Howley, C., Howley, A., & Telfer, D. (2017). National provisions for certification and professional preparation in low-incidence sensory disabilities: A 50-state study. *American Annals of the Deaf, 162*(3), 277–294.

National Provisions for Certification and Professional Preparation in Low-Incidence Sensory Disabilities: A 50-State Study

Craig Howley, Aimee Howley, and Deborah Telfer

Craig Howley is senior researcher and Aimee Howley is principal investigator, WordFarmers Associates, Albany, OH. Telfer is director and research associate, Systems Development and Improvement Center, University of Cincinnati, Cincinnati, OH.

A **multimethod study** examined the 50 U.S. states' preparation and licensure practices regarding students with low-incidence sensory disabilities (LISD). The researchers used document review and structured interviews with state education agency representatives. It was found that institutions of higher education (IHEs) in 38 states offer at least one LISD preparation program; 12 states offer no programs at all. Further, program intensity, a measure of state capacity to serve students with LISD, varies from 0 to about 3 programs per million state residents. States also differ by the regime used to qualify teaching candidates, using either licensure or endorsement. Nationally, being an LISD licensure regime is, all else being equal, negatively correlated with number of LISD programs. The findings suggest that many states lack the capacity to supply enough trained professionals to serve students with LISD. Recommendations are framed for states, national organizations, and IHEs.

Keywords: low-incidence sensory disabilities, blindness, deafness, teacher preparation, teacher licensure, education policy, special education, rural areas.

In the present article, we report findings from a 50-state study of preparation programs and professional licensure for low-incidence sensory disabilities (LISD): hearing impairment (HI), visual impairment (VI), and deafblindness (DB).[1] Preparation and licensure are fundamental to adequately serving students with low-incidence sensory disabilities. And these students are not typically served adequately.

First, by definition, students with LISD—even among those students with individualized education programs—are comparatively rare, accounting for only 1.2% of students ages 6–21 years served under Part B of the Individuals With Disabilities Education Act (IDEA; Office of Special Education Programs, 2015). This rarity may be the primary difficulty: The squeak of this small wheel remains unheard (Johnson 2013). Second, most parents of these children understandably prefer that they be served in neighborhood schools (Kamenopoulou, 2012), where, however, general education teachers have scant experience or preparation to serve them adequately (Corn & Spungin, 2003; Luckner &

Muir, 2002). Third, and most surprisingly to the uninformed, too few professional training programs exist nationwide (Ludlow, Conner, & Schecter, 2005). Worse still, established programs disappear faster than new ones come into being to replace them (Dolman, 2010; Johnson, 2013). Fourth, and as a result of all these challenges, many (probably most) districts nationwide lack the *organizational capacity* they need to support teachers, parents, and students involved with students with LISD (C. Howley & A. Howley, 2016; Johnson, 2013; Müller, 2005). This situation, moreover, has persisted in American education since the middle of the 20th century (Clarke, 1985; Johnson, 2013; Mason, 2000; Smith & Wild, 2006).[2]

Serving these students well, then, logically requires access to educators with relevant training. This assertion is unexceptional and bland, but the durable problems just enumerated have for decades kept states, districts, schools, and general education teachers from meeting this self-evident requirement. Certainly, many families, some professionals, and even some politicians have, over the decades, struggled to change things. Across states and localities, moreover, levels of service and capacity differ: Reports of poor quality of service (e.g., Johnson, 2013), while common, are not universal. Questions about educator preparation programs and the licensure provisions of state education agencies (SEAs) clearly bear on districts', families', and students' access to educators with relevant training.

For the present study, we gathered data from all 50 states about licensure and preparation programs through (a) inspection of SEA websites and (b) interviews with SEA special education directors (or designees). The resultant findings represent, to our knowledge, the first empirical work to associate these two realms in an effort to explain and redress the enduring shortfall in the number of trained education professionals for students with LISD.

Relevant Literature: Policy Background for Programs and Licensure

Preparation programs, whether traditional or alternative, lead candidates to the point of licensure. But licensure arrangements are not neutral: They exert a strong influence on how institutions of higher education design and operate professional preparation programs (Angus, 2001; Bales, 2006; Bowen & Stearns, 1992). Attentive to this influence, we begin our brief review of the relevant literature with a discussion of "certification regimes." It should be noted, however, that decisions in both realms (training and licensure) may influence the supply of relevantly trained professional educators. Following the discussion of the literature on certification, we will consider the literature on professional preparation programs.

Certification Regimes

Use of the term *regimes* suggests that SEA licensure provisions (which vary dramatically) constitute relatively long-lived organizing systems designed, established, and applied to govern the awarding of licenses or certificates for professional practice. Even though they undergo regular revision, they constitute established authoritative practice.

Angus (2001) observes that the design of these regimes turns on answers to four questions:

1. Which should determine certification—the state or the profession?
2. Should the awarding of teaching certificates depend on program completion or on examination?
3. What should a preparation program include?
4. How detailed should the certification regime be?

The traditional answers to these questions emerged in the early 20th century. In 1898, just 3 states issued all teaching certificates within their boundaries,[3] mainly through the administration of a literacy exam given by superintendents, but 41 states did so by 1937 (Angus, 2001). Angus writes that by that time "a vast multiplication of the number, types, and specificity of the certificates issued" had occurred (p. 12). By 1950, all states issued all certificates for educators practicing within their borders. By this time as well, the SEAs had adopted the "approved program" approach, whereby certification was contingent on completion of programs approved, and standardized, by the SEA. This model remains the default pattern, whether the process entails a traditional 4-year degree program in a college of education that puts 18-year-olds on the path to becoming teachers or an alternative whereby adults with a baccalaureate or other degree receive the requisite teacher preparation.

One significant variation in this well-established pattern is the use in some states of the *endorsement*. The endorsement provision either allows or requires already-certified teachers to add at least one additional field to their certificate or license (Kaye, 2013). Endorsements add teaching fields to existing certificates even in states requiring that a second field be added at the time of the *initial* certification.

The endorsement model notably means that teachers acquiring certification through an additional "endorsement" field or fields need not complete the full preparation program required of candidates in initial prepa-

ration programs in those fields. Instead, these teachers complete a reduced program approved as an addition ("endorsement") to an initial license or certificate. In the 2013 edition of an annual document on certification requirements, Kaye reported that 19 states widely employed the endorsement model (not just in LISD) in their overall certification regime.[4]

Preparation Programs

Even though teacher preparation programs typically attend to similar sets of state and/or national accreditation standards, program details (conceptions, curricula, delivery, length) vary considerably from state to state, from program to program within states, and across traditional and alternative pathways (Boyd, Grossman, Hamilton, & Wyckoff, 2006; Huebner & Strumwasser, 1987; Ludlow et al., 2005; Rosenberg & Sindelar, 2005). Even among traditional programs, preparation for initial certification sometimes takes place at the undergraduate level and sometimes at the graduate level, and in many cases the certification courses and field experiences make up a portion of what candidates are required to complete in order to obtain a university degree (e.g., at the bachelor's or master's level).

The differences between programs comprising traditional and alternative pathways are often modest, although some dramatically streamlined programs (e.g., Teach for America) receive a lot of media attention. In general, the differences relate to a combination of three oft-cited features (National Center to Inform Policy and Practice in Special Education, 2010; Rosenberg & Sindelar, 2005): (a) length and components of a program; (b) presence or absence of a requirement for attendance on a university's main campus; and (c) the makeup of the student population recruited or admitted. An additional important feature of "alternative" programs is mentioned less often: their frequently temporary existence (Feistritzer, 2009). The endorsement regime is relevant to the present discussion, since endorsement generally involves older students, and endorsement programs display at least some of the features of "alternative" programs.[5]

Preparation for LISD Teaching Fields

Preparation programs for teaching students with LISD are few and far between, and have proven remarkably difficult to sustain (Ambrose-Zaken & Bozeman, 2010; Dolman, 2010; Johnson, 2013; Linehan, 2000). Their sustainability is threatened because (whether they use a traditional or alternative pathway) these preparation programs target a "low-incidence" population and prepare relatively few teachers. Even in the face of a long-unmet need and a federal mandate to meet it, LISD programs are losing ground (Ambrose-Zaken & Bozeman, 2010; Dolman, 2010; Johnson, 2013; Linehan, 2000).

