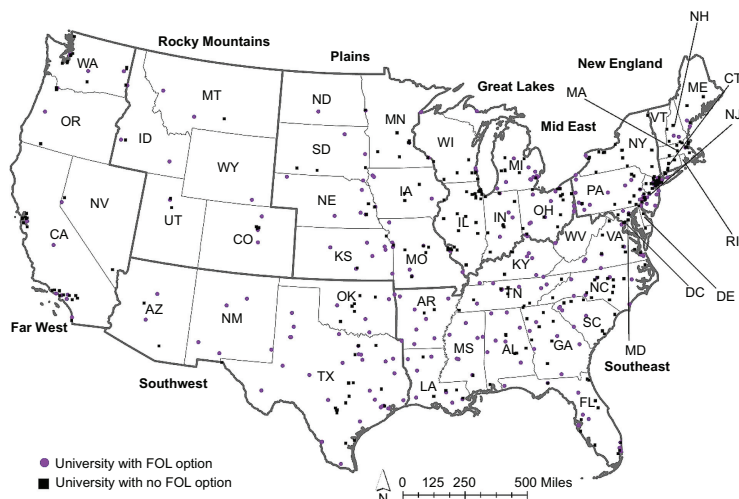
Figure 4.
Postsecondary
institutions offering
and not offering FOL
pathways at certificate,
master's, specialist, or
certificate of advanced
study level leading to
principal licensure
across contiguous
United States

Geography and infrastructure in ELPP

CART results revealed that geography was inextricably associated with FOL status, which is predictable since institutions that are close to each other vie for the same resources (e.g. students) and should, as a result, resemble one another over time (DiMaggio and Powell, 1983). Two of our three geographic variables—region and metropolitan status—account for the most variance in FOL status. The PSSR regions are less densely populated in terms of population and institutions (see measures of program dispersion in Figure 2). This may mean programs became FOL to meet prospective students' distance demands, alongside their own enrollment needs competing with other programs. Notably, it was more common for micropolitan-based programs in the PSSR region to have ELPPs offering an FOL pathway to the principalship (70 percent) than any other group in our analysis. These micropolitan programs would have a smaller number of students to compete for, but sufficient resources that could be shared, such as personnel with sufficient credentials to teach in the online programs.

Of course, Internet access must also be considered. Internet infrastructure is underdeveloped in rural areas (Salemink *et al.*, 2017). However, Internet access alone does not explain why institutions in the more densely populated FGMN regions with higher concentrations of ELPPs leading to licensure (see Figure 1) were less likely to have FOL options (pr = 31 percent). Logically, they should have more if Internet availability was the most important variable. In these more densely populated areas with more stable postsecondary systems, 56 of the Master's and R2 institutions with selective and highly selective institutions (pr = 20 percent) did not provide FOL options, although Internet connectivity should be available. Institutional isomorphism (DiMaggio and Powell, 1983) provides a better explanation for this trend. The less selective FGMN institutions may provide FOL options because they compete with each other for students who live closer to school, can afford the cost of traveling to earn a degree, and utilize infrastructure to support their travel (roads, buses, trains). More research about infrastructure in constellation with other barriers and how they drive FOL program emergence is needed. For instance, what if FOL is the only viable option for rural schools, but state policy does not recognize and approve an FOL ELPP, which several do not (e.g. Illinois)? How do such issues of policy and access impact leadership and stability in rural *K*-12 schools?

The accurate ELPP landscape and IPEDS inaccuracies

Despite increases in ELPP program landscape research this decade (e.g. Anderson and Reynolds, 2015; Perrone and Tucker, 2019), research had not mapped the prevalence of online learning as part of the larger question of access to principal preparation. This study provides the field with a current and detailed landscape of university-based ELPPs leading to principal licensure that was previously unavailable. This includes a first-ever mapping of FOL program delivery in postsecondary research.

