An Examination of Features of Evidence-based Teacher Credentialing Systems

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Executive Summary

As requested by the Maine Legislature's Joint Standing Committee on Education and Cultural Affairs, the Maine Education Policy Research Institute (MEPRI) has conducted a study with the purpose of examining current research and policies related to further developing an evidence-based teacher credentialing system in Maine. This work takes place in a context of new federal reporting requirements under Title II of the Higher Education Opportunity Act and new standards for national accreditation for teacher preparation programs. In addition, Maine has proposed major substantive changes to the Department of Education rule Chapter 115 regarding Certification, Authorization and Approval of Education Personnel, which are under review at the time of writing.

Currently Maine is not well positioned to meet the Title II reporting requirements as the state's program approval requirements do not require teacher preparation programs to report on many of the measures; this means the programs may not currently collect the data that they will soon be required to report. Questions that are looming for the state-approved teacher preparation programs with regard to how they will meet the Title II reporting requirements include: how to gather data on teacher placement, retention, and evaluation results; how to validly measure teacher preparation program effectiveness from the perspective of graduates and employers; and how to assess learning outcomes of the students of beginning teachers. As Maine policymakers determine how the State will meet these new reporting requirements, they may wish to consider whether the state program approval requirements for teacher preparation programs articulated in education rule Chapter 114: Purpose, Standards and Procedures for the Review and Approval of Preparation Programs for Education Personnel remain adequate.

Based upon a review of the research, findings suggest that an evidence-based teacher credentialing system needs:

- To recruit and select candidates to teaching who have strong content knowledge backgrounds in the subject areas they will teach;

- To provide quality clinical experiences with strong mentoring and supervision; and
- To assess teacher candidates on their performance.

Toward these ends, this report recommends that policymakers considering changes to the regulations regarding teacher preparation and credentialing may wish to review certain policies in light of the existing evidence base:

- Minimum content knowledge expectations and measures;
- Narrowing the grade span for elementary teacher certification;
- Addressing potential gaps in clinical preparation and mentoring between traditional and alternative teacher certification pathways;
- Addition of performance-based assessments to provide assurance that candidates can demonstrate key teaching skills;
- Considering expanded options for licensure examinations in order to address teacher shortage areas and diversify the teacher workforce to be more reflective of the communities in which they teach; and
- Improved alignment and coordination of initial teacher preparation expectations and professional development supports through induction, professional licensure and career advancement.

Key stakeholders should collaborate to assure that the policies relating to teacher quality in Maine serve to develop the profession of teaching and result in increased opportunities for the children of Maine to learn from well-qualified and effective teachers.

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Introduction

As requested by the Maine Legislature's Joint Standing Committee on Education and Cultural Affairs, the Maine Education Policy Research Institute (MEPRI) has conducted a study with the purpose of examining current research and evidence-based policies related to teacher credentialing systems. The goal is to inform revisions to Maine's current system for teacher credentialing. MEPRI is a nonpartisan research institute funded jointly by the Maine State Legislature and the University of Maine System.

The first section provides background and context related to teacher preparation pathways, accountability and quality assurance at the state and national levels. This is followed by a brief description of the methods used for gathering evidence related to teacher credentials and quality teachers and teacher education. The remaining report sections provide an overview of the findings from the research literature and other published reports about the evidence base related to teacher and teacher preparation program quality. To aid in organization, the reviewed components are grouped into sections: teacher content knowledge, the clinical preparation of teachers, alternative teacher certification, and teacher candidate testing and assessment. Each section summarizes the available evidence base for the included topics, and concludes with an analysis of how the evidence relates to current practices, policies, or questions in Maine.

Background and Context

Pathways to Teacher Certification

In Maine, as with most states, teacher certification is a requirement for eligibility to teach in public schools. The requirement is based upon the assumption that teacher certification is an important and effective screen for teacher quality.

Those seeking initial teacher certification pursue one of two general pathways to teaching: traditional or alternative. The vast majority of traditional teacher preparation programs

are offered through Institutions of Higher Education (IHEs), serving matriculated students at the undergraduate or graduate level. They generally lead to a bachelor's or master's degree, but may lead to a teaching credential but not to a degree (U.S. Department of Education, 2016b). Alternative route teacher preparation programs primarily serve candidates whom states permit to be the teachers of record in a classroom while participating in the route. They may be within an IHE (referred to as "alternative, IHE-based" providers) or outside an IHE (referred to as "alternative, not IHE based" providers). Each state determines which teacher preparation programs are alternative programs.

Nationally, traditional teacher preparation programs make up the largest pathway to teaching. According to 2014 Title II data, 69% of teacher preparation providers were classified as traditional. Alternative route teacher preparation providers made up 31% of all the teacher preparation providers, with 22% based at IHEs and 9% not based at IHEs (U.S. Department of Education, 2016b).

Maine Title II data mirrors national data. There are sixteen state approved traditional teacher preparation programs offered through IHEs and only one alternative route to teacher certification—the transcript analysis process administered by the Maine Department of Education. Approximately 75% of program completers in Maine enter teaching through a traditional program. For example, in 2014, there were 679 teacher preparation program completers within the state of Maine. Of these, 519 (76.4%) completed a traditional teacher preparation program and 160 (23.6%) achieved their initial teacher certification through the process of transcript analysis (Title II, 2016).

Maine's state credentialing system also serves individuals who are not beginning teachers, but seek Maine certification based on teacher preparation and prior experience in another state. In 2014, an additional 200 individuals received a Maine teaching credential based on teacher preparation completed in another state.