Adequate funding, rather than the evident needs of students, families, and society, is the oft-argued requirement of program stability and sustainability (Ambrose-Zaken & Bozeman, 2010; Dolman, 2010; Johnson, 2013; Linehan, 2000; Ludlow et al., 2005). The default position, one might suggest, is makeshift improvisation: the national shortage of LISD professionals ensuring that local provision must rely on temporary incentive funding from federal or state sources.[6]

Counting Programs and Graduates

Students who complete LISD programs have long been found to be about evenly divided between recipients of graduate and undergraduate degrees. Bowen and Stearns (1992, Table 7, p. 19) found that graduate degrees were more common in VI (80% in LISD) than in HI (47%). It is perhaps not surprising that 100% of DB degrees were reported to have been delivered at the graduate level. The total number of graduates in the study by Bowen and Stearns (for which data were gathered in 1991) for all three fields was 1,342 (HI = 974, VI = 353, DB = 15). More recent reports have provided similar results (see, e.g., Corn & Spungin, 2003; Dolman, 2010; Huebner & Strumwasser, 1987; Lenihan, 2010; Summers, Leigh, & Arnold, 2006).

LISD preparation *programs*, then, are more likely to be conducted at the graduate level, as compared to traditional teacher education (Ludlow et al., 2005). The clear exception is HI, with about half of candidates prepared in undergraduate programs.

These programs' historical trajectory of existence is not encouraging. Reports of numbers of programs vary, but "traditional" (graduate and undergraduate) LISD programs are closing, and the overall number of programs (all three fields together) nationally is argued to be in long decline (e.g., for VI, see Corn & Spungin, 2003; for HI, see Johnson, 2013, and Dolman, 2010). Our discussion moves next to a field-by-field examination.

Visual Impairment

Ambrose-Zaken and Bozeman (2010) found that 41 universities were offering programs to prepare teachers of students with visual impairment in 2008. Bowen and Stearns (1992) confirmed the existence of 36 such programs in academic year 1990–1991, but their initial sources had identified 48. Of that initial 48, two had closed, and contacts at another 10 reported that their programs did not actually

prepare any teachers of students with visual impairment. Corn and Spungin (2003) reported the existence of 36 VI programs in 1999, down from 42 in 1987.

Although reports differ, the overall number of VI programs nationally is evidently not in decline. The rate at which new programs emerge, has, however, decreased to zero (Ambrose-Zaken & Bozeman, 2010). According to Ambrose-Zaken and Bozeman (2010), four programs began operation between 2003 and 2008, and four closed. As of the 2007–2008 academic year, 19 states had no TVI program.

Hearing Impairment

Johnson (2013) reported that there were 83 HI programs in 1983, but only 66 in 2000, and 15 states had no HI program at all. Benedict, Johnson, and Antia (2011) located 68 programs, but only 60 were still operational and able to provide interviews. The 2015 triennial census conducted by the Office of Research Support and International Affairs, Gallaudet University (formerly the Gallaudet Research Institute), found just 56 programs ("University and College Programs," 2015). If the reported numbers are correct, the number of HI programs in the United States has declined about 33% since 1983.

The number of interpreter programs peaked in 2003 at 79 and was 72 in 2009 (Dolman, 2010).[7]

Deafblindness

Corn and Spungin (2003) reported that there were 10 DB programs in 1994, but only 6 remained in 1999. The 2015 triennial survey reported the existence of just 4 DB programs ("University and College Programs," 2015), a reduction of 60% since 1994. Ambrose-Zaken and Bozeman (2010) also located 4 DB programs. On this basis, it is clear that most states have no local access to qualified DB teachers.

Research-Based Conclusions From the Literature Review

What conclusions can be drawn from the literature review? Two lists follow: (a) preparation and certification in general and (b) preparation and certification in LISD fields.

Preparation and Certification in General

Four notable conclusions from the literature provide overall context:

1. Certification regimes have changed nationally to accommodate (a) alleged teacher quality issues, (b) actual teacher shortages in fields and locales, and (c) preparation of adults with undergraduate degrees not in education (Feistritzer, 2009; National Center to Inform Policy and Practice in Special Education, 2010; Rosenberg & Sindelar, 2005).
2. The 4-year education baccalaureate that enrolls 18-year-olds to become teachers remains the most common pathway to teaching (Angus, 2001; Feistritzer, 2009), and is predominant even in LISD fields (Bowen & Stearns, 1992).
3. The distinction between "alternative" and "traditional" programs is less clear than it once was (Feistritzer, 2009; Rosenberg & Sindelar, 2005), perhaps especially so in LISD fields.
4. Alternative programs (most often delivered as graduate-level course work) require fewer pedagogy courses than "traditional" undergraduate programs (Feistritzer, 2009; National Center to Inform Policy and Practice in Special Education, 2010; Rosenberg & Sindelar, 2005). Rosenberg and Sindelar's (2005) assertions about the features of program reputability seem reasonable.[8]

Preparation and Certification in LISD Fields

The literature review suggests seven conclusions specific to the LISD fields (VI, HI, and DB):

1. Funding for LISD preparation programs is inadequate and inconstant (Ambrose-Zaken & Bozeman, 2010; Dolman, 2010; Johnson, 2013; Linehan, 2000; Ludlow et al., 2005).
2. LISD preparation programs nationally have never yielded the numbers of teachers required by IDEA provisions (Johnson, 2013; Ludlow et al., 2005).
3. LISD programs in all the states lack the capacity to supply teachers to rural areas (Johnson, 2013; Müller, 2005).
4. Alternative program arrangements (nontraditional candidates, venues, course requirements) in LISD fields are in widespread use, and they have so far proven insufficient to produce more teachers and supply rural access (Ludlow et al., 2005).
5. Remarkably few states have experimented with university consortia to deliver LISD programs (Ludlow et al., 2005).
6. Many LISD programs are conducted at the graduate level (Bowen & Stearns, 1992; Lenihan, 2010; Ludlow et al., 2005).
7. The relative merits of endorsement and full-licensure arrangements have not been examined empirically, but the endorsement approach seems, at face value, to favor the production of more teachers in LISD fields (see the

discussion of endorsement in Kaye, 2013).

Each of these conclusions could easily inform a variety of research questions, but behind all of them lurks a genuinely vexing ignorance.

Method

The research team (the authors) formulated the following research question, based on a wide gap in the research literature:

> In a national frame of reference, what is the relationship between licensure provisions and professional preparation programs in HI, VI, DB, and orientation and mobility (O&M)?[9]

The present study approached the research question in two ways: (a) inspection of all SEA websites for information relevant to the preparation and certification of LISD teachers and (b) structured interviews with all SEA special education directors (or designates). This approach necessarily took SEA knowledge of licensure and preparation as authoritative—an assumption that will figure among the study's limitations (see "Caveats and Limitations" in the Findings section). We examined each approach in turn, using a website data protocol and an interview protocol.

Website Data Protocol

The research team developed procedures for gathering and maintaining data from SEA websites. First, the team recorded the following data from websites:

1. state name
2. URLs (for LISD-specific information)
3. contact (the most likely contact for interviews)
4. summary information about preparation programs (researcher-generated from website text)
5. certification summary information (researcher-generated from website text)
6. comments (researchers' reflections and questions evoked by website inspection)

The team then prepared a data sheet to record the specified data. They subsequently completed one such protocol for each of the 50 SEA websites.

After completing the data sheets for about 10 states, the team created a spreadsheet to display the most relevant data from all 50 states, with rows as cases (states) and columns recording the following variables:

1. state name
2. interviewee name, title, length of tenure, and date interview was completed
3. pathways to service (three categories: traditional, alternative, temporary)
4. types of license (name of license or certificate; availability of endorsement: yes or no)
5. alternative communication (Braille or sign required: yes or no)
6. number of preparation programs (for each: HI, VI, DB, O&M)

When data collection was about two thirds complete, we added two additional columns, importing the data for each state from public sources: (a) percentage of rural population and (b) median family income (data from U.S. Census Bureau, 2016a, 2016b).

Not surprisingly, maneuvering through the official SEA websites proved challenging. Some sites transparently provided sufficient information about certification and preparation programming, but some did not. Interviewees, however, provided sufficient data to complete records for all states, sometimes confirming and sometimes altering the information retrieved from SEA websites.

Completion of the spreadsheet, therefore, depended in part on completion of the interviews. Procedures for conducting the interviews are described next.