In the process of mapping this study, however, we uncovered major limitations in IPEDS' distance education reporting. IPEDS began collecting data on distance education in 2013, asking whether programs can be completed entirely through distance education courses (a distance education course is "A course in which the instructional content is delivered exclusively via distance education. Requirements for coming to campus for orientation, testing, or academic support services do not exclude a course from being classified as distance education" (NCES, n.d.)). Problems with the IPEDS data emerged when researchers attempted to extend findings longitudinally using IPEDS' Distance Completion data, including using what was known about the researchers' own program offerings over time.

Final findings for summer and fall of 2019 were compared to IPEDS report from 2017. This comparison revealed that 29 percent (75 of 247) of the FOL programs leading to licensure in 2019 did not report offering distance education at *any* level (e.g. master's, advanced certificate) in IPEDS 2017 data, regardless of whether the program level matched that leading to licensure. An additional 18 percent (45 of 247) of FOL programs reported offering FOL delivery at levels different than those recorded for 2017, meaning almost half of the 2019 FOL program offerings were captured differently by IPEDS at the end of the 2016–2017 academic year. Note that these figures did not capture false negative reports, meaning this report of incongruence between distance-offering reports may be conservative. Postsecondary FOL research and public information dissemination largely depend upon IPEDS' distance education variable (e.g. Allen and Seaman, 2017). Granted, the most recent year (2017) of IPEDS distance education data are still in its provisional release, meaning the data are subject to some revisions. Nonetheless, such discrepancies over two years have serious implications for research relying on this provisional data. Stakeholders should make decisions using IPEDs FOL data or IPEDs-reliant FOL research with caution.

FOL prevalence, growth, and related implications

Data analysis revealed a high prevalence in FOL principal pathways and strongly suggests rapid recent growth in FOL university-based principal pathways. Though comparisons should be interpreted with some caution due to varying response rates and questions, taken collectively, findings from Anderson *et al.* (2018), Hackmann and McCarthy (2011), and Robey and Bauer (2013) suggest rapid pace of FOL program adoption from 2002 to 2016, alongside expansion of online and hybrid offerings. This new 2019 FOL figure is much higher than the 18 percent of all United States' ELPP respondents (36.8 percent response rate) Hackmann and McCarthy (2011) found in 2008. Perhaps more illustrative of this rapid change, though, is the contrast between our findings regarding UCEA programs in 2019 and those of Anderson *et al.* (2018). This study found that 38 percent of UCEA programs offered FOL licensure pathways in 2019. Anderson *et al.*'s (2018) large UCEA program sample showed noticeably fewer in 2014–2016 (i.e. 35 percent offered at least some online learning opportunities, 16 percent offered online learning all or most of the time). Although, again, there are minor differences between the two studies' samples and online measures that preclude exact comparison, it seems the proportion of UCEA institutions offering an FOL pathway has risen sharply in six years.

Institutional isomorphism can explain the rapid FOL expansion, wherein postsecondary institutions relying on a central source of support (e.g. students) for resources (e.g. tuition

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revenue) begin to look more and more the same. This institutional isomorphism should naturally extend to all programs, and, as we see in our data analyses, FOL prevalence does not significantly differ by UCEA member status (see Table I), nor does UCEA membership account for meaningful variance in FOL status (see Figure 1). As only a few methods of principal preparation course delivery exist and FOL programs can reach far away students they previously could not, the second aforementioned assumption of institutional isomorphism predicts that programs will continue to adopt FOL pathways and do so at a high rate (which was also suggested by ten responses from non-FOL program representative responses that an FOL program or increased online offerings were in the near future).