Federal Accountability for Teacher Preparation

In recent years, each of these initial teacher preparation pathways has been subject to increased scrutiny and accountability. Teacher preparation programs are being asked to collect and report an increasing amount of data about their program completers. New federal rules under Title II, Part A of the Higher Education Act of 1965 (HEA), which went into effect in November 2016, are designed to hold teacher preparation programs accountable for preparing effective

educators. Key provisions require states to annually report on the effectiveness of all traditional and alternative teacher preparation programs. Beginning in 2019, states must report for each program:

- Placement and retention rates of program graduates in their first three years of teaching, including placement and retention in high-need schools;
- Feedback from graduates and their employers on the effectiveness of program preparation;
- Student learning outcomes of novice teachers' student growth, teacher evaluation results, and/or another state-determined measure that is relevant to students' outcomes, including academic performance, and meaningfully differentiates amongst teachers; and
- Program characteristics that assure that the program provides quality clinical preparation and graduates candidates with content and pedagogical knowledge who have met rigorous exit requirements. (U.S. Department of Education, 2016c)

States are also required to categorize each program's effectiveness using one of at least three levels of performance: effective, at-risk, and low-performing. States will design their reporting system, in consultation with stakeholders, during the 2016-17 academic year. They may choose to use 2017-18 as a pilot year and will fully implement the system in 2018-19 (U.S. Department of Education, 2016c).

State Program Approval for Teacher Preparation Programs

State program approval is another form of accountability and quality assurance based on external peer review. Teacher preparation programs, traditional and alternative, are approved by the state(s) in which they operate. Within Maine, requirements for Maine state approval are outlined in the Maine Department of Education Regulation rule Chapter 114. According to Ch. 114, IHEs that offer teacher preparation programs are required "to meet the state adopted standards and be authorized as an accredited degree-granting unit to recommend its graduates for certification" (p. 1).

State program approval, as defined in Ch. 114, is a " process for assessing and enhancing academic and education quality through peer review, to assure the public that a professional education unit and/or program has met the state's standards for the preparation of school

personnel" (p. 12). In order to achieve state program approval, the teacher preparation programs within Maine are required to meet the set of unit program approval standards outlined in Ch. 114.

National Accreditation for Teacher Preparation Programs

Similar to state program approval, national accreditation is a peer review process that is a form of quality assurance and accountability for teacher preparation programs. Some states, like New York, require all teacher preparation programs to be nationally accredited, but in most states, including Maine, national accreditation is optional. Three IHEs in Maine have nationally accredited teacher preparation programs: University of Maine, University of Maine at Farmington, and University of Southern Maine. These three institutions prepare approximately 70% of all the traditional preparation program completers in Maine (Title II, 2015).

In the United States, the newly constituted Council for Accreditation of Educator Preparation (CAEP) is the sole accrediting body for educator preparation providers. CAEP accreditation requires that teacher preparation programs continually self-assess, conduct evidence-based analysis of their programs, and seek to continually improve. Accreditation through CAEP assures that teacher preparation programs prepare teachers who know their subjects and students and who have the clinical training needed to enter the classroom ready to teach effectively (Council for Accreditation of Educator Preparation, 2016b).

CAEP has state partnership agreements that are intended to be responsive to the state's needs and policies, and are designed to promote excellence and continuous improvement in educator preparation by combining the benefits of meeting national standards with those of maintaining state program approval. The agreements aim to align the work around state expectations and to ensure thorough reviews while saving both states and providers time and expense by eliminating duplication of effort (Council for Accreditation of Educator Preparation, 2016c). In other words, processes for CAEP review and state program review are combined as much as is feasible. CAEP has these agreements with twenty-nine states including Maine.

The agreements vary from state to state. However, each state's partnership agreement requires that the CAEP educator preparation provider standards must be met on the basis of sufficient and accurate evidence to merit national accreditation by CAEP. In some cases individual states name specific state standards that may be applied in the CAEP accreditation process. For example, Maine's agreement states, "State standards and institutional standards also may be applied in the CAEP accreditation process."

National Accreditation and Maine Program Approval Standards Alignment

Because preparation programs seeking national accreditation must meet both CAEP standards as well as their state's expectations, the ease of combining the two review processes depends largely on how much the two sets of requirements overlap. Because each state sets their own standards, the similarity to CAEP expectations varies from state to state. Many states, including Maine, have built into their program approval requirements a set of standards for beginning teachers developed by the Interstate Teacher Assessment and Support Consortium (InTASC), a group comprised of 36 state education agencies (including Maine) and 10 national education organizations. CAEP standards also incorporate InTASC expectations, so that states whose program approval processes are aligned to InTASC find themselves with more overlap to CAEP requirements than other states.

Specifically, CAEP standard one and Maine state approval Standard One are aligned, focusing upon teacher candidate performance. Both require that teacher preparation programs demonstrate candidate evidence of the 10 InTASC standards. Key features of their alignment are as follows:

- CAEP standard 1.3 requires that teacher preparation programs ensure that candidates apply content and pedagogical knowledge as reflected in outcome assessments in response to standards of Specialized Professional Associations (SPA). Maine's partnership agreement does not require a SPA review, but Maine rule Ch. 114 states that curriculum must be informed by the standards and guidelines of the respective professional societies.
- CAEP standard 1.4 requires that teacher preparation programs ensure that candidates demonstrate skills and commitment that afford all P-12 students access to rigorous college- and career-ready standards such as the Common Core State Standards and the Next Generation Science Standards. Maine state program approval requires that an IHE's conceptual framework address the program's commitment to the Maine Learning Standards.
- CAEP standard 1.5 requires that teacher preparation programs ensure that candidates model and apply technology standards as they design, implement and assess learning experiences to engage students and improve learning. This aligns with the Maine state

program approval requirement that the candidates demonstrate evidence of the National Educational Technology Standards for Teachers (NETS•T).