Interview Protocol

As anticipated, interviews proved helpful for several reasons:

1. Website representations were variable, were often insufficiently specific for the purposes of the present study, and were sometimes inaccurate (e.g., outdated).
2. The dynamics of state policy circumstances (i.e., the negotiations that play out in political, professional, and organizational culture in legislatures, professional organizations, IHEs, and SEAs)[10] were not even hinted at on websites.
3. The study sought information about preparation programs (e.g., number of programs) *as reported by state directors or designees.*

Interviews were difficult to schedule; the target population is famously busy. Because the research team wanted to keep interviews short and at the same time produce maximally useful information, structured interviewing (brief-answer questions posed in a fixed order) was used. Questions were specific, but also permitted elaboration in response. The team drafted questions and, after several revisions, adopted the following set:

1. How many teacher preparation programs in your state offer VI licenses and endorsements? How

many teacher preparation programs in your state offer HI licenses and endorsements? How many teacher preparation programs in your state offer DB licenses and endorsements?
2. Is the preparation a license or an endorsement? How do you define endorsement? How do you ensure equivalence of programming, preparation, and competence?
3. Do you offer a DB endorsement or license? Why or why not? If not, what licensures allow teachers to work with DB students?
4. What are the requirements to become a highly qualified teacher in VI? What are the requirements to become a highly qualified teacher in HI? What are the requirements to become a highly qualified teacher in DB?
5. Do you offer temporary or emergency licenses that allow instructors to teach VI? Do you offer temporary or emergency licenses that allow instructors to teach HI? Do you offer temporary or emergency licenses that allow instructors to teach DB?
6. To what extent are students served by teachers who are not fully credentialed in VI? To what extent are students served by teachers who are not fully credentialed in HI? To what extent are students served by teachers who are not fully credentialed in DB?
7. Can alternative routes lead to specialized licensure for HI? Can alternative routes lead to specialized licensure for VI? Can alternative routes lead to specialized licensure for DB?
8. Are teachers of the visually impaired required to be trained in Braille? Are teachers of the hearing impaired required to be trained in sign language?

Interviews were secured in 45 states (see the Findings section for further detail). Interview data were recorded as notes on interview documents. These documents, together with relevant artifacts and the completed website data sheets, were placed in a shared documents folder. Researchers completed the interviews in December 2015. Data were prepared for analysis in February 2016.

Data Analysis Plan

Quantitative analysis summarized patterns in certification and preparation programming in four LISD fields (VI, HI, DB, O&M) for all 50 states ("What *are* the state provisions for licensure and professional preparations across the nation?"). These patterns are characterized by descriptive statistics: frequencies, means, and standard deviations. Additionally, the quantitative analysis explored relationships among variables, particularly for two key variables: certification and preparation programming ("In a national frame of reference, what is the relationship between licensure provisions and professional preparation programs in HI, VI, DB, and O&M?"). Descriptions of these key variables follow.

For certification, the key variable was "certification regime." This variable was analyzed to disclose the characteristics of states (e.g., population) associated with choice of certification regime (endorsement vs. certification). For this analysis, "endorsement" means an add-on LISD field for either initial or later licensure. "Licensure" in this instance identifies a certification regime in which LISD endorsement is *not* an option.

For programming, the key variable was "program intensity," a researcher-derived variable computed as the ratio of the total number of VI, HI, DB, and O&M programs to state population in millions. Program intensity served as an indicator of a state's capacity to supply LISD teachers to its residents. As with the analysis for certification regime, this analysis disclosed the characteristics of states associated with differences in program intensity.

Findings

The present study offers quantitative findings about (a) HI and VI certification arrangements and (b) HI, VI, DB, and O&M preparation programs across the 50 states, including program intensity. The narrative in this subsection uses the standard two-letter abbreviations as well as the full names of states.

Caveats and Limitations

Quantitative (numerical) data come principally from SEA websites and SEA interviews, supplemented with online searches of programs for five states (CT, ME, NM, NY, and SC) for which the study was unable to obtain any interviews, even after considerable effort.[11]

We did not attempt to fact-check the data supplied by interviewees. (Fact-checking of interviewees is not typical in this type of inquiry.) Indeed, the literature review demonstrates that fact-checking is a difficult, if not dubious, effort in this domain (cf. Benedict et al., 2011; Bowen & Stearns, 1992; Ludlow et al., 2005). The study's findings are limited by the decision to accept SEA data as authoritative, and by the substantive authority of interviewees.

For the present study, we had planned to interview state special education directors (or designates) in all states, with the idea that they were the officials best positioned to speak with authority. But we were able to inter-

view just five state special education directors (MA, MS, MO, ND, OK), about 8% of all those who participated in interviews.

The remaining interviewees[12] occupied other positions. About 40% of the interviewees were certification experts; about 40% (including the five state directors) were substantive experts; about 20% had more generic titles. In several states, we interviewed two or even three experts. Interviewees in four states included experts in higher education or at state schools or projects outside the relevant state agency. (For example, licensure in some states is granted by standards boards and not the SEA itself.)

Because of the diversity of interviewees' positions and experiences, their remarks reflect a variety of outlooks. Their remarks are not, therefore, equally authoritative or likely to be fully informed on all interview questions. In seven states, interviews could not be conducted by telephone, and, after many attempts at contact, the study was forced to accept e-mail responses to the 11 questions. In addition to answering factual questions, interviewees freely offered observations in response to some questions, particularly questions 7 and 8.

As a result of these limitations, some readers may discover that the reported numbers are not exact for their state. We cannot claim that the study's data are superior to those reported in previous studies (e.g., Ludlow et al., 2005), but they are more current. As for the strong national patterns we uncovered, our findings may better represent the general reality.

Finally, the state is the unit of analysis in the present study. The number of cases is small. Our defense is that the data are unique to states: They are not produced by "rolling up" the data for subunits. Certification provisions are created by states alone (Angus, 2001). And those regimes are specific to individual states. In addition, the certification regimes (via the approved program model) influence the design and conduct of LISD programs within the states, so those programs are also features of states and not of subunits. The data presented here do not constitute a sample, even if (as noted) they likely embed error.

The regression analyses reported below also adopt $p < .10$ as the significance level. Readers can judge if this choice (instead of $p < .05$) is appropriate. We believe it is, in light of the facts that (a) the necessarily small roster of states produces a small population and that (b) the roster is not a sample (so sampling error and statistical significance are not relevant). In this light, $p < .10$ seemed reasonable to the research team.

Findings About Certification

Nearly all states offer certification in both HI and VI. The single exception is New Mexico, which does not provide a certification in HI. As the analysis will show, however, the existence of certification does not imply the existence of *any* LISD programs in a state (see the discussion below, under "Findings About Numbers of Preparation Programs").

DB certification is offered in just three states: Illinois, Massachusetts, and Utah. The Texas interviewee claimed that the SEA was discussing the possibility of offering *certification.* (A DB *preparation* program reportedly exists in Texas.) Pennsylvania had been exploring DB certification, but as of late 2015 the plans had been dropped.

All interviewees noted that O&M certification was national, through the Association for Certification of Vision Rehabilitation and Education Professionals. In general, states authorize such professionals for work in schools on that basis.

The most remarkable finding with respect to certification is the distinction between those states that license LISD fields per se (i.e., as a stand-alone credential) and those that authorize them as endorsements (i.e., as add-on credentials to an existing primary license). The study's interview data, with respect to LISD fields, suggest that there is a complete separation of endorsement states from licensing states. That is, taking into account the previously explained caveats, there are 29 endorsement states (AL, AK, AR, CO, CT, DE, GA, HI, ID, IL, IA, KS, LA, ME, MI, MS, MT, NE, NV, NH, NJ, ND, TN, UT, VA, VT, WA, WV, WY) and 21 licensure states (AZ, CA, FL, IN, KY, MD, MA, MN, MO, NM, NY, NC, OH, OK, OR, PA, RI, SC, SD, TX, WI).

Certification regimes that widely deploy endorsements apparently presume that an existing licensure, of whatever sort, qualifies a teacher for a preparation program leading to endorsement, and such programs (a) by definition are often conducted at the postbaccalaureate level, even when the specific content is identical to that required of undergraduates in a licensure regime in another state; (b) typically are of shorter duration (e.g., 1–2 years, as opposed to 4); and (c) often consist of fewer courses. These inferences point to strategic considerations (certification regime choices, pipeline tactics) useful for policymaking.[13]

Data analyses show that the prevailing certification regime (licensure or endorsement) is related to demographic context, most notably a state's total population. Table 1 contrasts the group of 21 licensure states with the group of 29 endorsement states on three contextual features from the 2010 U.S. Census: (a) total population, (b) percent rural population, and

Table 1
Certification Regimes: A Comparison of Ohio and Five Neighboring States

	Population		Percent rural		Income	
Regime/state	*M*	*SD*	*M*	*SD*	*M*	*SD*
Licensure	9,381,105	8,991,229	22%	12%	$53,193	$9,209
Endorsement	3,832,434	3,306,808	29%	16%	$51,909	$7,017
Ohio	11,536,504		22%		$46,398	
Pennsylvania	12,702,379		21%		$53,952	
Kentucky	4,339,367		42%		$42,158	
Indiana	6,483,802		28%		$50,553	
Michigan	9,883,640		25%		$48,801	
West Virginia	1,852,994		51%		$40,241	

Source. U.S. Census Bureau (2011, 2012).