Future research must focus on online principal preparation program design and pedagogy given such high FOL prevalence and adoption and the critical role program design and pedagogy play on principal preparedness to lead (e.g. Bowers and Murakami-Ramalho, 2010; Cosner et al., 2015). Despite large growth in principal preparation research (e.g. Young and Crow, 2016), only a few studies to date have evaluated student learning and perceptions of FOL ELPPs (e.g. Chapman et al., 2009; Mullen, 2019; Ritter et al., 2010) or pedagogical approaches to FOL principal preparation (Nash, 2011). Some existing studies demonstrate high potential for fully online courses and programs, such as Ritter et al.'s (2010) finding that a fully online ELPP course can engender a greater sense of student community. More recently, Mullen (2019) found negligible learning outcome differences between a group of seven principal preparation students who took her course in person and seven who took the same course entirely online. Such studies are promising for FOL's potential, but the field must do more to understand *how* to implement and deliver FOL programs and courses so that students are as best prepared to lead as possible. If institutional isomorphism (DiMaggio and Powell, 1983) does predict FOL principal pathways, the majority of educational leadership instructors will eventually adopt FOL delivery. Faculty teaching the next generation of leaders will need support to prepare principles in the online delivery mode (e.g. Dabbagh et al., 2019).

Findings for FOL prevalence and growth also have several additional implications. First, these findings demonstrate that FOL is no longer an "alternative" route to principalship, as earlier research understandably labeled it (e.g. Robey and Bauer, 2013). Online delivery of some type, both hybrid and FOL, is now commonplace in principal preparation. Prior evidence suggests that there has been hesitation around the quality of FOL programs (Richardson et al., 2011) as well as some proof of similar or positive learning experiences as compared to face-to-face offerings (Mullen, 2019). Future research is needed to determine whether FOL graduates are (1) able to secure school leadership after graduation and (2) properly prepared to lead. Such research would help determine whether FOL programs truly provide greater access to the principalship, and whether the FOL model is currently as or more useful to K-12 education as face-to-face model.

Finally, as suggested by institutional isomorphism, further research would need to be conducted to understand how market forces may be influencing decisions about whether to offer online learning. Further studies could explore (1) the timeline of implementation of FOL programs and trends over time, (2) the policy environment and the impact on expansion of online offerings, (3) enrollment trends, including the number of rural students applying and attending preparation programs in each state, (4) Internet connectivity and the feasibility of online offering, and (5) online offerings as a response to funding decreases.

Limitations
Researchers were unable to capture all principal preparation programs in the United States or track them over time because, unlike teacher preparation data under Title II, centralized data collection for principal preparation programs does not exist. Researchers were thus limited to studying university-based programs that reported granting degrees leading to building-level

licensure from 2013–2014 to 2016–2017. No information can be provided about alternative and independent preparation programs for which very little research exists (e.g. Hackmann, 2016), and our study does not include doctoral pathways to school administration. Additionally, it is likely that researchers did not capture university-based ELPPs that may have existed in 2019, but were not recorded as granting degrees prior to the 2017–2018 academic year. Further investigation revealed that Vermont did have two institutions with ELPPs offering pathways to the principalship in the summer and fall of 2018–2019, though there are no recorded degrees for these institutions below the doctorate in the available IPEDS data. It is also possible that one or more of the 111 programs that fit our IPEDS search parameters, but were dropped during our full website coding stage, actually did have a principal licensure program in place in 2019. Regardless of these limitations, this study offers the most comprehensive and current overview of where non-profit university-based principal preparation below the doctoral level is taking place and whether FOL delivery is offered. This is the first such overview of its kind in higher education research.

Conclusion

The reauthorization of the Higher Education Act (United States Department of Education, Office of Inspector General, 2018) addressed online learning and the expansion of distance learning for university and non-university-based programs. Regulations for distance learning and for-profit schools might be lifted by Congress (e.g. House Bill PROSPER), potentially changing the landscape of online education and furthering the need to understand current factors related to FOL offerings.

Fully online learning might be a way to resolve principal shortages in some areas, but only if programs are widely available across a range of settings. Market forces may also supersede needs for online learning in places where it might be the most useful. To test this idea, researchers gathered information about online educational leadership programs that led to licensure and mapped their dispersion. Analyses revealed FOL ELPPs may be serving rural areas in several regions in the United States and that these micropolitan places might be the most affected by institutional isomorphism (DiMaggio and Powell, 1983), but more research is needed. Importantly, this research contributes to growing understandings about FOL principal preparation and the need to offer programs in areas where they would be the most useful.

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Corresponding author
Frank Perrone can be contacted at: fperrone@unm.edu

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