5-2012

Arkansas Teacher Licensure Cut Scores, Do They Indicate Highly Qualified Teachers?

Karen K. Morton
University of Arkansas, Fayetteville

ARKANSAS TEACHER LICENSURE CUT SCORES, DO THEY INDICATE HIGHLY QUALIFIED TEACHERS?

ARKANSAS TEACHER LICENSURE CUT SCORES, DO THEY INDICATE HIGHLY QUALIFIED TEACHERS?

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy in Educational Statistics and Research Methods

By

Karen K. Morton
University of Arkansas
Bachelor of Arts in Mathematics and Psychology, 1976
The College of William and Mary
Master of Science in Mathematics, 1979

May 2012
University of Arkansas

ABSTRACT

The highly qualified provision of the 2001 No Child Left Behind Act promoted licensure exams on a national level. The present study is an effort to explore the most commonly used Praxis licensure exams and their passing scores. Hypothesized was that passing scores are set at such a minimal level that they are ineffectual in identifying highly qualified teachers. More specifically, Arkansas's low passing scores are examined by comparing the distribution of University of Arkansas Praxis scores to national trends. Based on low passing scores, the question was posed – At what point in teachers' careers are expectations lessened? Academic data from Elementary Education graduates of the University of Arkansas College of Education and Health Professions were compared to colleagues with the conjecture that they would fall below. Finally, as the reauthorization of No Child Left Behind looms, the mandate for highly qualified teachers has become energized with the call for *effective* teachers. Student gains data of relatively new teachers from a local district were regressed on teacher scores on content knowledge exams as well as years of experience to explore the relationships.

SEA passing scores were found to be low with all but a few exceptions using cut scores for licensure exams below the median of the national testing pool. Further, University of Arkansas testers, replicated national trends in scoring on Praxis exams eliminating any justification for Arkansas employing minimal standards. As conjectured, Elementary Education graduates of the U of A presented academic credentials below that of colleagues thus exacerbating the highly qualified conundrum. Lastly, the attempt to connect student achievement to teacher content knowledge through Praxis exam scores and years of experience proved unsuccessful.

Higher standards, particularly for Elementary Education graduates, were discussed in the context of the Common Core State Standards and the push for *effective* teaching.

This dissertation is approved for recommendation
to the Graduate Council.

Dissertation Director:

_____

Dr. Sean Mulvenon

Dissertation Committee:

_____

Dr. Ronna Turner

_____

Dr. Charles Stegman

_____

Dr. Tim Martin

DISSERTATION DUPLICATION RELEASE

I hereby authorize the University of Arkansas Libraries to duplicate this dissertation when needed for research and/or scholarship.

Agreed _____

Karen K. Morton

Refused _____

Karen K. Morton

ACKNOWLEDGMENT

I thank the professors and dear friends in the Educational Statistics and Research Methods Department. Their vast theoretical knowledge, patience, and ability to apply have coalesced all of the loves of my life: education, psychology, and mathematics.

A special thanks goes to my superintendent for his continual encouragement and faith in me. Besides providing counsel, his help in accessing the data was pivotal to completion of this project.

I appreciate the inspiration provided me by my three precedents, my father, grandfather, and great-grandfather who attained this valued degree in their beloved content areas.

DEDICATION

To Mike Morton, dear friend, who supported me through the whole process. If not for his picking up the slack and encouraging me, this would not have been completed.

TABLE OF CONTENTS

I. INTRODUCTION

Purpose of the Study

"Highly Qualified Teachers: it's a lofty and good goal, but we won't achieve it. If states set a low standard, it can be done. If states set a medium-to-high proficiency, it can't" (Scavongelli, 2003, p. 1). This administrator opinion summed up the quandary created by the Highly Qualified Teacher (HQT) provision of the 2001 No Child Left Behind Act (NCLB). The level of content knowledge required of teachers by this federal initiative was intended to raise student achievement to 100% proficiency and close subpopulation gaps.

The U.S. Department of Education stated the following as the reasoning behind the HQT provision:

> A major objective of *No Child Left Behind* is to ensure that all students, regardless of race, ethnicity or income, have the best teachers possible. A well-prepared teacher is vitally important to a child's education. In fact, research demonstrates the clear correlation between student academic achievement and teacher quality. Studies also show that many classrooms and schools, particularly those with economically disadvantaged students, have disproportionately more teachers who teach out-of-field or are not fully qualified in the subjects they teach ("Strengthen Teacher Quality," 2007, p. 10).

The purpose of this study is to evaluate the impact of the highly qualified provision in Arkansas and to investigate its effect on student achievement in a local school district. To facilitate the goals of the study, educator data on the national, state, college, and local levels were used to assess the expectations of teachers through the degree process, teacher training, and licensing. State licensing examination "cut scores" for those exams most frequently used and passing rates are presented for states with a focus on the ability of the cut scores to distinguish HQT adequately. Within Arkansas, University of Arkansas (U of A) Praxis I and II examination scores and their relationships to passing scores and national scoring quartiles were investigated. In addition, academic credentials and core course grade point averages for the U of A's College

of Education and Health Professions (COEHP) teacher-graduates were utilized to assess the level of their credentials as compared to students of other colleges within the U of A. Finally, in an effort to measure teacher effectiveness, Praxis II content knowledge scores and total years of teaching experience were linked to student academic growth in a local school district.

Importance of Highly Qualified Teacher

Convincing evidence exists that teacher qualifications are related to student achievement. For every $500 spent by schools on teacher education, student achievement gains of nearly one quarter of a standard deviation were realized (Greenwald, Hedges, & Laine, 1996). The evidence from that study demonstrated that the extra money spent on teacher education provided greater student gains in achievement than resulted from three and a half years of teacher experience.

More recently, Houston teachers with standard certification were found to be significantly more effective in raising student standardized test scores than teachers without standard certification in 22 out of 36 estimates ($p < 0.10$). In the study, the standard certification group was compared to six non-standard certification groups on six state-mandated tests (Darling-Hammond, Holtzman, Gatlin, & Heilig, 2005). Non-standard certification was defined as the absence of licensing exams, temporary or emergency certification, incomplete licensure code information, or alternative certification. The authors of that study revealed that teachers not meeting licensing requirements negatively impacted student scores.

Goldhaber and Brewer (2000), using an NELS:88 sample of 12^{th} graders ($n = 3,786$), reported that a B.A. or M.A. degree in mathematics contributed to student achievement in that content area ($d = 0.41$ and 0.58, respectively). Utilizing 2,524 student science scores, an M.A. degree in science yielded a small effect ($d = 0.23$). In addition, authors revealed that students having

teachers with permanent or emergency certification in a *relevant* field outperformed students under the tutelage of non-certified personnel.