(c) median household income. As an illustration, relevant to policymaking, Table 1 also compares Ohio to its five neighboring states on these contextual features.[14] Three of the five are licensure states (IN, KY, PA) and two are endorsement states (MI, WV).

In a national frame of comparison, endorsement states have smaller populations, are somewhat more rural, and are somewhat less affluent than licensure states (see Table 1). Using pooled variance shows that the observed difference in population size is equal to about 0.80 standard deviations (r = .40). The equivalent estimates for magnitude of difference are 0.49 standard deviations (for percent rural, r = .25) and 0.15 standard deviations (for household income, r = .08). The relationship with population is moderate, weaker for rurality, and small for income. In short, endorsement states are, overall, substantially less populous, somewhat more rural, and a bit less affluent than licensure states.

In the context of such variability, it is worth nothing that the six most rural states (44% to 61% rural: AR, ME, MS, MT, VT, WV) use endorsements with LISD fields. By contrast, the six most urbanized states (5% to 9% rural) are equally split between endorsement regimes (NJ, HI, NV) and licensure regimes (CA, FL, RI).

Findings About Numbers of Preparation Programs

Findings about preparation programs are more complex than those for certification programs. Appendix A provides a summary of the number of program offerings by state.[15]

About half the states (n = 26) reported having institutions of higher education (IHEs) that provide *both* HI and VI programs: AL, AZ, CA, CO, FL, IL, IN, KY, MA, MI, MO, NE, NH, NJ, NY, NC, ND, OH, PA, SC, TN, TX, UT, VA, WV, WI). Judging from the reports, about one quarter of the states (n = 12) *lack IHEs that provide any LISD programs at all* (AK, CT, DE, IA, KS, ME, MT, NV, RI, VT, WA, WY). About 15% of states (n = 7) reported that IHEs provide HI programs only (GA, HI, ID, MD, MN, MS, OK), and 8% (n = 4) reported that IHEs provide VI programs only (LA, NM, OR, SD).

About one quarter of the states (n = 12) reported the presence of IHEs offering O&M programs (AR, CA, CO, FL, IL, MA, MO, NE, NY, NC, PA, TX). All but Arizona *also* offer both HI and VI programs.

Interviewees reported that 5 states (FL, GA, NC, TX, UT) have IHEs with DB programs.[16] The only states that offer at least one program each in HI, VI, DB, and O&M are Florida, North Carolina, and Texas.

Nationwide, as one can see from this narration and from inspection of Appendix A, LISD programs are rare indeed. Even at a superficial level, the rarity is complicated. Almost one quarter (n = 12) of the states reported that just one program in HI and one in VI exist across all their many IHEs: AZ, AL, CO, IN, KY, MA, MI, NH, NJ, ND, SC, and VA. Surprisingly, *most states* in this group had a total 2010 population greater than the median for all states (4,533,372); only three states (KY, NH, ND) had lower populations. One might have anticipated that a large population base would support more extensive programming, but it does not. (Subsequent discussion will highlight Ohio as an example.) Indeed, Michigan—reportedly with just one program each (and none in DB or O&M)—has a population greater than the median for all licensure states. (See Appendix A; it should be recalled that population is strongly related to certification regime—LISD endorsement states are smaller in general.)

Almost one third of the states (n = 16) have IHEs that offer more than two programs: CO, GA,[17] MA, OH, WV,

WI (3 programs); MO, NE, UT (4 programs); IL (5 programs); FL, NC, TN (6 programs); PA (7 programs); NY (8 programs); and TX (12 programs).

The data in Appendix A and the counts provided in the foregoing discussion suggest the possibility that the total number of programs offered in a state is related to the total population of the state. The same contextual variables described above under "Findings About Certification" were available for exploration here.

Table 2 presents only those variables with moderate-to-strong magnitude. In addition to those presented, the present study also examined population density, geographic area, and median household income. Those variables showed a negligible relationship to the number of programs provided. The strongest among the variables not reported in Table 2 was the state's geographic area in square miles (r = .12).

The variables in Table 2 exhibit a notable relationship to the number of programs offered in a state. Of these, by far the strongest is total population (r = +.84). This magnitude means that total state population alone explains 71% of the variance in the number of programs offered across the nation (the square of the correlation statistic): the larger the population, the more programs offered. At the same time, certification regime (licensure = 0, endorsement = 1) is negatively correlated at r = –.40: Licensure regime is associated with fewer programs, and endorsement with more programs. Similarly, a higher proportion of rural population is associated with fewer programs, though to a modest degree. More pertinent than bivariate relationships, however, is how these contextual influences operate *jointly*.

Sheer number of programs, though, is not a useful measure in itself. Rather, the capacity of whatever number of programs exists in a state *relates to the size of the population to be served*.[18] In this framework, population functions quite differently, and more usefully—to indicate *capacity to provide adequate service* (a free and appropriate public education for students with HI, VI, and DB).

Table 2
Findings of Moderate-to-Strong Bivariate Relationships

	Programs	*Regime*	*Population*
Certification regime	–.40		
State population	.84	–.40	
Percent rural	–.31	.25	–.45

Findings About State Program Intensity

The more programs per unit of population, the more educators a state's IHEs will supply for schools and students, all else equal. Compare, for instance, a state with a population of 10 million in which IHEs offer four programs to a state with a population of 1 million in which IHEs offer two programs. Which of these states exhibits the greater capacity to supply its schools and students with qualified educators? The one with higher program intensity: the second of these two. We compute *program intensity* (PI) as a ratio: for instance, four programs/10 million as compared (for example) to two programs/1 million: 4/10 (0.4) as compared to 2/1 (2.0). The smaller state has a program intensity *five times* that of the larger state, even though it has fewer programs.

The hypothetical comparisons just given, however, match almost exactly the program intensity levels in actual states: for instance, Nebraska (four programs in a population of 1.8 million, = 2.19 PI) and Texas (12 programs in a population of 25.1 million = 0.48 PI). Many states are like Texas (low PI), and comparatively few like Nebraska (high PI).

The data in Appendix B show that, on the one hand, seven states (ND, NE, WV, NH, UT, SD, TN) exhibit a PI of about 1 or greater. On the other hand, 12 (those where IHEs reportedly offer no programs) exhibit a PI of 0. In other words, PI is positively skewed (+2.37). Subsequent analysis will not include the 12 states with PI = 0. (Skew for that distribution, however, is the same, at +2.40.)

For states with IHEs that reportedly offer at least one program (n = 38), intensity ranges from a low of 0.17 (MD) to a high of 2.97 (ND). North Dakota's 2.97 puts the state more than four standard deviations above the mean for all 50 states, but the states with no reported programs are just one standard deviation below the mean (a fact that reflects the overall positive skew).

How does program intensity, measured with total population, translate to school-aged children (ages 5–18 years)? In 2010, approximately 18% of the total U.S. population was between the ages of 5 and 18 (U.S. Census Bureau, 2016c). North Dakota, with the highest PI (2.97), had a total population of 672,951; 18% of that is 121,131. If students with HI, VI, and DB make up about 0.25% of that population (C. Howley & A. Howley, 2016), we might roughly estimate the North Dakota student population with HI, VI, and DB at about 300 students.

In other words, the North Dakota student-based PI (on this estimated basis) would translate to roughly 300

LISD students per preparation program. Maryland, with a PI of 0.17 and a total state population of 5,773,552 (about 80 times that of North Dakota), would have an estimated 2,600 students with HI, VI, or DB.[19] But Maryland reportedly has just one HI program, so PI translates to 2,600 students per preparation program as compared to North Dakota's 300 per program. These figures are rough estimates, of course. But the difference between roughly 2,600 and roughly 300 has practical importance (even if the "true" figures are somewhat different from these rough estimates).

The implications can be shocking. For an illustration, we now turn to Ohio—a famously average state in many ways. For Ohio to exhibit program intensity equal to that of North Dakota, *Ohio IHEs would need to field about 16 HI, VI, DB, and O&M programs,* more than the most offered in any state (i.e., Texas, with its 12 programs) and four times as many as IHEs currently offer in Ohio (see Appendix B).

This estimation does not mean that Ohio IHEs *should* add 12 programs to the 4 currently existing. But the "shocking" calculation nonetheless *does* provide a real-world context, since North Dakota *actually* provides this program intensity—and in a lightly populated rural state. It sets a very high standard for our illustrative state (PI = 2.97 vs. PI = 0.35), and, indeed, for all other states.[20] Next, we report regression results that provide estimates that are less shocking but perhaps even more troubling.

With so much variability, it would be useful to see if we could identify practically and statistically significant influences on program intensity. What contextual features might be related to program intensity? What proportion of the variance in program intensity might be associated with such features? Regressing program intensity on contextual variables might produce practically useful findings.