- Maine state program approval standard two, Assessment System and Unit Evaluation, requires that state approved teacher preparation programs have an assessment system that collects and analyzes data on the qualifications of applicants, the performance of candidates and graduates, and on unit operations to evaluate and improve the unit and its programs. This standard aligns with CAEP standard three, Candidate Quality, Recruitment and Selectivity; standard four, Program Impact; and standard five, Provider Quality, Continuous Improvement, and Capacity.
- Maine state program approval standard three, Field Experiences and Clinical Practice, aligns with CAEP Standard Two which focuses upon Clinical Partnerships and Practice. The CAEP standard requirements are based upon the 2010 report of the NCATE Blue Ribbon Panel on Clinical Preparation and Partnerships for Improved Student Learning, *Transforming Teacher Education Through Clinical Practice*, as well as National Research Council report (2010), *Preparing Teachers: Building Evidence for Sound Policy*. The NCATE blue ribbon panel report identified ten design principles for clinically based preparation:
    - Student learning is the focus;
    - Clinical preparation is integrated throughout every facet of teacher education in a dynamic way;
    - A candidate's progress and the elements of a preparation program are continuously judged on the basis of data;
    - Programs prepare teachers who are expert in content and how to teach it and are also innovators, collaborators and problem solvers;
    - Candidates learn in an interactive professional community;
    - Clinical educators and coaches are rigorously selected and prepared and drawn from both higher education and the P-12 sector;
    - Specific sites are designated and funded to support embedded clinical preparation;
    - Technology applications foster high-impact preparation;

    - A powerful R&D agenda and systematic gathering and use of data supports continuous improvement in teacher preparation;
    - Strategic partnerships are imperative for powerful clinical preparation.
- Maine state program approval standard four, Diversity, is not a stand-alone CAEP standard. It is a cross-cutting theme and must be addressed across multiple standards. Teacher preparation programs must demonstrate that candidates have the skills and commitment to provide all P-12 students with access to rigorous college and career ready standards, that clinical experiences prepare candidates to work with all students, and that they are committed to efforts to recruit a more able and diverse candidate pool (CAEP Commission on Standards and Performance Reporting, 2013). This last expectation is based upon the fact that the makeup of the nation's teacher workforce has not kept up with changing student demographics. At the national level, students of color make up more than 40 percent of the public school population, while teachers of color are only 17 percent of the teaching force (Boser, 2011). The mismatch has consequences as researchers have found that student achievement is positively impacted by a racial/ethnicity match between teachers and students (Dee, 2004; Goldhaber & Hansen, 2011; Hanushek, Kain, O'Brien & Rivkin, 2005).
- Maine state program approval standard five, Faculty Qualifications, Performance, and Development, and standard six, Unit Governance and Resources**,** are not CAEP standards. However, elements of each are documented in appendices to the IHE's CAEP Inquiry Brief. Parity and capacity are documented in Appendix B and Faculty qualifications are in Appendix C.

While there is significant overlap between Maine's standards for for state program approval and CAEP, the two are not fully aligned.

In addition to questions related to the varying alignment between state certification and program approval requirements, national accreditation and federal policy, there is an overarching question related to the evidence base each of these policies. According to Rockoff and Speroni (2011), the characteristics used to certify teachers bear little relation to student outcomes (p. 687). What follows is an examination of the evidence base related to some of these characteristics in order to inform the further development an evidence-based teacher credentialing system in Maine.

Methods

This study of evidence-based teacher credentialing systems reviewed existing and proposed policies, related research literature and published reports. At the federal level, the documents and data reviewed relate to the Higher Education Opportunity Act's Title II, Part A reporting requirements and data. Policy reports and documents related to national accreditation and state program approval were also reviewed. These include documents relating to Council for Accreditation of Educator Preparation accreditation as well as state rule Chapter 114: Purpose, Standards and Procedures for the Review and Approval of Preparation Programs for Education Personnel (Ch. 114) and rule Chapter 115: Certification, Authorization and Approval of Education Personnel (Ch. 115). This led to an examination of the research base related to the requirements for national accreditation, state program approval, and teacher certification. The research related to the impacts of teacher content knowledge, the clinical preparation of teachers, alternative teacher certification,and teacher candidate testing and assessment were reviewed. The review does not delve into evidence based teaching practices within various content areas (e.g., mathematics, science, social studies or reading or writing) or domains of teaching (e.g., instructional planning, classroom management, instructional interactions, or professional responsibilities). The review included examination of original research reports as well as syntheses of the research literature that have been completed by other researchers to inform the research community or policy makers. Findings from these various sources were compiled into this final report.

Evidence Base Related to Teachers' Content Knowledge

There have been efforts by researchers to determine what characteristics make teachers most effective. Teachers' content knowledge has been found to have a positive effect on student achievement. Teachers need to understand subject matter so they can see how ideas connect across fields and to everyday life, providing a foundation for pedagogical content knowledge that enables teachers to make ideas accessible to students so they can create useful cognitive maps, relate one idea to another, and address misconceptions (Commission on Standards and Performance Reporting, 2013). Research evidence supporting this includes:

- The presence of teachers with at least a major in their subject area is the most reliable predictor of student achievement scores in math and science (Goldhaber & Brewer, 1996).
- Students who have subject matter certified teachers make higher gains in social studies and mathematics (Dee & Cohodes, 2008).
- Content learning—as proxied by disciplinary coursework requirements—is positively associated with student learning in the teachers' second year. Content knowledge may not distinguish more and less effective teachers until their second year, when teachers are more comfortable with the basic practices of teaching (Boyd, Grossman, Lankford, Loeb & Wyckoff, 2009).
- Teachers' knowledge of the content they teach is a consistently strong predictor of student performance (Center for Public Education, 2005).

As these studies illustrate, teachers' content knowledge has been consistently found to be a factor related to teacher effectiveness and student achievement. Whether teachers have a major or have had courses in the disciplines they teach matters.