In his 2007 study of North Carolina teacher achievement on Praxis exams required for Elementary licensure, Goldhaber revealed that licensure tests, in some cases, are related to teacher effectiveness as manifested in student test scores. He reported small but significant coefficients in models predicting student math scores with teacher pass/fail performance on licensure content and curriculum exams (R^2 = 0.70). Several student demographic variables were controlled for in the model. These results were primarily discovered in the highest quintile of teacher scores where high performance on the content exam alone provided a significant coefficient in his model (R^2 = 0.70). In general, Goldhaber was tentative in interpreting the relationship between licensure scores and student achievement because the use of elevated cut scores eliminated many effective teachers from the teaching ranks.

Central to the HQT provisions, Wenglinsky (2000), in his study of teacher candidates and the colleges they graduated from, inferred that teachers should have more exposure to content knowledge and less exposure to professional knowledge. Using as the dependent variable Educational Testing Service (ETS) Praxis II average scores from a broad range of content and pedagogical assessments, his study provided evidence that institutions with larger percentages of Education majors and with larger percentages of money spent on Departments of Education produced less effective teachers, as reflected in scores, than those institutions with a more limited and focused scope. The author inferred that limiting coursework required by Departments of Education would, in effect, increase content area requirements.

A study by Schmidt et al. (2007) revealed that Middle school teachers in the U.S. complete fewer mathematics courses and are less knowledgeable in the subject than their counterparts in

South Korea, Taiwan, and Germany. Middle school teacher-candidates responsible for teaching mathematics in Taiwan and South Korea complete coursework comparable to that required of mathematics majors in the United States. Tested on five math scales developed by the MT21 project, future U.S. teachers generally scored below China (Taiwan), S. Korea, and Germany though they excelled in the statistics strand. The research revealed that undergraduate programs for U.S. Middle school mathematics teachers provided less instruction in algebra, functions, advanced math, and analysis than their international counterparts. Approximately half of the advanced math topics taught in an undergraduate math degree program were covered in U.S. Middle school degree programs as compared to 90% in Taiwanese programs. U.S. Middle school math teachers were found to be less prepared in content knowledge than colleagues graduating in Secondary programs while receiving the same levels of pedagogy training. Schmidt et al. also related the decline in U.S. student performance on international science exams to students' lagging mathematics ability. The association was more pronounced for students who attempt the more complicated courses like chemistry and physics in Secondary schools. The authors attributed success on international standardized tests not only to teacher content knowledge but also to the extensive pedagogy training received by the front-runners of the study.

Schmidt et al. (2010), in Breaking the Cycle: An International Comparison of U.S. Mathematics Teacher Preparation, expanded The Teacher Education Study in Mathematics by surveying 3,300 future U.S. teachers and approximately 20,000 future teachers across 15 foreign countries. Revealed from survey results, educators trained at institutions that focused on Secondary teaching scored higher in math content knowledge than those future educators trained in a Middle school environment. Among other suggestions, Schmidt promoted requiring more challenging math courses in all Elementary and lower Secondary Education degree programs

where the graduates would be teaching mathematics. In addition, educators with stronger math backgrounds should be recruited, emulating high achieving foreign countries. To attain future teachers comparable to Taiwanese teachers that scored at the mean on the 2003 TIMSS, U.S. recruits would necessarily have scored in the 85th percentile range.

Heck (2007) revealed in his research on the relationship between teacher quality and student achievement that collective teacher quality was positively related to achievement in both reading and mathematics, especially in schools where subgroups were more highly clustered. In this multilevel study, teacher quality was measured by the percentage of teachers at a school that were fully certified, had passed content knowledge exams, and had met state performance standards. Other encouraging results revealed were that increased collective teacher quality over time was related to higher student growth rates in math and the narrowing of subgroup achievement gaps.

Another example of teacher performance affecting student achievement was found in Connecticut. The Beginning Educator Support and Training assessment (BEST), for many years, was administered to second and third year teachers. BEST scores significantly predicted value-added gains on state mandated reading tests. Gains of 40% or more in reading were associated with a one point performance difference on the BEST's four-point scale (Darling-Hammond, 2010). Alternately, she reported that Praxis scores on teacher licensure exams were not significantly related to student gains.

Years of teaching experience has been an important and well-researched factor of student achievement. Gordon, Kane and Staiger (2006) revealed that the largest gains in teacher impact on student math achievement were between years one and two, 3 percentile points, with 1 percentile point gained between years two and three. Clotfelter, Ladd, and Vigdor (2007)

regressed a number of teacher characteristics on student achievement. The effects of teacher experience on reading achievement ranged from 0.042 ($p = 0.004$) for one to two years of experience, increasing to 0.083 ($p = 0.004$) for 28 or more years of experience. Math effects were stronger, ranging from 0.066 ($p = 0.005$) for 1-2 years of experience to 0.097 ($p = 0.006$) for 28 plus years of experience.

National, state, and college-level concerns about teacher qualifications have generated a plethora of research and rhetoric. Administrations, State Educational Agencies (SEA), and teacher organizations have espoused differing directions for NCLB to proceed. Presently, the Obama administration plans on reauthorizing the legislation and utilizing a former title, the Elementary Secondary Education Act. Proposed changes to the HQT provisions are designed to produce more *effective* educators ("Elementary," 2011). In this the Common Core State Standards era, teachers are under more pressure to have a deeper understanding of their content areas. Elementary educators, responsible for teaching several subjects, will be especially challenged as they teach rigorous content and application of knowledge through higher-order thinking skills ("About the Standards," 2011).

The reauthorization of NCLB will not only uphold previous standards for qualified teachers but will institute measures of teacher effectiveness. Generally accomplished through principal evaluation in the past, the upcoming legislation will measure teacher effectiveness with student learning evidence (Darling-Hammond, 2010). Though many measures are available, student achievement gains in the classroom has been espoused as a valuable method for fulfilling the goals of NCLB while meeting the new goals of the reauthorization.

Research Questions

National level. Though the highly qualified designation has been defined in as many ways as there are states and jurisdictions, the common thread that runs through almost all of the plans is passing licensing examinations. Differences in state requirements are the number of teacher examinations mandated and the combinations of content knowledge and pedagogical exams. The decision on whether a beginning teacher meets their state's definition of highly qualified is directly contingent upon licensure examination cut scores.

Of initial importance in the present study is the examination of the cut scores applied by the states for teacher licensure assessments, especially those required to teach in a content area. Education Secretary Margaret Spelling (2005, p. 38) asserted, "As a result of the low minimum passing scores and the high, test-taker pass rates, many question the value of the current pass rates for determining how well novice teachers are prepared to enter the classroom."