We assembled a range of possible influences and investigated their combined relationship to program intensity. The result is a prediction equation based on data for the 38 states with program intensity measures. Table 3 provides descriptive statistics for the variables assembled for the study and used in the analysis.

The variables new to the discussion include

1. Per pupil expense in 2010 (PPEXP).
2. Per pupil special education expense (PPEXP-SE, in 2010 dollars, for special education salaries divided by the number of special education students).
3. The ratio of these two variables (SPED RATIO, a measure of the intensity of special education expenditures given overall expenditures).
4. The state's Gini coefficient (based on the distribution of household incomes in 2010—*Gini* is a well-known measure of degree of income equality that varies in magnitude from 0, for complete equality, to 1, for complete inequality).

Table 3
Descriptive Statistics for Program Intensity and Selected Context Variables

Variable[a]	*M*	*Mdn*	*SD*	*Min*	*Max*	*Ohio*[b]
PI	.64	.45	.60	.17	2.97	.35
Regime	.47	.00	.51	0	1	0
PPEXP	$11,068	$10,724	$2,073	$7,042	$16,239	$11,719
PPEXP-SE	$4,622	$4,432	$1,938	$1,905	$12,198	$5,442
SPED RATIO	.41	.42	.13	.19	.75	.46
Income	$52,029	$52,328	$8,744	$39,622	$71,322	$46,398
Gini coefficient	.46	.46	.017	.42	.50	.45
Rural	25.42	26.00	13.069	5	51	22
School size	474	473	118	178	685	467
District size	10,863	3,834	29,266	538	179,60	12,852
Area (km^2)	160,640	136,850	120,867	16,630	676,600	105,800

Notes. N = 38 states with at least one low-incidence sensory disabilities program. PI = program intensity (programs per 1 million total population). Regime = state certification regime (endorsement = 1, licensure = 0). PPEXP = total expenditures per pupil, 2010. PPEXP-SE = special education salary expenditures per special education student, 2010. SPED RATIO = PPEXP-SE divided by PPEXP. Income = median household income, 2010. Gini coefficient = measure of household income inequality, 2010. Rural = proportion rural population, 2010. School size = total enrollment, 2010, divided by number of public schools, 2010. District size = total enrollment, 2010, divided by number of districts, 2010. Area = geographic area of state in square kilometers.

[a] Sources for variables (see reference list for full entries): Dependent variable: PI = interview data (*n* of programs), U.S. Census Bureau (2012). Independent variables: Regime = interview data. PPEXP = Kids Count Data Center (2015). PPRXP-SE = TA&D Network (2016), National Center for Education Statistics (NCES, 2016). SPED RATIO = PPEXP-SE/PPEXP. Income = U.S. Census Bureau (2012). Gini coefficient = U.S. Census Bureau (2011). Rural = U.S. Census Bureau (2011). School size = NCES (2013a, 2013b). District size = NCES (2013a, 2014). Area = U.S. Census Bureau (2016a).

[b] To keep data sources comparable, the study always used the number of programs reported by interviewees; in fact, in Ohio, one of the 3 hearing impaired programs reported by the interviewee had recently closed, but Ohio institutions of higher education also offer one orientation and mobility program not reported by the interviewee.

5. Average school size (2010 enrollment divided by number of schools).
6. Average district size (enrollment in 2010 divided by number of regular public school districts).
7. Area (geographic area of states in square kilometers). This array constitutes a collection of "usual suspects" in studies that attempt to account for contextual influences on a key policy variable (LISD program intensity, in the present case).

Features of the descriptive statistics given in Table 3 are worth highlighting, again with Ohio as an example. Program intensity for Ohio, compared to all 38 states that offer programs, falls *half a standard deviation below the mean.*

One can dig deeper. Again, Ohio: the amount of funding Ohio devoted to special education salaries per pupil (PPEXP-SE) is 0.42 standard-deviation units above the mean for the 38 states with LISD programs. And the ratio of per pupil special education to per pupil total expenditures is also above the mean for these states (equal to about 0.40 standard-deviation units). Income, however, is substantially lower than average: about 0.64 standard-deviation units. District size is also about 0.27 standard-deviation units smaller than average. The remaining variables (i.e., per pupil expenditure, Gini, percent rural, school size, area) are similar to the average for the group of 38 states.

Among this collection of variables, those with zero-order correlations to PI greater than $r = .10$ among the 38 states appear in Table 4, listed in order of the absolute value of the magnitude of r.

Table 4 harbors some apparent surprises, despite the simplicity of the analysis. Why, among such key contextual variables, should *school size* (but not district size, listed in Table 3) exhibit the strongest negative bivariate relationship to program intensity? And wouldn't one anticipate a positive, not a negative, influence of SPED RATIO? Why is household income (unreported in Table 4) so weakly related ($r = .09$, $p = .60$), but income inequality (Gini) so strongly related (–.51, $p = .00$)? And why is being an "endorsement state" positively related to program intensity? Although one might offer speculations and theories, we don't know. The study was designed to discover such relationships (or lack of relationships) rather than to explain them.

Table 4
Bivariate Relationships Greater Than $r = .10$ with Program Intensity

Independent variables	*r*	*p*
School size	–.55	.00
Gini coefficient	–.51	.00
Regime	+.34	.04
Rural	+.33	.04
PPEXP	+.23	.16
SPED RATIO	–.19	.26

Notes. $N = 38$. Correlations with PPEXP and SPED RATIO are not statistically significant. PPEXP = total expenditures per pupil, 2010. SPED RATIO = PPEXP-SE (special education salary expenditures per special education student, 2010) divided by PPEXP.

The final result of regression analysis designed to produce the smallest set of predictor variables exercising the largest joint relationship to program intensity appears in Table 5. In view of the small N, the analysis set $p < .10$ as the threshold for entry of variables in a stepwise procedure instead of the usual $p < .05$; all predictor variables in Table 4 were available for use in the regression.[21]

Table 5 shows that *school size*, *Gini*, and *regime* exert statistically significant influences on program intensity, and that the directionality (positive or negative) remains the same as in Table 4 (bivariate analysis). The larger the average school size in a state, the lower its program intensity. The influence (–.411) can be translated as follows: For every standard-deviation unit of change in school size (118 students), PI decreases by 0.41 standard-deviation units (~0.41 * .595 = –.24). Table 6 provides the three "translations" into respective changes to PI.

To summarize: *Across the nation, smaller schools, greater income equality, and fielding an endorsement regime are associated with pre-*

Table 5
Significant Influences on Program Intensity (Hierarchical Linear Regression)

Variables	*B*	*ß*	*t*	*p*
(Constant)	5.961		2.725	.010
School size	–.002	–.411	–2.914	.006
Gini	–9.833	–.279	–1.948	.060
Regime	.298	.253	1.966	.057

Notes. Significance levels for entry set at $p < .10$. $N = 38$. B = unstandardized regression coefficient (units are those of the original variable); ß = standardized regression coefficient (based on variables in standard-deviation units of the original variable); t = ratio of the coefficient to its standard error; p = significance level. Adjusted $R^2 = .43$.

Table 6
Changes to Program Intensity (PI) by Predictor Variable

Variable	*ß (SD units)*	*Δ PI (original units)*
School size	–.411	–.24
Gini	–.279	–.17
Regime	.253	+.15

dictably higher levels of program intensity.

The practical upshot is that the statistics in Table 6 define a prediction equation that can be used with existing state data to predict program intensity, all else being equal. Again, we illustrate this application with data for Ohio.

Values of the variables for Ohio are simply substituted in the equation. (This can be done for any state.)[22] The resultant PI value—the one the equation predicts for Ohio based on the state's school size, degree of income equality, and certification regime within a national context—can be translated into predicted numbers of LISD programs for the state, based on the national average situation as the standard.

Here is the equation (see Table 5 B-coefficients, not ß-coefficients) with the values for Ohio substituted in it ($\hat{y}$ = predicted value of program intensity; see Table 3 for the Ohio values of independent variables):

$$\hat{y} = -.002(\text{school size}) - 9.833(\text{Gini}) + .298(\text{regime}) + 5.961$$
$$\hat{y} = -.002(467) - 9.833(.452) + .298(0) + 5.961$$
$$\hat{y} = -0.934 - 4.445 + 0 + 5.961 = .582$$

One can contrast the predicted value for Ohio of PI = 0.58 with the actual value of 0.35. Based on its actual contextual features, then, Ohio exhibits a lower program intensity than predicted (based on characteristics derived from the values in all 38 states with reported LISD programs). What number of programs does the predicted value of .582 translate into? The calculation is simple: 11.54 * .582 = 6.72.