The extent to which teachers' content knowledge matters at various grade levels is less clear, but research suggests that it is important for teachers to have content knowledge appropriate to the grade levels and content they teach. Key findings include:

- Stronger correlations exist between the achievement of secondary school students and their teacher's subject-area expertise than exists between the success of younger students and their teacher's subject knowledge. This is especially true in middle and high school mathematics (Betts, Zau & Rice, 2003; Goldhaber & Brewer, 2000).
- Mathematics or science teachers who have completed an undergraduate or graduate major in the discipline they are teaching are associated with higher student achievement in high school and middle school (Aaronson, Barrow, & Sander, 2003; Goldhaber & Brewer, 2000; Wenglinsky, 2000, 2001, 2002).
- Teacher content knowledge at the elementary level has been found to be one of twelve teacher quality indicators that are positively associated with elementary student achievement in reading, mathematics, and language (Schacter & Thum, 2004).
- Elementary and high school teachers' mathematics pedagogical knowledge is the strongest teacher-level predictor of student achievement (Hill, Rowan, & Ball, 2005).

These findings confirm the importance for teachers to have strong content knowledge at various grade spans. The research on teachers' subject-area certification supports the importance of this qualification for predicting which teachers will contribute to student achievement. Whether that content expertise is reflected in their certification, course taking, or degrees, the research is consistent about the importance of subject-matter knowledge for mathematics teachers at the secondary level. The research is less conclusive in other content areas but finding seem to support a requirement that teachers demonstrate high levels of content knowledge about their subject and that their content knowledge should be appropriate to the grade levels they teach.

The content requirements for elementary teachers in Maine (i.e., grades K-8) is six credits in each of the following: English, mathematics, social studies and science. Secondary content teachers (i.e., grades 7-12) must have a total of 24 credits in the content area they teach. Additionally, to be highly qualified to teach a content area at the middle level (i.e, grades 5-8), a teacher must have 24 credits hours in the content area. No specific content courses are required for either K-8 or 7-12 certification, but specific content knowledge is assessed through Praxis II.

Policy Implications

The current Ch. 115 and proposed revisions to Ch. 115 requirements for teacher certification in Maine help ensure that teachers have the content knowledge required to teach at the grade level to which they are assigned. However, they do not fully align with the research evidence that a major in a discipline makes a difference at the middle and secondary level, as Maine does not require a major or specific content courses. Maine policymakers may want to consider whether the current rules (including content courses and assessment requirements) are sufficiently rigorous with regard to required content knowledge for teachers.

These findings also support the currently proposed revisions to Ch. 115 that would narrow the grade level span for elementary certification from grades K-8 to K-6. While the research is not conclusive enough to suggest an exact grade cutoff, it does substantiate that the content knowledge requirements for middle school and higher are more rigorous than for lower grades.

Evidence Base Related to Teachers' Experience

Clinical practice and partnerships are an expectation for both national accreditation and state program approval. Additionally, teacher preparation programs must describe the supervised clinical experience they require prior to and during student teaching in Title II institutional

reports. In 2013 and 2014, the most commonly reported average number of hours required before student teaching in traditional teacher preparation programs nationwide was 100, and the average number of hours required before student teaching in traditional teacher preparation programs was 125. In 2013 and 2014, the most commonly reported average number of hours required for student teaching in traditional teacher preparation programs was 600, and the average number of hours required for student teaching in traditional teacher preparation programs was 525. Recent research speaks to the importance of these clinical experiences.

- Levine (2006) reports on a four year study of the education of teachers in which teachers were surveyed about their preparation. The most common finding was a desire for more, longer, earlier, and better integrated field work experiences.
- Novices need structured opportunities to gain experience in settings of actual teaching practice and the value of clinical experience depends at least as much on the quality of the experience as on the quantity. Specifically, research suggests placement in a partnership school benefits prospective teachers. Co-teaching models, where student and cooperating teachers are jointly responsible for the classroom, lead to gains in teaching ability and the academic achievement of students improves as well (Grossman, 2010).
- Teacher preparation that focuses more on the work of the classroom, is grounded in the practices of teaching, and provides opportunities for teachers to study what they will be doing as first-year teachers, is associated positively with student achievement gains in the first year of teaching; a lack of student teaching experience is negatively related to student achievement (Boyd et al., 2009).
- Prospective teachers benefit from cooperating teachers who provide both instructional guidance and opportunities for independent teaching (Fives, Hamman, & Olivarez, 2007).
- Clinical supervisors provide a critical link between the university and the school, and both the quality of feedback provided by a supervisor and the frequency of supervision are associated with better outcomes for both prospective teachers and their students (Boyd et al., 2009).

As the research findings presented here suggest, clinical experiences are critically important to teacher preparation (National Research Council, 2010). It supports research on teaching that finds that those with more experience are more effective than those with less experience (Clotfelter, Ladd, & Vigdor, 2007; Buddin & Zamarro, 2009). This research also points the need

for high quality clinical experiences that are a partnership amongst IHEs and K-12 schools. Novices need structured opportunities to learn through the practice of teaching and feedback from more experienced educators who are their mentors and supervisors.

Policy Implications

Maine does not require clinical experiences prior to student teaching, and the student teaching requirement in Maine is the equivalent of fifteen weeks of full time teaching (approximately 450-500 hours). According to Maine's 2014 Title II report the number of hours of early clinical experience required by state approved teacher preparation programs ranged from zero to approximately 263 hours. The number of student teaching hours required by state approved teacher preparation programs ranged from 500 hours to 936 hours. As this data illustrates, there is a wide range in the number of clock hours of supervised clinical experience required prior to and during student teaching. This may be sufficient as the research suggests that quality is as important as quantity. However, policymakers may want to consider how Maine's system ensures that all prospective teachers, including those seeking teacher certification through alternative routes, have opportunities to co-teach and ground their learning in practice with the guidance of high-quality mentors and supervisors.

Evidence Base Related to Alternative Teacher Certification

As noted, those who wish to teach pursue initial teacher certification through one of two pathways: traditional or alternative. According to Cochran-Smith, Villegas and their colleagues (2016), the nature of alternative preparation programs varies and the language used to designate alternative preparation programs is inconsistent. Generally, alternative pathways refer to those where participants begin teaching before they complete full certification requirements and without completing a program at a college or university. Traditional teacher preparation programs at universities frontload coursework and fieldwork before teachers enter the profession, whereas, "alternative programs provide minimal preparation prior to entry and then require coursework, mentoring, or professional development while participants are teaching" (Cochran-Smith & Villegas, 2016, p. 452).