Nationally, low cut scores have been the rule rather than the exception. Very few states have set cut scores for their required teacher assessments at or above the national median for those exams. For example, only Virginia has used cut scores close to the national median on the Praxis I "Pre-Professional Skills Test" ("State Requirements," 2010). Virginia, Alaska, and Colorado have all used cut scores for the Praxis II "Mathematics: Content Knowledge" above the national median of 144, but they are the only states or jurisdictions that have done so for that exam. However, all of the states, including the aforementioned, use at least one cut score below national medians. Some SEAs have set passing scores at such a minimal level that an aspirant could score higher by guessing. For example, in Arkansas, before the Fall of 2008, a prospective teacher passes the multiple choice Praxis II "Mathematics: Content Knowledge" exam with a scale score of 116 ("Praxis Series Testing," 2010). This assessment, necessary for Secondary

licensure in mathematics, is scored between 100 and 200 with each of the 50 items having four response choices. Assuming equal weighting of the items then calculating this binomial probability, an individual has a 95% chance of attaining a 116 or better by guessing. Arkansas raised the mathematics passing score to 125 in September, 2008 ("Praxis Series Testing," 2010). With the change, the probability of guessing and passing is a much decreased 49% (see Appendix B for calculation).

Percentages of prospective teachers passing these examinations reveal high passing rates in all states, with over half of the states showing passing rates 95% or higher (Spelling, 2006). In a perfect world, states and institutions of higher learning should be proud and take credit for such exemplary passing rates. However, if the cut scores do not distinguish between simply qualified teachers and those highly qualified to teach in the content area, the question arises: are they set too low? The first research question is: *nationally, do cut scores for content area licensure examinations differentiate highly qualified teachers from those less qualified?* The relationship between passing scores and passing rates is explored to investigate the hypothesis that cut scores are minimally set to distinguish HQT. As further support, the probability of passing exams by means of random guessing was addressed.

Arkansas Praxis examinations. Whereas all states differ on the kind and number of assessments utilized to qualify teachers, of particular interest in the present study is the state of Arkansas. Numerous ETS Praxis I and Praxis II assessments, testing both professional and content knowledge, are required of new teachers in the state. Passing the examinations fulfills one part of the highly qualified requirements in the state ("Arkansas Highly," 2010). Arkansas also required a direct classroom assessment, the Praxis III, for beginning teachers ("Overview,"

2010). After May of 2011, the Praxis III was no longer required for beginning teachers that had attained a master's degree or completed the Non-Traditional Licensure Program (Tolson, 2011).

Where the sentiment behind the testing is honorable, the Arkansas cut scores may be set too low. Linked to Arkansas licensure cut scores are the high passing rates for prospective teachers in the state. The second research question is: *do Arkansas Praxis I and Praxis II content area passing scores differentiate highly qualified from non-highly qualified teachers?* The most commonly taken examinations are explored with a focus on the associated percentiles of Arkansas passing scores amongst U of A test-takers and how testers compared nationally. The probabilities of passing the English, math, and biology content knowledge exams through random guessing are reported as they specifically are related to Arkansas passing scores. To put Arkansas passing scores in perspective, the level at which U of A test-takers would pass in states with comparable examinations is investigated. In addition, the actual pass rates on most commonly used examinations is explored.

College level. Preceding college admittance, degrees in Education, and licensure examinations, the academic credentials of prospective teachers may be below that of other fields. National SAT data from 2006 indicated that high school students who planned on going into education have among the lowest scores in reading, mathematics, and writing ("Total Group," 2006).

The American College Testing (ACT) composite scores for the graduating class of 2006 demonstrated that Education majors-to-be averaged below the national mean for the total cohort ("ACT High School," 2006). Nationally, ACT test-takers averaged 21.1 on the composite score while students specifying Education as their career objective averaged 20.7. Differences of as little as 0.2 in ACT averages are referred to as significant ("2006 ACT National Score," 2006).

Results of graduating high school seniors from 2010 revealed that Education aspirants averaged in the lower tier of scores, especially within the professions that would require college degrees ("2010 College-Bound," 2010). Pertinent to the present study, the group of future educators scored lower than Business majors and far lower than students indicating that they will major in mathematics, English, or the sciences ("National Level," 2011).

Disconcerting was U.S. Department of Education research on teaching careers in comparison to college-entrance exams ("To Teach or Not," 2007). Researchers discovered that the college-entrance scores of future teachers in 1992-1993 were inversely related to the likelihood that they would be teaching ten years later. Of the lowest quarter of scores, 16% of teachers were still teaching in 2003 while 10% were not. Of the highest scorers, more left teaching than not.

Encouraging research on the SAT revealed test-takers from 2002-2005 as having stronger grades and higher verbal and math scores on the SAT than prospective educators of the mid-1990s (Gitomer, 2007). The data included profiles of alternative candidates as well as those traditionally trained. This upward trend suggested a "higher caliber" of educator entering the classroom. But, the author's findings also revealed Elementary school, Special Education, and Physical Education teachers as having scores markedly lower than their colleagues teaching an academic subject in Secondary school.

The third research question is: *do Education majors enter the University of Arkansas with credentials below that of their peers in other fields and exit as graduates with levels of general content knowledge below that of their peers?* Differences in group means on college admittance variables and core course GPAs are reported and discussion follows on whether future teachers are deficient in academic measures where high achievement would be desirable to fulfill HQT. Discussed is how these lagging credentials have fostered lowered expectations of teachers in

their scoring abilities on licensure tests and, ultimately, undermining the NCLB goal of a highly qualified teacher in every classroom.

Office of Institutional Research (OIR) data from the University of Arkansas, Fayetteville, were analyzed to explore the academic admittance credentials and college coursework for graduates from the U of A from 2008 to 2010. The focus was College of Education and Health Professions Elementary teacher-graduates who acquired their Bachelor of Science degrees during this timeframe. Variables explored included those used for college admittance: high school grade point average (HSGPA), the ACT composite score, and ACT subtest scores. Grades in college core courses, English, mathematics, history, and biology, were utilized to compare the level of general knowledge acquired by U of A graduates.

The summary statistics of Education majors are juxtaposed against prospective Secondary educators and, the majority of students in the data, the Non-Education graduates. The Non-Education group included business, arts and sciences, engineering, architecture, agriculture, family and consumer science, and other majors outside of the COEHP.

Teacher effectiveness. Going beyond collegiate expectations for future teachers and assumptions that teachers are qualified, the fourth research question addresses teacher effectiveness in the classroom. *Can content area Praxis II examination scores and total years of teaching experience of educators be linked to student academic gains?* Student data from a local school district in Arkansas were accessed to explore the relationship between student achievement gains on the state mandated exam and two teacher variables. Praxis II content knowledge scores were collected for teachers from this local district with total teaching experience of one to five years. Should teacher content knowledge, as manifested in Praxis II scores, be related to student achievement, a key point in the NCLB HQT legislation would be

supported. Another of the many factors associated with effective teachers, the number of years of total teaching experience, was included in analysis, as well. Either or both may serve as indicators of teacher success in the classroom providing administrators with another measurable attribute in their quest to hire effective teachers. While successfully establishing a relationship between the teacher variables and student achievement gains would prove beneficial, scrutinizing both ends of the spectrum of licensure exam scores, years of experience, and student gains would be enlightening as to the profile of effective teachers.