In other words, based on what is *normal* across the nation for the intensity of LISD programming *under the present inadequate provisions among 38 states with programs*, Ohio would operate seven LISD programs rather than the current four.[23] It should be noted that a very similar result would be obtained if one simply suggested that Ohio should achieve the average PI (0.64) for all 38 states. Ohio does poorly by this standard, and so do many other states (e.g., larger Florida would need to offer 12 programs instead of its reportedly current 6).

Summary of Findings

Findings for certification and for preparation programming distill the complex national practices into useful information for policymaking in the LISD fields. Although such practices are complex, the study was able to clarify key features. These include the concepts of *certification regime* and *program intensity.*

Certification Regime

Nearly all states reportedly offer certification in both HI and VI. DB certification is reportedly offered in just three states. More important than which fields are certified, however, is the *certification regime* prevailing in states: endorsement versus licensure.

With respect to LISD fields, the separation of "endorsement states" from "licensing states" is complete, according to information provided by study informants: There are 29 endorsement states and 21 licensure states. (Ohio, our illustrative case, is a licensure state.) Endorsement regimes make adding certifications (e.g., in HI, VI, and DB) to existing fields easier, whereas licensure regimes make it more difficult to do so. Empirically, nationwide, the licensure model is negatively related to LISD program intensity.

The choice of regime by a state is not accidental. Total population, percent rural population, and household income predict regime to some extent. Licensure states (like Ohio) have, on average, larger populations, are less rural, and have somewhat higher household incomes.

Program Intensity

The relationship of program offerings to certification regime is not immediately obvious from the data because the number of programs offered in HI, VI, DB, and O&M is strongly related (r = .84) to a state's population. On average, larger states offer more programs. Texas, for instance, offers the most programs; it has a population of 25.1 million and 12 programs. Remarkably, 12 states offer no programs at all, and some of these states are quite populous. With 6.7 million people, Washington has the most residents of any of these 12 states.

But population and number of programs can be combined in a useful way, in the form of the *ratio of programs to population.* The argument is that the higher such a ratio, the greater the state's capacity to supply trained LISD professionals to local districts. We calculated the ratio as programs per million total population and labeled it *program intensity*. Across the 38 states with at least one program,

program intensity varies from 0.17 (MD) to 2.97 (ND).

The Relationship of Certification Regime and Programming

Being an endorsement regime state is one of three relevant features of states that predict program intensity. The other two influences are school size and income equality. Being an endorsement regime state correlates with program intensity to a moderate degree (r = .34).

Discussion and Recommendations

The most remarkable feature of the literature reviewed is an inference that the poor supply of professionals indicates a lamentable level of apathy across the states and the nation as a whole. To the contrary, however, the study's findings suggest that, overall and nationwide, endorsement arrangements—along with smaller schools and greater income equity—are associated with better state-level supplies of such professionals.

In other words, evidence suggests that the nationally poor supply of LISD professionals is not accidental, but is at least related to conditions that vary across states. Two of the three state-level influences that emerged from the present study are within the direct control of education policymaking, and one—use of endorsement—is primarily discursive: *a practice of (official) language*. To change it, policy actors *change what the words governing certification say*. It is a no-cost, or at least low-cost, policy move that bodes well for improving the supply of LISD professionals.

Quite likely, opponents of the change would cite concerns about program quality. The longer study from which the present work is drawn summarized the literature related to that issue (C. Howley & A. Howley, 2016). In brief, though, program quality depends on design, its elements are well known (see, e.g., Rosenberg & Sindelar, 2005), and they *can* be and *already are* accommodated in endorsement programs in other states.

Funding additional LISD endorsement programs (in any state) does, of course, require a struggle: a different one from the one to change policy language, but certainly a related one. That work is vexing and grubby, compared to the high-minded nature of inquiry. Yet we find from the present research that four recommendations suggest themselves:

1. *State-level policy actors should use the results of the present study to gauge the situation in their own states.* By the low-standard method, both Ohio and Florida should double the number of programs offered by their IHEs. But the high-standard method of measuring program intensity (see North Dakota) can also be used. It seems clear that having more programs makes sense almost everywhere. Even North Dakota might find it profitable to seek greater reach in its programs (e.g., to supply remote parts of the state with trained professionals).
2. *National organizations should organize to develop and support new LISD programs in the states.* Why? Sometimes very simple statistics provide powerful evidence. The positive skewness of program intensity is a graphic illustration of a national shortfall of LISD programs. State-level efforts alone are inadequate.
3. *High-quality programs that lead to endorsement-style certification should be designed.* Establishing endorsement as a LISD norm removes needless barriers to preparation without compromising quality. In licensure regime states, this new norm would provide an advantage to all future efforts to fill difficult-to-staff fields.
4. *Subfield specialization should be abandoned in the name of improved LISD service.* This recommendation goes beyond the study data, but draws on our experience and advocacy work. As we observe in note 6, at least two states have implemented generic sensory-disability programs (combining visual impairment and sensory impairment in a program of typical, not double, length). Such an endorsement could provide a measure of relief and improvement in local districts, especially if candidates were recruited from among teachers already employed in those districts. This model might prove widely applicable, in view of the need for professionals dedicated to supporting students with LISD in general education classrooms.

The failure of IHEs in 12 states to provide any programs at all is professionally irresponsible.[24] But many other states have IHEs that operate too few preparation programs. They can all blame poor funding, but one-size-fits-all certification language is also irresponsible. Action depends on coalitions, allies, strategies, and tactics for pioneering and deploying alternatives and securing state and national legislative action. Working to develop suitable certification policies can help develop the coalitions, alliances, strategies, and tactics needed to secure sustainable funding for LISD

programs. More work is clearly in order, nationwide.

Notes

1. This work was supported in whole or in part by the U.S. Department of Education, Office of Special Education Programs (Award H027A 160111, CFDA 84.027, awarded to the Ohio Department of Education) under University of Dayton Subgrant R-21494. The opinions expressed herein do not necessarily reflect the policy or position of the U.S. Department of Education, Office of Special Education Programs; or the Ohio Department of Education, and no official endorsement by the departments should be inferred.

2. The present article is part of an ongoing effort by professional educators in Ohio to engage with challenges in their own state. That effort has included research and dissemination activities as well as persistent advocacy. This article, in fact, reports just one part of a larger study that assessed (a) licensure and preparation nationwide and (b) the experiences of Ohio districts (traditional districts and charter schools) in providing services. In this article, and for a national audience, we focus on the first part: a national view of provisions for licensing and preparing LISD professionals. The full report, *Improving Service to Students With Low-Incidence Sensory Disabilities in Ohio: A Mixed-Methods Study to Examine National Context and District Experience* (C. Howley & A. Howley, 2016), is available at http://www.wordfarmers.com/publications.html.

3. Prior to the establishment of statewide certification, county superintendents often issued teaching certificates (Angus, 2001).

4. These 19 states are AZ, CO, GA, IL, IA, KS, KY (gifted only), ME, NE, NJ, RI), SD, TN, UT, VT, VA, WA, WV, and WY (Kaye, 2013). Although the specifics vary widely from state to state, the principle is clear: Already-certified teachers can, in these states, more readily add endorsements to existing licenses than they can add fields that require complete approved programs from the beginning.

5. Rosenberg and Sindelar (2005) aptly observe that "teacher preparation may best be represented as a continuum along which *the point where alternative ends and standard begins is uncertain*" (p. 118; emphasis added). In other words, program design on the basis of the professional standards that define quality (broadly characterized by Rosenberg & Sindelar, 2005) forms a continuum in which the use of varied, but approved, arrangements often renders the distinction between "traditional" and "alternative" more problematic than is usually appreciated.

6. A generic LISD endorsement is one alternative to makeshift improvisation. Two states—Illinois and Nebraska—receive external funding for generic sensory disability preparation programs (e.g., HI, VI, and DB combined in one certificate). For Nebraska, see Buck (2016).

7. Of consequence for both the number of programs for HI and the number of programs for interpreter training was the 1963–1965 rubella epidemic, which increased incidence threefold (Dolman, 2010). Dolman (2010) concluded that the ratio of graduates to the school-aged population with hearing impairment had remained comparatively steady since 1985, although the ratio declined from 1:30 in 1976 to 1:56 in 2006. *In other words, teachers of students with hearing impairments were, by 2006, about half as common, on this basis, as they had been 40 years before* (see Dolman, 2010, Table 5, p. 335).

8. For instance, a Teach for America–like approach to securing more teachers, and better statewide spread of teachers for students with LISD, would clearly not meet the requirements of free appropriate public education or least restrictive environment. Nor would a meager 12–credit hour program that lacked any clinical component.