Since 1999, there has been a dramatic increase in the proportion of teachers in the United States who enter the teaching profession through alternative pathways, up from 13% to 24% in 2012. This increase in alternatively certified teachers corresponds with the decline in the proportion of uncertified teachers from 14% in the 1999–2000 school year to 1% in the 2011–

2012 school year. This shift in certification policies is attributable to No Child Left Behind's requirement for a highly qualified teacher to staff all classrooms (Redding & Smith, 2016); teachers participating in an approved alternative programs were considered to be highly qualified.

The evidence related to the effects of traditional and alternative teacher certification pathways on student achievement is mixed, and it is difficult to compare results across programs. One of the primary reasons is that research cannot address program heterogeneity or the variability of teacher certification requirements across states (Goldhaber & Brewer, 2001; Humphrey & Wechsler, 2007; Redding & Smith, 2016). Additionally, most studies of certification programs suffer from at least one methodological constraint (Ballou & Podgursky, 2000).

The research related to teacher certification programs has provided descriptive evidence of the characteristics of alternatively versus traditionally certified teachers and alternative versus traditional teacher preparation programs as well as evidence of whether a teacher's route to certification impacts student achievement. Overall, little evidence exists on the effectiveness of the teacher licensure *system,* in terms of how well teachers subsequently teach and what works to promote positive student outcomes (Goldhaber & Brewer, 2000).

Research related to the characteristics of alternatively versus traditionally certified teachers finds:

- Alternatively certified teachers resemble those prepared through traditional preparation programs as well as the labor market within a particular geographic location (Humphrey & Wechsler, 2007).
- Alternatively certified teachers are more likely than traditionally certified teachers to be male, be part of an underrepresented racial or ethnic minority group, be 30 years old or over, have attended a most selective undergraduate institution, and teach in-demand subjects; they are less likely to have an education degree (Redding & Smith, 2016).

These results suggest that alternative certification pathways may provide opportunities to attract candidates who have strong content knowledge and who are more diverse.

Other research related to certification pathways compares the content of the teacher preparation programs. Findings indicate:

- Coursework in alternative teacher preparation programs generally mirrors that of traditional routes (Humphrey & Wechsler, 2007; Boyd et al., 2008; Redding & Smith, 2016).
- Alternatively certified teachers are less likely to have had practice teaching or a course in teaching methods (Redding & Smith, 2016).
- Alternative teacher preparation programs do not offer full certification more quickly than traditional programs, but they truncate pre-service clinical practice, quickly moving participants into classrooms. Candidates serve as the teacher of record and receive training and support of mentor teachers (Humphrey & Wechsler, 2007).

These findings indicate that there are similarities amongst alternative and traditional pathways to teacher certification. In many states, including Maine, the minimum coursework requirements are the same for those pursuing teacher certification through alternative and traditional routes. As a result, alternative and traditional teacher candidates take the same courses at the same Universities. However, candidates in Maine's traditional programs typically take more education courses than the minimum required of individuals pursuing transcript analysis.

The primary difference between the two pathways is the clinical preparation of those prepared through traditional versus alternative routes. By design, most candidates in alternative pathways serve as the teacher of record and receive on the job training and support from mentors. In contrast, those in traditional pathways complete their clinical experience as a University required student teaching experience and receive support of university supervisors and mentors in the school setting prior to becoming the teacher of record. Maine's transcript analysis pathway differs from the alternative programs represented in the literature as individuals are not required to serve as the teacher of record.

Research related to the effectiveness of the pathways to teacher certification is mixed. Findings suggest:

- Those who have more teacher training appear to do better in influencing student achievement (Darling-Hammond, Berry, & Thoreson, 2001).
- Certified teachers consistently produce stronger student achievement gains than uncertified teachers (Darling-Hammond, Holtzman, Gatlin, & Heilig, 2005).
- Teachers who enter teaching through Teach For America (TFA), one of the nation's largest and most well known alternative teacher preparation program, are "no worse than

average traditional teachers" (Xu, Hannaway, & Taylor, 2011, p. 460). For example, in high school mathematics and science, the net effect of a TFA teacher was insignificant in math but positive in science (Xu, Hannaway, & Taylor, 2011); TFA teachers had a positive impact upon students in mathematics but no impact in reading (Glazerman, Mayer, & Decker, 2006). TFA teachers' impact was greater than traditionally prepared teachers as well as teachers in New York City Teaching Fellows Program in middle school math (Boyd et al., 2012).

- Teachers who were certified through an alternative route are more likely to leave their positions. Alternatively certified teachers' predicted turnover rates were 10 percentage points greater than traditionally certified teachers. Reasons cited include a lack of preparation and support (Redding & Smith, 2016).

This mix of findings most likely relate to the variability across alternative and traditional teacher preparation programs. It is difficult to generalize the findings or make definitive statements about the quality of preparation alternative or traditional programs provide. However, the evidence that alternative teacher certification programs are increasingly attracting teachers with different background characteristics into the profession and that teachers who complete alternative programs can be as effective as those who complete traditional preparation programs is promising. It assists researchers in identifying the specific characteristics of effective teacher preparation programs.

Presently, the alternative route to teacher certification in Maine does not reflect the emerging evidence base related to the characteristics of effective alternative teacher preparation programs. First and foremost, Maine's alternative route to teacher certification through transcript analysis is not a formal program. Individuals who wish to become teachers seek teacher certification without going through an admissions process or following a pre-established curriculum. These prospective teachers apply for teacher certification and have their transcripts and other materials analyzed by the Maine Department of Education Certification Office. The certification office staff determine whether the applicant has met the minimum requirements for their desired area of teacher certification in five areas: content coursework, pedagogy (education) coursework, clinical experience in the classroom, certification exam scores, and a criminal background check. Once notified of any gaps that need to be filled, candidates seek out and take the courses, tests, or clinical teaching practice they need for certification.