Today, teacher training can be gained in a multitude of ways, from the traditional route in Colleges of Education to alternative licensure. The multitude of licensure examinations with the various cut scores used by SEAs for certification has further complicated the highly qualified issue contributing to the question of *who* is "highly" qualified? States, individually, have refined their definitions during the past decade thus enabling their school districts to hire only those candidates that have the important characteristics that would classify them as "highly qualified," in theory. But, are they *truly* highly qualified? And, looking toward the reauthorization of NCLB, can educator attributes translate into teacher effectiveness?

To understand the depth of the issues and support the argument that educator testing standards should be elevated, the background must be explored.

II. LITERATURE REVIEW

Definition of the Highly Qualified Teacher Provision

The HQT provision of the NCLB Act of 2001 required that teachers have a bachelor's degree, full state certification, and demonstrable content knowledge in the subjects taught ("No Child Left Behind: A Toolkit," 2006). To demonstrate competency, Middle and Secondary teachers had to prove to the SEAs that they *knew* the subject they taught. This could be accomplished with a college major in the subject or credits comparable to a major, passage of a state-mandated assessment, completing a graduate degree in the subject, being awarded an advanced certification from the state, or gaining credit for experience and professional development through the High Objective Uniform State Standard of Evaluation (HOUSSE) form ("New No Child," 2004). New elementary teachers were required to take a "rigorous" content test of elementary curriculum (Spelling, 2006).

English (reading and language arts), mathematics, science, history, civics and government, geography, economics, the arts, and foreign language were denoted as core academic subjects and would be the focus of the HQT provision. Other content areas were not specifically addressed by the legislation. The requirements placed on core teachers also applied to Special Education and teachers of English Language Learners (ELL) that taught core subjects.

The original target was to have highly qualified teachers in 100% of the core subject classrooms by the end of the 2005-2006 school year. However, the U.S. Department of Education issued a one-year reprieve if states met certain qualifications. If states had defined HQT in a way consistent with the law, had reported their statistics on percentages of highly qualified teachers in their state to parents and the public, and had collected complete and accurate data on their highly qualified teachers, then states' requests were considered (Keller,

2005). All states, the District of Columbia, and Puerto Rico had submitted revised plans attempting to meet the HQT goals by the fall of 2006 ("HQT Revised State Plans," 2008). No dates were set by the U.S. Department of Education to revoke Title I funds based on state insufficiencies in HQT requirements.

HQT in Arkansas

As state highly qualified plans were being finalized in 2006 at the behest of the United States Department of Education (USDOE), Arkansas reported that 5% of classes were not taught by highly qualified teachers ("State Report [2006]," 2011). Further, it was revealed that the level was 15% in high poverty schools.

The USDOE reviewed Arkansas's definition of HQT in May 2006, and the decision was that the Arkansas plan needed further revision (James, 2006). The major comments, both favorable and unfavorable, were: progress had been made in the past year in reviewing and identifying highly qualified teachers (even though Arkansas's formal definitions were not in place until August, 2005); the State Report Card did not contain HQT data, but had slated its inclusion by March 2006; and, though strategies were in place, Arkansas lacked a comprehensive, written plan to ensure HQT equity for poor and minority students. The revised plan was submitted by September 2006, with more revisions submitted in November. The plan was accepted by the USDOE in December (Howell, 2006, December 16).

The revised plan to achieve 100% HQT in Arkansas core courses focused on reading, social studies, language arts, foreign language, music, and art classes. The plan designated that districts and schools where the percentage of highly qualified teachers was 10 percentage points below the Arkansas average of 84.8% would be targeted for attention (Howell, 2006, December 16).

Arkansas districts were directed to report to the Arkansas Department of Education (ADE) on their HQT percentages by January 2007. Central to 100% fulfillment, Arkansas districts were required to complete a plan delineating how non-highly qualified teachers would meet the state's definition of highly qualified by the end of the 2006-2007 school year ("LEA Plan," 2006). For the 2008-2009 school year, the Arkansas Department of Education reported that a mere 2.4% of teachers were not highly qualified ("Arkansas State [2009]," 2010). As an update, the 2010 Arkansas State Report Card revealed that 1.1% of classes were not taught by highly qualified teachers ("Arkansas State [2010]," 2011).

Background on the Federal Government's Role in Teacher Quality

The federal government's role in promoting high standards for teachers has been fairly recent. In 1950, half of U.S. teachers had not attained a college degree, and staffing decisions were made almost exclusively on the state level. A recapitulation by Waugh and Slivka (2005) revealed the following history of HQT.

With the success of the Soviet space program in 1957, Congress intervened in the teacher education process with the National Defense Education Act (NDEA). Besides providing loans and scholarships for those entering the fields of mathematics, science, and foreign language, Congress appropriated one billion dollars for teacher professional development.

In 1965, Congress passed the Higher Education Act (HEA). The HEA provided federal funding for poor and minority students to go to college and was later given credit for many of the female and minority teachers who entered teaching in the 1970s. Its reauthorization in 1980, renamed the Schools of Education Assistance Act (SEAA), enacted reform in teacher-education institutions.

Attention to teacher quality escalated when the renowned *A Nation at Risk: The Imperative for Educational Reform* of 1983 was published. The report criticized teacher-education programs for overemphasizing courses in pedagogy while disregarding content area knowledge. Through the 1998 Teacher Quality Enhancement Grants and Teacher Training Partnership Grants, the U.S. Department of Education (USDOE) directed states to ensure that their schools were staffed with qualified teachers. Under NCLB, the legislation housing the HQT provision, the directive for highly qualified teachers was formalized.

The No Child Left Behind Act of 2001 was preceded by the Elementary and Secondary Education Act (ESEA) of 1965. As part of President Johnson's war on poverty, this legislation provided significant federal funding to schools for the first time (Nwazota, 2005). The bill provided subsidies to schools with large populations of students with low socioeconomic status (SES). Head Start, a pre-school program for impoverished students, was a key component of this legislation. Later the program was expanded to aid all grades in poor communities while leaving the management of public education as it was, with the SEAs. Professional development for teachers and programs to promote parent involvement were also funded with federal money.

A cornerstone of the ESEA was the measurement of student achievement by the National Assessment of Educational Progress (NAEP). The Nation's Report Card, as it is also called, has been administered to U.S. students since the 1969-1970 school year ("The History," 2006). NAEP assesses the content areas of reading and mathematics biennially within states on random samples of 4^{th} and 8^{th} grade students. In every other testing cycle either science or writing is assessed ("Overview," 2007). Nationally, a random sample of 12^{th} grade students are tested on the same content areas. A variety of subject areas such as U.S. history, economics, and foreign language are assessed mid-cycle ("Schedule for the State," 2007). Administered by the

Education Commission of the States until 1983, The NAEP utilizes nine contractors to design assessments and administer the tests ("Current," 2010). Under ESEA, states were not held accountable to the federal government for student achievement as they are within No Child Left Behind.