9. In the process of addressing this question, the present study answers another question: What *are* the state provisions for licensure and professional preparations across the nation?

10. Of particular interest, given the findings of the literature review, are those dynamics and provisions (if any) reported by interviewees to be relevant to the durable challenges of providing free appropriate public education in the least restrictive environment to students with LISD.

11. The quantitative information sought in interviews was whether or not the preparation programs in the state required course work in alternative communication (i.e., Braille or American Sign Language). Two of these states (CT, ME) offered no programs in HI or VI and were coded accordingly (i.e., nonexistent programs cannot impose requirements). Internet searches located courses of study for programs in the other three states (NM, NY, SC). HI and VI programs in those states did require the relevant alternative communication course work. (New Mexico reportedly offered a program only in HI.)

12. Across the 45 states for which interviews proved feasible, 66 people participated in interviews. (A few states needed two interviews—but more often a single interview with multiple participants would involve two or three participants.) Inferring expertise from titles is, of course, a matter of judgment.

13. For instance, adopting an endorsement model for LISD fields and creating programs that recruit local ed-

ucators to add LISD endorsements—especially programs designed to supply trained professionals to poorly served school districts. Developing such programs, moreover, could involve such innovations as dual licensure, a more general sensory-impairment endorsement, and multi-institutional sponsorship. Such policy moves have been uncommon in LISD fields (see, e.g., Ludlow et al., 2005).

14. State-level policy discussion typically focuses on comparisons with contiguous states (see, e.g., Marshall, 1989).

15. Readers should keep in mind that nearly all states certify in LISD fields, but (as the present analysis shows) this fact does *not* imply that a state has IHEs that offer programs in any of the LISD fields.

16. This list differs from the 2015 list of four states (AZ, CA, NY, TX) provided by the recent Gallaudet report ("University and College Programs," 2015).

17. Georgia reportedly offers two HI programs, none in VI, and one in DB (see Appendix A).

18. Arguably, the number of LISD students served by programs in a state would also have a bearing, but we did not have access to that information, and analyses not within the scope of this report demonstrate the difficulty of making such estimates (see C. Howley & A. Howley, 2016).

19. 5,773,553 * .18 * .0025 = 2,598

20. It is perhaps worth noting that if one of these programs closed, that high standard would deteriorate, but even then, North Dakota's program intensity would still be high relative to that of all other states.

21. Arguably, however, significance levels (*p* values) are irrelevant when an analysis uses data for an entire population (in this case, all relevant states). There are, indeed, no other states to which the data might be generalized, However, such procedures are necessary to avoid developing an equation so confounded by multiple collinearity that it cannot be relied upon. Variance inflation factors for the equation in Table 5 are all under 2.5.

22. For this demonstration, it is more appropriate to use the unstandardized version of the equation with the unstandardized values given in Table 5 (i.e., instead of the standardized version based on a transformation of values into standard-deviation units).

23. Based on the totals for the 38 states with programs, HI programs slightly outnumber VI programs (by a ratio of 1.21 to 1).

24. Certainly, large portions of CT, DE, MD, and CT are in the East Coast metroplex (as are regions of MA, NY, PA), but it should be noted (see Appendix B) that program intensity for those metroplex states is mediocre: Service provision to their own large populations is not good, and will be predictably poor in their rural areas.

References

Ambrose-Zaken, G., & Bozeman, L. (2010). Profile of personnel preparation programs in visual impairment and their faculty. *Journal of Visual Impairment and Blindness, 104*(3), 148–168.

Angus, D. L. (2001). *Professionalism and the public good: A brief history of teacher certification* (J. Mirel, Ed.). Washington, DC: Thomas B. Fordham Foundation. Retrieved from http://files.eric.ed.gov/fulltext/ED449149.pdf

Bales, B. (2006). Teacher education policies in the United States: The accountability shift since 1980. *Teaching and Teacher Education, 22*(4), 395–407.

Benedict, K. M., Johnson, H., & Antia, S. D. (2011). Faculty needs, doctoral preparation, and the future of teacher preparation programs in the education of deaf and hard of hearing students. *American Annals of the Deaf, 156*(1), 35–46.

Bowen, M. L., & Stearns, K. E. (1992). *Low-incidence special education teacher preparation: A supply and capacity pilot study*. Normal: Illinois State University. Retrieved from http://files.eric.ed.gov/fulltext/ED355706.pdf

Boyd, D., Grossman, P., Hamilton, L., & Wyckoff, J. (2006). How changes in entry requirements alter the teacher workforce and affect student achievement. *Education Finance and Policy, 1*(2), 176–216.

Buck, K. (2106, May 2). $1.1M grant to expand sensory disabilities education. Retrieved from Nebraska Today website: http://news.unl.edu/newsrooms/unltoday/article/11m-grant-to-expand-sensory-disabilities-education/

Clarke, B. R. (1985). The training of teachers for low-incidence handicaps. *BC Journal of Special Education, 9*(2), 105–110.

Corn, A., & Spungin, S. (2003). *Free and appropriate public education and the personnel crisis for students with visual impairment and blindness.* Gainesville: University of Florida, Center of Personnel Studies in Special Education. Retrieved from http://copsse.education.ufl.edu/copsse/docs/IB-10E/1/1B-10E.pdf

Dolman, D. (2010). Enrollment trends in deaf education teacher preparation programs, 1973–2009. *American Annals of the Deaf, 155*(3), 353–359.

Feistritzer, E. C. (2009). Teaching while learning: Alternate routes fill the gap. *Edge*, *5*(2), 3–15. Retrieved from California Teacher Corps website: http://www.cateachercorps.org/downloads/teaching_while_learning_alternate_routes_fill_the_gap.pdf

Howley, C., & Howley, A. (2016). *Improving service to students with low-incidence sensory disabilities in Ohio: A mixed-methods study to examine national context and district experience.* Albany, OH: WordFarmers Associates. (ERIC Document Reproduction Service No. ED570178). Retrieved from http://www.wordfarmers.com/publications.html

Huebner, K., & Strumwasser, K. P. (1987). State certification of teachers of blind and visually impaired students: Report of a national study. *Journal of Visual Impairment and Blindness, 81*(6), 244–250.

Johnson, H. (2013). Initial and ongoing teacher preparation and support: Current problems and possible solutions. *American Annals of the Deaf*, *157*(5), 439–449.

Kamenopoulou, L. (2012). A study on the inclusion of deafblind young people in mainstream schools: Key findings and implications for research and practice. *British Journal of Special Education, 39*(2), 137–145.

Kaye, E. A. (2013). *Requirements for certification of teachers, counselors, librarians, administrators for elementary and secondary schools* (78th ed.). Chicago, IL: University of Chicago Press.

Kids Count Data Center. (2015). *Per pupil educational expenditures adjusted for regional cost differences: 2010*. Retrieved from http://www.datacenter.kidscount.org/data/tables/5199-per-pupil-educational-expenditures-adjusted-for-regional-cost-differences#detailed/2/252/false/133/any/11678

Lenihan, S. (2010). Trends and challenges in teacher preparation in deaf education. *Volta Review, 110*(2), 117–128.

Linehan, P. (2000). *Selected state strategies for addressing personnel shortages in the area of VI* (Quick Turnaround Report). Alexandria, VA: Project FORUM at the National Association of State Directors of Special Education.

Luckner, J., & Muir, S. (2002). Suggestions for helping students who are deaf succeed in general education settings. *Communication Disorders Quarterly, 24*(1), 23–30.

Ludlow, B., Conner, D., & Schechter, J. (2005). Low-incidence disabilities and personnel preparation for rural areas: Current status and future trends. *Rural Special Education Quarterly*, *24*(3), 15–24.

Marshall, C. (1989). *Culture and education policy in the American states*. Bristol, PA: Falmer.

Mason, C. (2000). Shortages of personnel in the low-incidence area of blindness: Working and planning together. *Teaching Exceptional Children, 32*(5), 91–94.

Müller, E. (2005). *Deaf and hard of hearing: State infrastructures and programs*. Alexandria, VA: Project FORUM at the National Association of State Directors of Special Education.