As noted above, Maine's transcript analysis pathway is not typical of alternative programs seen nationally. Unlike the alternative certification programs highlighted in the research literature, there is no admissions and selection process and there is no requirement for employment. The clinical experience requirement can be met through a student teaching experience sponsored by a preparation program, or through documenting one year of public school teaching under an emergency teaching certificate or at an approved private school. Data are not available to estimate the proportion of Maine's transcript analysis completers who pursue student teaching versus teaching under an emergency certificate. If hired under an emergency credential, the mentoring and evaluation requirements are the same as for beginning teachers who have graduated from a traditional program; there are no additional intensive supports similar to those typical of alternative programs such as Teach for America. In addition, the minimum content and pedagogy course requirements are fewer than what is required of candidates in Maine's approved programs. Because data do not exist to specifically compare Maine's traditionally certified teachers to transcript analysis pathway completers, it is unknown whether there is a gap between the backgrounds and effectiveness of teachers prepared through the different routes.

Implications for Policy

In recognition of the gaps between Maine's transcript analysis pathway and both the requirements for Maine's approved programs and the prevalent national models for alternative programs, Maine policymakers may want to consider whether the requirements for transcript analysis are adequately evidence-based. Impending federal reporting requirements will require that the transcript analysis pathway is subject to the same review and standards as traditional preparation programs, and may require changes to how those program completers are tracked and analyzed. There are provisions outlined in rule Chapter 114 for other alternative pathways that are structured more similarly to the models seen nationally, yet no organizations have developed programs under those guidelines. If a goal is to increase alternative pathway options in order to address teacher shortage areas and diversify the teacher workforce, additional study may be desirable to understand why. The current options may benefit from revision. Improved partnerships between the state, IHEs, and school districts may also be beneficial in order to address the causes and challenges of teacher shortage areas; Title II, Part A funds could be used to support these efforts (U.S. Department of Education, 2016d).

Evidence Base Related to Teacher Candidate Testing and Assessment

In order to determine whether the teacher candidates within their state have the prerequisite knowledge and skills that are deemed necessary, most states require that those seeking a teaching credential take and pass standardized tests. More than 40 states use one or more of the Educational Testing Service's (ETS) Praxis series of tests, and additional states use their own state-developed assessments. The Praxis tests measure specific content and pedagogical knowledge for beginning teaching practice (ETS, 2017). In nearly all states, teachers have to pass at least three tests (i.e., multiple choice tests of basic skills, subject matter, and teaching knowledge) to become licensed (Darling-Hammond, 2010). Each state determines which tests are required of prospective teachers as well as their passing (cut-off) scores.

The evidence related to knowledge-based teacher licensure tests is somewhat mixed. Findings suggest:

- No state uses a cut score that reflects scientific evidence about a particular level of teacher effectiveness (Goldhaber, 2007).
- Licensure tests evaluate teacher knowledge before they enter or complete teacher education and are not strongly related to teachers' ultimate success in the classroom (Darling-Hammond, 2010).
- The imposition of a testing requirement is associated with an increase in the probability of new teachers teaching a subject in which they majored and may be a device to select teachers with stronger subject specific skills (Angrist & Guryan, 2007).
- There is relatively little empirical work linking teachers' scores on licensure tests to student achievement, and due to selection effects it is not possible to judge the extent to which states' use of licensure tests allows ineffective teachers into the workforce or screens potentially effective teachers out of the workforce (Goldhaber, 2007).
- Licensure tests provide limited and varying evidence of teacher effectiveness across demographic groups, and enforcing strict cutoffs has the potential to both adversely affect minority student outcomes and decrease workforce diversity (Goldhaber & Hansen, 2010).
- Teacher licensure test scores are unrelated to teacher success in the classroom (Buddin & Zamarro, 2009).

As these findings indicate, teacher licensure tests assess teacher content and pedagogical knowledge, not skill. As such, they are not strong predictors of teacher effectiveness in practice.

More recently, states have been developing teacher performance assessment systems that focus on evaluating candidate performance in the classroom and impact on student achievement. Fifteen states have policies in place requiring a state-approved performance assessment as part of candidates' program completion or for state licensure, and aggregate candidate performance on these tests is considered in state program review (AACTE, 2016). In each of the states where such policy exists, edTPA, a national performance assessment based upon the Performance Assessment for California Teachers (PACT), has been approved as a performance assessment for these purposes. edTPA is a teacher performance assessment instrument that gives states, districts and teacher preparation programs a common framework for defining and measuring a set of core teaching skills that form a valid and robust vision of teacher competence (NCATE, 2010). Currently there are 722 Educator Preparation Programs in 38 states and the District of Columbia participating in edTPA (AACTE, 2016).

According to Darling-Hammond (2010), teacher performance assessments have been found to be stronger predictors of teachers' contributions to student learning gains than traditional teacher licensure tests. Recent research related to teacher performance assessments supports her claim. These findings suggest:

- Performance assessments that measure what teachers actually do in the classroom have been found to be related to later teacher effectiveness. Mentor teachers' evaluations of beginning teachers were significant predictors of beginning teachers' current and subsequent value-added effectiveness. Teachers who receive better subjective evaluations of teaching ability prior to hire or in their first year of teaching also produce greater gains in achievement, on average, with their future students (Rockoff & Speroni, 2011).
- In California, evidence suggests that teacher candidates' performance on the PACT, an evaluation of prospective teachers abilities to plan, teach, assess, and reflect on instruction in actual classroom practice, is a significant predictor of their later teaching effectiveness as measured by their students' achievement gains in both English language arts and mathematics (Darling-Hammond, Newton & Wei, 2013).
- Evidence on the relationship between edTPA scores and teaching effectiveness is mixed. Passing the edTPA is significantly predictive of teacher effectiveness in reading but not

in all areas of specification in mathematics. Additionally, Hispanic candidates in Washington state were more than three times more likely to fail the edTPA after it became consequential in the state than non-Hispanic White candidates (Goldhaber, Cowan & Theobald, 2016).