In 1994, the Clinton administration revised the ESEA as the Improving America's Schools Act (IASA) (Nwazota, 2005). Programs for disadvantaged students and student testing were expanded. NAEP testing for 4th, 8th, and 12th grade core areas indicated that low percentages of students met proficiency minimums and that there were performance gaps in achievement between subpopulations of students.

Title II legislation within the Higher Education Act was reauthorized in 1998 with the provision that all states require licensure exams for beginning teachers (Stotsky, 2007). Licensure exams were utilized before this time, but not broadly. Formalizing the requirement was intended to serve two purposes: the public would be protected from incompetent teachers and teacher training programs would be held accountable for the academic competence of their graduates.

At the turn of the century, the Bush administration conducted an overhaul of the educational system, which resulted in the No Child Left Behind Act of 2001 (Nwazota, 2005). Initially, NCLB received praise from legislators and constituents based on its far-reaching goals for *all* students. Since the signing on January 8, 2002, many of these same supporters became critics of the legislation calling it an unfunded mandate and condemning it for imposing unrealistic expectations on student achievement.

States responded to NCLB and its HQT provision in a number of ways. Many states addressed the highly qualified issue directly while others tried to circumvent the law. In the early

years, some SEAs even considered renouncing Title I: Aid to Disadvantaged Children funds, one of the most renowned of the ESEA programs, because of the HQT compliance contingency. In more recent years, five states unsuccessfully introduced legislation to completely opt out of NCLB recognizing that federal funds might be affected ("States Opt," 2008).

Since the institution of NCLB in 2002, student achievement has been on the rise. A 2010 study by Kober, Chudowsky, and Chudowsky of student test data from state assessments, as well as the NAEP, revealed that a majority of states (with sufficient data) made gains in both 4th and 8th grade math and reading scores. Authors discovered that trends on state-mandated exams usually moved in the same direction as performance on the NAEP though state test gains tended to be larger. Arkansas achieved gains in math and reading proficiency on state tests but NAEP results trended upward only in math.

NAEP results have improved over the last decade. Percents at or above Basic in math and reading increased in 4th grade math and reading until 2007 where they have remained the same at 82% and 67%, respectively ("The Nation's Report Card," 2010). Additionally, gains were achieved in NAEP 8th grade math over the last decade and more modestly in reading since 2005. The 12th grade NAEP scores in math have improved since 2005 in the combined and racial/ethnic subgroups while reading scores have increased only modestly. The NAEP achievement gap between African American and White students narrowed during the timeframe 2002-2007 in 4th and 8th grade math and in 4th grade reading ("Achievement Gaps," 2010).

In 2007, the Arkansas Department of Education and a large majority of states had their accountability and highly qualified plans in place, or at least formulated and waiting for approval. These successes coincided with the fifth anniversary of the signing of the NCLB Act and the initial push by President Bush to have the law reauthorized by 2009. President Bush

stated that reauthorization was critical ("Fact Sheet," 2007). He asserted that NCLB is "changing a culture and that it *is* working." As evidence, he referred to outstanding reading progress in nine year olds during the NCLB years. More progress had been made in NAEP reading scores during that timeframe than in the preceding 28 years combined, he stated. Additionally, the percentage of classes taught by highly qualified teachers had risen to greater than 90% nationally ("No Child Left Behind's 5th," 2007).

Contrary viewpoints to NCLB were issued by the Commission on No Child Left Behind (Lips, 2007). Organized by the Aspen Institute and chaired by two former governors, seventy recommendations to improve NCLB were made. On the HQT provision, the commission recognized that teacher qualifications do not necessarily translate into effectiveness. In their report, they cited studies in Los Angeles and New York City where teacher certification did not affect student achievement. Their report recommended including *Effective* in the title, the new provision being named Highly Qualified Effective Teachers. With the reauthorization of NCLB looming, the Aspen Commission plans on holding hearings to release an addendum to their 2006 report (Klein, 2009). One of their focus areas will be aid to low-performing schools.

Reauthorization stalled at the end of President Bush's second term in office. As a stopgap, Secretary Spelling introduced new regulations to strengthen NCLB. First, high school graduation rates would be calculated in a standard way across states. Second, school transfer and free tutoring would be publicized to a greater degree in schools on the improvement list, and lastly, NAEP scores for each SEA would be reported with other student achievement data ("U.S. Secretary," 2008).

Throughout 2010, seven hearings were held in the House Committee on Education and Labor on the future of the ESEA ("Elementary and Secondary," 2010). The Obama blueprint outlined

to the public provided significant changes to the NCLB legislation and focused more on responsibility, reform, and results. The President was seeking to build bipartisan support with the goal, since unfulfilled, of reauthorization in 2011 ("Readout," 2011).

Arne Duncan, U.S. Secretary of Education, has espoused eliminating the *perverse* incentives in the law that, instead of raising student achievement, have actually caused states to lower their standards. The emphasis will change in the Obama legislation from the pass-fail method utilized under NCLB to student academic growth over time. The goal for all students will be college and career readiness by the year 2020 (Anderson, March 14, 2010).

Teacher quality under the Obama blueprint will give states flexibility to define "effective teachers" and support career ladders that improve student outcomes ("A Blueprint," 2011). Professional development, recruitment and other supports will be instituted to elevate the level of teaching. Education preparation programs will be held accountable through data systems designed to follow teacher progress in student achievement over time. Bold in its approach, states will be held accountable for placing effective teachers in all schools equitably.

Diversity in Qualifications

Background on HOUSSE. States were charged with creating their definitions for "highly qualified teacher." Following the definition phase, they were tasked with creating an evaluation tool that struck a balance between rewarding experienced teachers for years of subject-specific knowledge and service while fostering rigorous, but fair, content standards for all teachers (Azordegan, 2004). A key emphasis in the HQT wording made states responsible for deciding *what* constituted proper content knowledge of a subject. The consensus was that it should at least be equivalent to attaining a college minor in the subject (Walsh & Snyder, 2004).

The instrument for evaluating veteran teachers was the HOUSSE, or High Objective

Uniform State Standard of Evaluation. This tool, designed by individual State Educational Agencies (SEA), was used to gauge whether Elementary, Middle, and Secondary teachers were highly qualified. However, options other than an examination or college degree in the content area could be substituted in many of the state HOUSSE requirements.

An early analysis of versions of HOUSSE was conducted by the Education Commission of the States (ECS). They reported that the versions being developed by the states could be placed in the general categories: 1) a point system, 2) professional development, 3) performance evaluation, 4) classroom experience, 5) portfolio, and 6) student achievement data (Azordegan, 2004). Some of the more frequently used options to fulfill the HOUSSE requirements included professional development, college course work, student achievement data, awards, or publications. Azordegan concluded that the point system was the most widely used method for assigning HQT status.