National Center for Education Statistics. (2013a). *Enrollment in public elementary and secondary schools, by region, state, and jurisdiction: Selected years, fall 1990 through 2023* (Table 203.20). Retrieved from https://nces.ed.gov/programs/digest/d13/tables/xls/tabn203.20.xls

National Center for Education Statistics. (2013b). *Public elementary and secondary schools, by level, type, and state or jurisdiction: 1990–91, 2010–11, and 2011–12* (Table 216.70). Retrieved from https://nces.ed.gov/programs/digest/d13/tables/xls/tabn216.70.xls

National Center for Education Statistics. (2014). *Number of public elementary and secondary education agencies, by type of agency and state or jurisdiction: 2010–11 and 2011–12* (Table 214.30). Retrieved from https://nces.ed.gov/programs/digest/d13/tables/xls/tabn214.30.xls

National Center for Education Statistics. (2016). *Instruction expenditures: Special education salaries (E11B), state finance: 2010–11* [user-generated table]. Retrieved from https://nces.ed.gov/ccd/elsi/tableGenerator.aspx?savedTableID=16593

National Center to Inform Policy and Practice in Special Education. (2010). *Alternative- route special education certification program: An opportunity for school-university partnersbips.* Gainesville, FL: Author. Retrieved from http://ncipp.education.ufl.edu/files_9/teachereducators/TEII-4%20Alternative%20Route%20Special%20Ed%20Cert%20Progs.pdf

Office of Special Education Programs. (2015). *Number of students ages 6 through 21 served under IDEA, Part B, by disability and state, 2014–2015*. Washington, DC: U. S. Department of Education, Office of Educational Research and Improvement. Retrieved from http://www2.ed.gov/programs/osepidea/618-data/static-tables/2014-2015/part-b/child-count-and-educational-environment/1415-bchildcountandedenvironment-2.xlsx

Rosenberg, S., & Sindelar, P. (2005). The proliferation of alternative routes to certification in special education: A critical review of the literature. *Journal of Special Education, 39*(2), 117–127.

Smith, D., & Wild, T. (2006). Least restrictive environment for students with visual impairments. *Journal of Visual Impairment and Blindness, 99*(10), 592–593.

Summers, S., Leigh, L., & Arnold, J. (2006). Personnel shortage and caseload management of students with visual impairments: Children at risk. *Journal of Visual Impairment and Blindness*, *99*(10), 593–594.

TA&D Network. (2016). *Part B child count, 2010*. Retrieved from http://uploads.tadnet.org/centers/97/assets/2422/download

U.S. Census Bureau. (2011). *Household income for states: 2009 and 2010* (American Community Survey Briefs). Retrieved from https://www.census.gov/prod/2011pubs/acsbr10-02.pdf

U.S. Census Bureau. (2012). *Percent urban and rural in 2010 by state*. Retrieved from http://www2.census.gov/geo/docs/reference/ua/PctUrbanRural_State.xls

U.S. Census Bureau. (2016a). *2010 Census urban and rural classification and urban area criteria*. Retrieved from http://www2.census.gov/geo/docs/reference/ua/PctUrbanRural_State.xls

U.S. Census Bureau. (2016b). *Historical income tables: Households*. Retrieved from https://www.census.gov/hhes/www/income/data/historical/household/2014/h08.xls

U.S. Census Bureau. (2016c). *Quick facts United States: People*. Retrieved from http://www.census.gov/quickfacts/table/PST045215/00

University and college programs for personnel in deafness. (2015). *American Annals of the Deaf, 160*(2), 180–198. http://doi.org/10.1353/aad.2015.0016

Appendix A

Characteristics of Programming for Students With Low-Incidence Sensory Disabilities, by State

State	*Programs (N)*	*State population (2010)*	*HI*	*VI*	*DB*	*OM*	*BRL*	*ASL*
AL	2	4,779,736	1	1	0	0	0	0
AK	0	710,231	0	0	0	0	0	0
AZ	2	6,392,017	1	1	0	0	0	0
AR	1	2,915,918	0	0	0	1	1	0
CA	10	37,253,956	5	3	0	2	0	0
CO	3	5,029,196	1	1	0	1	1	1
CT	0	3,574,097	0	0	0	0	0	0
DE	0	897,934	0	0	0	0	0	0
FL	6	18,801,310	3	1	1	1	1	1
GA	3	9,687,653	2	0	1	0	1	0
HI	1	1,360,301	1	0	0	0	0	0
ID	1	1,567,582	1	0	0	0	0	0
IL	5	12,830,632	2	2	0	1	1	1
IN	2	6,483,802	1	1	0	0	0	1
IA	0	3,046,355	0	0	0	0	0	0
KS	0	2,853,118	0	0	0	0	0	0
KY	2	4,339,367	1	1	0	0	0	0
LA	1	4,533,372	0	1	0	0	1	1
ME	0	1,328,361	0	0	0	0	0	0
MD	1	5,773,552	1	0	0	0	1	0
MA	3	6,547,629	1	1	0	1	1	1
MI	2	9,883,640	1	1	0	0	1	0
MN	N	5,303,925	1	0	0	0	1	1
MS	1	2,967,297	1	0	0	0	1	0
MO	4	5,988,927	2	1	0	1	1	0
MT	0	989,415	0	0	0	0	0	0
NE	4	1,826,341	2	1	0	1	1	1
NV	0	2,700,551	0	0	0	0	0	0
NH	2	1,316,470	1	1	0	0	1	1
NJ	2	8,791,894	1	1	0	0	1	1
NM	1	2,059,179	0	1	0	0	1	0
NY	8	19,378,102	4	3	0	1	1	1
NC	6	9,535,483	3	1	1	1	0	0
ND	2	672,591	1	1	0	0	1	1
OH[a]	4	11,536,504	3	1	0	0	1	1
OK	2	3,751,351	2	0	0	0	1	1
OR	1	3,831,074	0	1	0	0	1	1
PA	7	12,702,379	3	3	0	1	0	0
RI	0	1,052,567	0	0	0	0	0	0
SC	2	4,625,364	1	1	0	0	1	1
SD	1	814,180	0	1	0	0	1	0
TN	6	6,346,105	3	3	0	0	0	0
TX	12	25,145,561	7	2	1	2	1	1
UT	4	2,763,885	2	1	1	0	1	0
VT	0	625,741	0	0	0	0	0	0
VA	2	8,001,024	1	1	0	0	1	1
WA	0	6,724,540	0	0	0	0	0	0
WV	3	1,852,994	1	2	0	0	0	0
WI	3	5,686,986	1	2	0	0	1	0
WY	0	563,626	0	0	0	0	0	0
U.S. total	123	306,827,345	123	62	42	5	14	27
U.S. mean	2	6,261,783	2	1	1	0	0	1

Notes. HI = number of programs reported in hearing impairment. VI = number of programs reported in visual impairment. DB = number of programs reported in deafblindness. OM = number of programs reported in orientation and mobility. BRL = whether (1) or not (0) VI programs reportedly requiring Braille course work. ASL = whether (1) or not (0) HI programs require course work in American Sign Language.

[a] To keep data sources comparable, the study always uses the number of programs reported by interviewees. In Ohio, the interviewee was unaware that one HI program had recently closed, but also did not report Ohio's O&M program.

Appendix B

Program Intensity (PI) by State (Ranked From High to Low Intensity)

State	PI	Regime	Rural	Programs (N)
ND	2.97	1	40	2
NE	2.19	1	27	4
WV	1.62	1	51	3
NH	1.52	1	40	2
UT	1.45	1	9	4
SD	1.23	0	43	1
TN	0.95	1	34	6
HI	0.74	1	8	1
MO	0.67	0	30	4
ID	0.64	1	29	1
NC	0.63	0	34	6
CO	0.60	1	14	3
PA	0.55	0	21	7
OK	0.53	0	34	2
WI	0.53	0	30	3
NM	0.49	0	23	1
TX	0.48	0	15	12
KY	0.46	0	42	2
MA	0.46	0	8	3
SC	0.43	0	34	2
AL	0.42	1	41	2
NY	0.41	0	12	8
IL	0.39	1	12	5
OH	0.35	0	22	4
AR	0.34	1	44	1
MS	0.34	1	51	1
FL	0.32	0	9	6
AZ	0.31	0	10	2
GA	0.31	1	25	3
IN	0.31	0	28	2
CA	0.27	0	5	10
OR	0.26	0	19	1
VA	0.25	1	25	2
NJ	0.23	1	5	2
LA	0.22	1	27	1
MI	0.20	1	25	2
MN	0.19	0	27	1
MD	0.17	0	13	1
AK	0	1	34	0
CT	0	1	12	0
DE	0	1	17	0
IA	0	1	36	0
KS	0	1	26	0
ME	0	1	61	0
MT	0	1	44	0
NV	0	1	6	0
RI	0	0	9	0
VT	0	1	61	0
WA	0	1	16	0
WY	0	1	35	0
M	0.49	0.58[a]	26.46	2.46

Notes. Regime = certification regime (endorsement state = 1, licensure state = 0). Rural = proportion rural population. For programs, *N* = number of programs reportedly offered by institutions of higher education in the state. The mean for states with programs ($n = 38$) is 0.64 and the standard deviation is 0.60.

[a] 58% of states are endorsement states.