- Evaluation practices aligned with Charlotte Danielson's 1996 Framework for Teaching are positively associated with elementary students' reading, mathematics, science, and social studies achievement. The relationship is strongest for schools that rigorously conduct the evaluations, suggesting that standards based evaluations may be useful indicators of teacher quality (Heneman, Milanowski, Kimball, & Odden, 2006).
- Teachers who are certified by National Board for Professional Teaching Standards (NBPTS) are more effective than those teachers with similar levels of experience who are not-certified and there is a positive relationship between teachers' performance on NBPTS portfolio assessment and their students' achievement (Cowan and Goldhaber, 2016).

These results the support the use of performance assessments to assess and evaluate prospective teachers' as they enter the profession. Initial research related to standardized performance assessments such as PACT and edTPA suggest they are predictive of teachers' effectiveness in relation to student learning. However, as this review points out, more subjective evaluations of teaching also present significant and meaningful information about a teacher's future success in raising student achievement, and these likely also capture facets of teaching skill that may affect outcomes not captured by standardized tests (Rockoff & Speroni, 2011).

Policy Implications

Presently, Maine requires the Praxis Core test of basic skills in reading, writing and mathematics as well as Praxis II content area test of the subject matter related to the area of certification. The evidence suggests that once cut scores are achieved, these test scores do not strongly correlate with effective teaching and higher scores are not evidence of greater preparedness to teach. However, that evidence is limited by the fact that individuals who do not meet minimum cut scores are ineligible for certification, and thus are not included in the studies.

Based upon the evidence, Maine policymakers may want to consider whether these tests are achieving their intended goals in Maine, and even if they are, at what cost. For example, policymakers may want to consider the extent to which the requirement of the Praxis Core and

Praxis II are acting "more as a barrier to entry than a quality screen" (Angrist & Guryan, 2007, p. 18), particularly for prospective teachers of color. Maine policy makers may want to consider revisiting the cut scores, or providing alternative forms of assessment for candidates to demonstrate their knowledge.

Teacher performance assessments may be an alternative worthy of consideration by Maine policymakers. Initial research evidence suggests they are a predictor of effective teaching. Currently, Maine does not require performance assessment, but all state approved teacher preparation programs must demonstrate evidence that their candidates meet Maine's Common Core Teaching Standards (i.e., InTASC Standards). This generally requires observation(s) of practice by mentors or supervisors. This assessment practice aligns with evidence that suggests subjective evaluations, like observations of teachers, are good predictors of teacher effectiveness. Therefore, the current assessment practices of Maine's state approved teacher preparation programs may be a sufficient assurance of teacher quality to traditional programs. However, the transcript analysis pathway is not subject to program review. If policy makers would like to achieve greater consistency across programs and pathways to teaching, they could consider adopting a standardized performance assessment like edTPA, or requiring the use of valid and reliable observation protocols that align with the expectations of beginning teachers in all program pathways.

Conclusion

Cochran-Smith (2003) writes: "Policies intended to improve teaching quality can only be as good as the underlying conceptions of teaching, learning, and schooling on which they are based" (p. 4). The ideal is that newly established policies will emerge out of research (Wiseman, 2012), but at the state level they are also driven by demands to comply and/or align with federal policy and by the pragmatic needs of the state. As Maine policymakers balance these priorities, there are implications for how Maine holds teacher preparation programs accountable and assures the quality of beginning teachers. With these things in mind, what follows are considerations for Maine policymakers as they seek to further develop an evidence-based system for teacher credentialing.

The new federal rules under Title II of the Higher Education Opportunity Act have implications for Maine's evidence-based teacher credentialing system. Policymakers may want to consider these requirements alongside any potential changes to teacher certification or state

program approval requirements. Presently, Maine's state approved programs are not well positioned to meet these reporting requirements, and thus, neither is the state. The questions that are looming for the state approved teacher preparation programs include how to gather data on teacher placement, retention, and evaluations; how to measure teacher preparation program effectiveness from the perspective of graduates and employers; and how to assess learning outcomes of their graduates' students. The state may continue to allow each preparation program to be responsible for their own data, or it may develop some data collection and analysis coordinated at the state level. Either way, policymakers may want to consider how teacher evaluation and K-12 student data that is connected to teachers will be accessed and reported to assure equity and consistency of reporting across the state by all programs and pathways to teaching.

As policymakers consider these implications of the federally required Title II reporting, they may also want to consider how these reporting requirements align with state program approval of teacher preparation programs. For example, consideration of whether these data will also be required as a part of the state program approval process for teacher preparation programs is needed. These new Title II requirements align with CAEP standards for national accreditation. Presently, Maine's standards for state program approval do not. Policymakers may want to consider whether greater alignment between the state program approval standards and CAEP accreditation standards would benefit the state's system of quality assurance and accountability. To achieve greater alignment with national accreditation and reporting, Ch. 114 rules would need to be reviewed against the CAEP standards and the new Title II requirements.

In addition to considering federal reporting and alignment with national accreditation, state policy makers should also consider the research evidence related to quality teachers and teacher preparation. Table 1 below summarizes the research evidence presented in this report that may be useful in work to further develop an evidence-based system of teacher credentialing.