On the national level, the HOUSSE requirements varied widely. Whereas North Carolina required six months of experience to meet requirements for Elementary teachers, New Mexico required two years of experience ("50-State," 2006). In California, half the necessary points could be accumulated from years of experience, while in Alabama only 30% of points could be gained through experience (Carey et al., 2003). Two states, Wisconsin and Idaho, did not originally institute HOUSSE because they asserted that their teacher licensure policies already ensured that teachers in their states were highly qualified. However, through pressure from the U.S. Department of Education (USDOE) to comply, both developed HOUSSE forms for state use.

By 2006, the USDOE "strongly" encouraged states to phase out use of the HOUSSE

as veteran teachers had been given adequate time to move to the HQT rolls (Keller, 2006). In May 2006, the USDOE required SEAs to submit, in their revised HQT plans, how they would utilize the HOUSSE procedures for teachers already hired and how they would limit use of HOUSSE for teachers hired after the end of the 2005-2006 school year. The USDOE determined that experienced teachers no longer needed HOUSSE to become highly qualified after 2006 and found that state HOUSSE procedures were less rigorous than other ways of assessing content knowledge (Spelling, 2006, September 5).

HQT in Arkansas and ARHOUSSE. To attain highly qualified status in Arkansas, first, a teacher must have one of the four Arkansas teaching licenses: 1) initial, 2) standard, 3) Non-Traditional Licensure Program (NTLP) provisional, or 4) reciprocity provisional. The actual inventory that enumerated HQT options was the Highly Qualified Teacher Designation Form. It held three options for attaining the HQT status: 1) passing Praxis II content and professional knowledge assessments, 2) being a veteran Middle or Secondary teacher with a college major or its equivalent in the content area, or 3) being a veteran teacher with 100 or more points on Arkansas's version of the HOUSSE form, the ARHOUSSE (Williams, 2006). A graduate degree or National Board Certification in a teacher's content area also served to establish experienced teachers as highly qualified.

All new Arkansas teachers are deemed highly qualified by passing the Educational Testing Service (ETS) Praxis II examinations for content area and professional knowledge. This met the federal mandate that all new hires, beginning with the 2002-2003 school year, are required to be highly qualified if the teachers participate in Title I school-wide programs ("No Child Left Behind: A Toolkit," 2006).

Addressing content knowledge is essential for Secondary schools where teachers most often instruct in a single content area. In contrast, having Elementary teachers meet HQT was not as straightforward because they teach subject matter across the entire grade-level curriculum. To become highly qualified, new Elementary teachers were required to pass a rigorous state test on multiple core subject areas and teaching skills, as mandated by NCLB (Spelling, 2006).

In Arkansas, HQT can be gained for three levels, grades K – 6, grades 4 – 8, and grades 7 – 12. For all three levels, Arkansas requires the Praxis I "Pre-Professional Skills Test," an assessment of basic skills in reading, writing, and mathematics. In many states, Arkansas included, students are required to pass this exam to fulfill conditions of their degree program ("State Requirements," 2010). In addition, all teaching levels require the level-appropriate Praxis II Principles of Learning and Teaching (PLT) examination. This examination uses a case study design with constructed response and multiple choice items to measure general pedagogical knowledge ("Praxis II Overview," 2006).

Before 2007, Arkansas required passing the Praxis II "Education of Young Children" examination for Elementary certification. This examination assesses what teachers know about child development, the learning environment, relationships with families, and other teaching-related areas. Arkansas moved away from only testing pedagogy on the Elementary level with the introduction of a new content examination in 2007. The Praxis II "Early Childhood: Content Knowledge" exam is presently used to measure teacher knowledge of language/literacy, mathematics, social studies, science, health and physical education, and the creative and performing arts. A synopsis of the examination specifically stated that pedagogy was not emphasized. The exam measures the major concepts, how they were related, applications of knowledge, and the structure of the content areas ("Early Childhood," 2007). According to

ETS documentation in 2010, eleven other states employ this examination ("The Praxis Series Passing," 2010).

Besides the basic skills and pedagogy examination required, all Arkansas Secondary teachers must show proficiency in a content area (e.g. mathematics, language arts, science) for HQT status. The Praxis II content areas examinations, with associated cut scores, are utilized to measure teacher knowledge. An examination measuring content area for middle grades 4-8 has been required since 2001 ("Praxis Series Testing," 2008). Arkansas also required that all new teachers pass the Praxis III, a performance assessment, as an additional requirement for standard licensure until May 2011 (Tolson, 2011).

The College of Education and Health Professions (COEHP) at the University of Arkansas requires that future educators pass the Praxis I and Praxis II content area exams prior to their student teaching internships ("Test Requirements," 2007). It is recommended that students attempt the Praxis I after completing College Algebra and both semesters of freshman English. The Praxis II pedagogy exams are to be completed during the internship phase of the M.A.T. program.

Most experienced Arkansas teachers met HQT because of attainment of a college degree in a subject specific to a content area. The ARHOUSSE form was used in the early NCLB years as evidence of content knowledge if there was no college degree or content area assessment to demonstrate adequate training. Of the 100 points necessary, 10 points per year of subject area teaching could be credited, up to a maximum of 50 points ("Arkansas Department of Education," 2006). Content-based professional development could accumulate to a maximum of 40 points. Other ways to acquire credits were through university coursework (i.e. three points per credit hour), acting as lead teacher or in an administrative capacity in the content area (i.e. 10 points per

year, 30 points maximum), or serving on a curriculum committee either locally, statewide, or nationally. Additionally, service on a textbook adoption committee, publishing in a content area, presenting at or attending content area conferences, and service as a mentor could apply. Several other specialized reading and mathematics curricular training courses were accepted as well. An example of a way that an experienced English teacher, without an English degree, could have attained the 100 points was with five years of teaching experience in English, two years of mentoring, being on the textbook adoption committee, and having completed one college course in English.

Of those who did not meet HQT in Arkansas, 74% of non-qualifiers were Secondary teachers who were teaching out-of-field (those not teaching in their certification field) and had no professional history to obtain the 100 points (James, 2006). Twenty percent were general education teachers in Elementary schools, with a college degree, who did not pass a content area test or could not meet the required 100 points on the ARHOUSSE.

State reporting of highly qualified teacher statistics. September 2003 was the original date that states were to file baseline data on highly qualified teachers in their states. However, seven states or jurisdictions failed to comply. Some cited an inability to collect even rudimentary information, while others appeared to be acting in good faith. Suspicions as to the validity of the data arose when the Education Trust analyzed the reported data. Wisconsin's Department of Public Instruction reported the largest percentage of highly qualified teachers, 98.6% in aggregate and 96.9% in the high-poverty schools (Carey et al., 2003). The diversity in percentages of highly qualified teachers among the states was underscored by Wisconsin's disclosure that they had no content area testing for new teachers until 2004, well after this survey of states. Before 2004, Wisconsin approved all current Middle and Secondary teachers as

meeting HOUSSE requirements. Since then, they have utilized ETS Praxis II content area exams for Secondary certification ("Testing Prospective," 2004).

Of the 45 states or jurisdictions responding to the federal request for state data, twenty reported that at least 90% of their classrooms were taught by highly qualified teachers (Carey et al., 2003). Seventeen claimed that 70-89% of their teachers, in content areas, were highly qualified. Five, including California and Maryland, reported proportions between 40 and 69%. The remainder had very low proportions of highly qualified teachers. These numbers should be interpreted cautiously, as many states included a disclaimer or footnote about the limitations of their data. Examples of footnotes ranged from percents being based solely on Secondary classrooms to *only* core subjects being reported. Mostly, states presented favorable percentages of highly qualified teachers.

Since 2003, less optimistic numbers have been presented by several states. Arkansas reported in 2003 that 97% of classes were taught by highly qualified teachers (Carey et al., 2003). After revisions to their HQT plan in 2006, the *Arkansas State Report Card* revealed that a lower 92.6% of classes were taught by highly qualified teachers in the state ("School Report Cards," 2006). The *Arkansas State Report Card 2009* revealed a higher 97.6% of classes taught by highly qualified teachers ("Arkansas State," 2010).

HQT data for Elementary and Secondary schools by high- and low-poverty are attainable from the U.S. Department of Education website ("HQT Data," 2008). The levels of HQT in Elementary schools ranged from a low of 70.9% in Idaho to 100% in North Dakota. On the Secondary level, Hawaii disclosed that 60.2% of its core academic classes were taught by highly qualified teachers. Again, North Dakota reported that *all* Secondary core academic courses were taught by highly qualified teachers. For states, the average percentage of Elementary core

academic courses taught by highly qualified teachers was 95.9% while the corresponding statistic on the Secondary level was a lower 93% (Figure 1). Percents increased by the 2008-2009 school year to 97% and 95%, respectively ("A Summary," 2010).

		Elementary			Secondary		
	All Schools	**High-Poverty**	**Low-Poverty**	**Total Elem.**	**High-Poverty**	**Low-Poverty**	**Total Second.**
Alabama	94.5	95.2	98.1	97.1	79.3	93.2	90.1
Alaska	80.9	70.7	68.1	74.6	80.0	86.2	85.4
Arizona	94.7	92.2	97.7	94.7	94.4	96.2	94.7
Arkansas	97.6	95.8	98.9	97.8	95.9	98.6	97.3
California	90.9	94.9	97.4	95.7	86.3	93.4	89.4
Colorado	98.1	98.3	98.3	98.3	96.2	97.8	97.2
Connecticut	98.0	96.9	99.1	98.5	95.2	98.8	97.9
Delaware	90.7	92.4	97.0	96.3	78.1	91.3	89.6
D.C.	56.6	76.1	68.8	73.8	55.7	57.1	52.5
Florida	89.8	90.7	88.5	91.5	91.2	89.6	87.9
Georgia	96.2	94.3	98.1	97.1	91.5	98.0	95.9
Hawaii	64.9	82.7	89.6	86.2	58.1	63.4	60.2
Idaho	71.3	72.6	72.6	70.9	74.1	68.2	71.0
Illinois	96.8	83.3	99.8	96.1	96.5	99.9	98.9
Indiana	92.6	90.1	89.2	90.9	94.0	95.9	95.2
Iowa	99.2	99.6	99.6	99.5	98.7	99.3	99.0
Kansas	88.3	94.6	97.7	97.4	72.3	91.2	86.3
Kentucky	98.0	98.9	99.4	99.1	96.7	97.6	97.2
Louisiana	83.7	85.3	95.6	90.3	66.7	88.3	77.8
Maine	94.9	95.3	97.1	96.0	93.3	95.1	94.4
Maryland	82.2	66.2	94.8	84.3	63.4	89.1	81.8
Massachusetts	94.9	91.5	98.0	95.7	84.7	95.8	93.1
Michigan	99.6	99.6	99.8	99.8	98.9	99.8	99.6
Minnesota	97.7	97.4	98.2	98.2	94.1	98.4	97.5
Mississippi	94.9	91.2	97.5	95.9	87.1	95.5	92.5

Figure 1 (continued)

		Elementary			Secondary		
	All Schools	**High-Poverty**	**Low-Poverty**	**Total Elem.**	**High-Poverty**	**Low-Poverty**	**Total Second.**
Missouri	96.7	93.9	98.8	96.9	91.8	98.1	96.5
Montana	99.4	99.9	99.9	99.9	98.7	99.3	99.3
Nebraska	97.5	98.6	96.9	98.4	96.1	97.7	97.1
Nevada	86.6	86.0	93.3	90.0	80.0	87.6	85.4
New Hampshire	98.7	98.0	99.8	99.3	98.1	98.8	98.5
New Jersey	98.8	97.8	98.4	98.9	97.2	99.1	98.7
New Mexico	91.7	93.8	96.7	93.4	90.8	94.1	91.1
New York	95.0	94.9	99.1	97.4	83.9	97.1	93.2
North Carolina	97.2	98.3	99.2	98.6	92.5	96.7	95.5
North Dakota	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Ohio	96.5	89.5	99.2	97.1	87.2	98.8	95.8
Oklahoma	93.7	95.3	97.6	96.8	85.4	93.1	91.8
Oregon	89.9	96.8	90.2	94.8	87.5	89.8	88.6
Pennsylvania	96.5	90.5	99.3	96.6	87.2	98.4	96.3
Rhode Island	94.9	97.1	98.0	97.7	89.1	94.5	92.5
South Carolina	95.7	92.3	97.7	96.3	87.8	96.8	93.8
South Dakota	97.9	98.9	98.5	99.1	95.1	97.0	97.3
Tennessee	97.4	98.1	99.1	98.9	93.7	97.9	96.2
Texas	98.1	98.9	99.6	99.3	96.7	98.7	97.7
Utah	78.8	89.2	84.4	87.4	75.7	85.1	77.5
Vermont	92.8	92.0	92.2	92.2	91.3	94.0	93.1
Virginia	96.8	96.6	98.5	97.9	93.5	98.1	96.5
Washington	98.2	99.2	99.7	99.5	96.2	98.4	97.9
West Virginia	90.9	94.2	95.9	95.3	82.8	87.2	87.8
Wisconsin	98.4	97.2	99.3	98.7	95.2	99.1	98.1
Wyoming	95.6	95.6	96.1	96.8	93.2	97.4	95.3
Average	94.2	93.5	96.6	95.9	88.7	95.4	93.0

Figure 1. Percentage of core academic classes taught by highly qualified teachers 2006-07.