Table 1: Summary of Evidence Base for Teacher Credentialing, By Category

Content Knowledge
• A major in a subject area is the most reliable predictor of student achievement Goldhaber & Brewer, 1996); • Content knowledge is positively associated with student learning (Boyd et. al, 2009); • Teachers' knowledge of the content they teach is a consistently strong predictor of student performance (Center for Public Education, 2005). • Stronger correlations exist between the achievement of secondary school students and their teacher's subject-area expertise than exist between the success of younger students and their teacher's subject knowledge (Betts et al., 2003; Goldhaber & Brewer, 2000); • Mathematics or science teachers who have completed an undergraduate or graduate major in the discipline they are teaching is associated with higher student achievement in high school and middle school (Aaronson, Barrow, & Sanders, 2003; Goldhaber & Brewer, 2000; Wenglinsky, 2000, 2001, 2002). • Teacher content knowledge at the elementary level is positively associated with elementary student achievement in reading, mathematics, and language (Schacter & Thum, 2004).
Clinical Preparation
• Teachers' desire more, longer, earlier, and better integrated field work experiences (Levine, 2006); • Teacher preparation should focus more on the work of the classroom and provide opportunities for teachers to study what they will be doing as 1st-year teachers (Boyd et al., 2009); • The value of clinical experience depends at least as much on the quality of the experience as on the quantity (Grossman, 2010). • Prospective teachers benefit from cooperating teachers who provide both instructional guidance and opportunities for independent teaching (Fives, Hamman, & Olivarez, 2007). • Clinical supervisors provide a critical link between the university and the school, and both the quality of feedback provided by a supervisor and the frequency of supervision are associated with better outcomes for both prospective teachers and their students (Boyd et al., 2009).
Alternative Teacher Certification
• Alternatively certified teachers are more likely than traditionally certified teachers to be male, be part of an underrepresented racial/ethnic minority group, be 30 years old or over, have attended a selective undergraduate institution, were less likely to have an education degree, and more likely to teach in-demand subjects (Redding & Smith, 2016). • Alternatively certified teachers are less likely to have had practice teaching or a course in teaching methods (Redding & Smith, 2016); -Alternative teacher preparation programs do not offer full certification more quickly than traditional programs, but they truncate clinical practice, quickly moving participants into classrooms (Humphrey & Wechsler, 2007); • Alternative teacher candidates serve as the teacher of record and receive training and

support of mentor teachers (Humphrey & Wechsler, 2007);
- Teachers who were certified through an alternative route are more likely to leave their positions due to a lack of preparation and support (Redding & Smith, 2016);
- Full certification is a more powerful predictor of student achievement than teachers' education levels (Darling-Hammond, 2000);
- Those who have more teacher training appear to do better in influencing student achievement (Darling-Hammond, Berry, & Thoreson, 2001).

Teacher Candidate Testing and Assessment

- No state uses a cut score that reflects scientific evidence about a particular level of teacher effectiveness (Goldhaber, 2007).
- Licensure tests evaluate teacher knowledge before they enter or complete teacher education and are not strongly related to teachers' ultimate success in the classroom (Darling-Hammond, 2010).
- The imposition of a testing requirement is associated with an increase in the probability of new teachers teaching a subject in which they majored and may be a device to select teachers with stronger subject specific skills (Angrist & Guryan, 2007).
- There is relatively little empirical work linking teachers' scores on licensure tests to student achievement and it is not possible to judge the extent to which states' use of licensure tests allows ineffective teachers into the workforce or screens potentially effective teachers out of the workforce (Goldhaber, 2007; Buddin & Zamarro, 2009).
- Licensure tests provide limited and varying evidence across demographic groups and enforcing strict cutoffs has the potential to both adversely affect minority student outcomes and decrease workforce diversity (Goldhaber & Hansen, 2010).
- Teachers who receive better subjective evaluations of teaching ability prior to hire or in their first year of teaching also produce greater gains in achievement, on average, with their future students (Rockoff & Speroni, 2011).
- Teacher candidates' performance on the PACT is a significant predictor of their later teaching effectiveness as measured by their students' achievement gains in English language arts and mathematics (Darling-Hammond, Newton & Wei, 2013).
- Passing the edTPA is significantly predictive of teacher effectiveness in reading but not in all areas of specification in mathematics. Additionally, Hispanic candidates in Washington state were more than three times more likely to fail the edTPA after it became consequential in the state than non-Hispanic White candidates (Goldhaber, Cowan & Theobald, 2016).
- Standards based evaluations may be useful indicators of teacher quality (Heneman, Milanowski, Kimball, & Odden, 2006).
- Teachers who are certified by NBPTS are more effective than those teachers with similar levels of experience who are not-certified and there is a positive relationship between teachers' performance on NBPTS portfolio assessment and their students' achievement (Cowan and Goldhaber, 2016).

Synthesizing this research evidence, an evidence-based teacher credentialing system needs:

- To recruit, select, and graduate candidates to teaching who have strong content knowledge backgrounds in the subject areas they will teach;

- To provide quality clinical experiences with strong mentoring and supervision; and
- To assess teacher candidates on their performance as well as their knowledge.

Toward these ends, policymakers may want to consider the content requirements for teachers at all levels of teacher certification. In conjunction, policy makers may want to consider whether the content requirements for teacher certification in the current and proposed rule Ch. 115 are satisfactory. The proposed Ch. 115 change in elementary grade span from a grade K-8 certificate to grades K-6 is supported by the available evidence.

While this report focuses on characteristics of effective beginning teachers, many of the research findings related to teacher quality are also applicable to more experienced educators. Maine policymakers may want to consider implications for systems (including performance-based expectations and evaluation assessments) that are aligned and coordinated from initial teacher preparation and licensure through induction, professional licensure and career advancement.

Lastly, supporting a high-quality teacher workforce is not the sole responsibility of teacher preparation programs. All aspects of teaching quality, from recruitment and preparation through induction, professional development, teacher evaluation, and career recognition, involve partnerships with schools, districts, and state agencies. A coordinated system would consider the evidence base as well as federal policy requirements an effort to assure quality teacher preparation and teaching. It would help to assure that all of Maine's policies related to teacher preparation, certification, evaluation and support are not only based upon the most recent research evidence but also work in concert with one another. Key stakeholders including members of the Education and Cultural Affairs Committee, the State Board of Education, Maine Department of Education, IHEs that offer teacher and leader preparation, and organizations like the Maine Education Association and those representing Maine school leaders should have opportunities for input into the policies relating to teacher quality in Maine. Greater coordination would serve to the develop of the profession and result in increased opportunities for the children of Maine to learn from well qualified and effective teachers.

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