Summary of Diversity

States have developed their own definitions of Highly Qualified Teacher in compliance with the NCLB requirements that highly qualified teachers should hold a bachelor's degree, have full state certification, and possess demonstrable content knowledge in their content areas. In order for veteran teachers to meet the HQT requirements, states employed the HOUSSE which afforded teachers the opportunity to evince content knowledge without a college major or licensing exams in their teaching field. To meet HQT in Arkansas, a teacher must hold an Arkansas teaching license, have passed the appropriate Praxis I and II exams in pedagogy as well as in content area. In the early years of NCLB, Arkansas teachers could fulfill the requirements through a combination of teaching-specific activities on the ARHOUSSE.

States, originally, were to report percentages of teachers highly qualified in 2003. Of the 45 states or jurisdictions reporting, twenty reported that at least 90% of classrooms were taught by highly qualified teachers. By the 2008-2009 school year, 97% of core academic classes on the Elementary level and 95% on the Secondary level where taught by highly qualified teachers.

Teacher Shortages and Out-of-field Teaching

In discussions of NCLB, certain points have recurred with paucity of qualified teachers often identified. Teacher shortages in certain fields and staffing in rural and inner-city schools have been identified as making HQT even more difficult to achieve (Spelling, 2005). The shortages that exist ultimately hurt disadvantaged students, such as those in high-poverty schools where hiring and retention are the most problematic (Spelling, 2006). The states' challenge is to meet the issue of shortages without lowering their HQT standards.

Secretary Spelling (2005) claimed that the U.S. does not have an overall shortage of qualified teachers. Further, she stated that the nation prepares an excess of Elementary teachers but not

nearly enough Secondary teachers in critical areas like mathematics, the sciences, limited English proficient, and special education. The U.S. Department of Education revealed that as many as one in four high school mathematics teachers and one in five science teachers did not major or minor in their content area (Rotherham & Mead, 2003). Other research revealed that 8th grade students in the U.S. and Hong Kong were less likely than their peers in England, Japan, the Netherlands, Korea, Singapore and Australia to have teachers with a college major in mathematics or science (Wang, Ashaki, Coley, & Phelps, 2003).

In his 2006 study, Ingersoll reported on teacher qualifications in seven countries: China, Hong Kong, Japan, South Korea, Singapore, Thailand, and the U.S. Only China, Hong Kong, and Singapore did not require a bachelor's degree for some level of teaching and were the only countries of the seven to allow teaching with an associate's degree. The lowest qualification in the seven nations was the requirement of a high school diploma for Chinese Elementary teachers. But, for Secondary teaching, all except Hong Kong required at least a bachelor's degree. For licensure, all systems except Hong Kong required expertise in both subject matter and pedagogy, both obtained in undergraduate coursework with the possible addition of a post-baccalaureate year.

Ingersoll (2006) identified that the U.S., Korea, and Thailand had the greatest percentage of teachers with master's degrees or higher. The U.S. far surpassed the other countries, with 49% of Secondary teachers holding master's degrees or higher.[1] However, the U.S. trailed Korea, Thailand, Singapore, and Japan in the percentage of fully certified Secondary teachers with a degree. On the Elementary level, Hong Kong and Thailand both exceeded the U.S. in the percentage with degrees and certification. A surprising result was that the U.S. far exceeded Japan, Korea, and Hong Kong in the proportion of teachers instructing out-of-field in their native

language, math, science and social studies. In Japan, out-of-field teaching was virtually nonexistent.

Out-of-field teaching, the direct result of qualified teacher shortages and understaffing, may be a contributor to the U.S. student shortfall on international achievement tests. Fifteen-year-old American students scored near the international average on the 2009 Program for International Student Assessment (PISA) reading literacy section ("Reading Literacy," 2010). Six countries including Japan and Korea outscored U.S. students. Seventeen countries performed higher than the U.S. on the mathematics section with the U.S. mean registering below the international average ("Mathematics Literacy," 2010). U.S. fifteen year olds scored close to the international average on the science literacy section of the PISA. Twelve countries including Japan, Korea, and the United Kingdom, outscored the U.S. students ("Science Literacy," 2010).

The Trends in International Mathematics and Science Study (TIMSS) of 2003 revealed U.S. students lagging behind in the tested content areas. In science, U.S. fourth-graders ranked sixth behind Singapore, Japan, and Hong Kong, and ninth in eighth-grade science. In fourth-grade mathematics, the U.S. ranked 12th and in eighth-grade math, 15th, both behind Singapore, Hong Kong, Japan, and other countries ("TIMSS 2003," 2003).

In the 2007 TIMSS results, U.S. fourth-graders ranked 11th in math, again with an average score below Asian countries. Eighth-grade mathematics results placed U.S. scores 9th in the list of 48 countries. Though still falling behind Asian students in math scores, U.S. students had improved their average scores significantly since 1995. Science results were not measurably different. Again, participating Asian countries outscored U.S. students in science (Gonzales et al., 2008). U.S. fourth-graders ranked 8th while eighth-graders ranked 11th.

These international student results were seemingly opposite what would be expected from highly degreed teachers. The U.S. was a leader in the percentage of teachers with advanced degrees, but student scores in science and mathematics did not reflect this. Ingersoll (2006) suggested that entry into the teaching field in the U.S. was not especially restrictive nor difficult. In the other countries of his study, teaching was a highly desirable occupation for salary and status reasons and was, thus, more selective. Other explanations offered by Ingersoll for lagging international test scores were that Asian teachers experience more professional development and preparation than U.S. teachers and that students in those high ranking countries are more likely to be taught by teachers who attained a college major in their content area.

Akiba, LeTendre, and Scribner (2007) revealed similar results to Ingersoll. Higher achieving countries had higher percentages of students taught by fully certified, experienced mathematics teachers. Their research focused on eighth-grade student achievement on the 2003 TIMSS and socioeconomic achievement gaps. Authors reported that of 46 countries, the U.S. was ranked 15th in national student achievement and 10th in the size of achievement gaps. They revealed that only 47.3% of U.S. eighth-grade students were taught by teachers with a mathematics degree. The international average was 70.9%. Though average student achievement rose with the level of HQT among countries, socioeconomic achievement gaps were not significantly related to qualified teacher opportunity gaps. Discussed was the role of professional development and equalization of instructional resources to narrow the achievement gaps.

In the U.S., disparity among states exists in the number of teachers trained annually. Five states, California, New York, Texas, Illinois, and Pennsylvania produced about 39% of the nation's teachers in 2004-2005 (Duncan, 2009). In 2005, New York, California, and Texas alone prepared over half of the alternative program completers. Other states, like Nevada and

Wyoming, because of teacher shortages, must rely on hiring teachers trained out-of-state. More than 60% of initial teaching certificates in those states were awarded to out-of-state graduates (Spelling, 2005). Nationally, 22% of those certified to teach in a given state received their education in another state. Other states dependent on out-of-state educators included: Alaska, Colorado, Connecticut, Delaware, Georgia, Maryland, New Hampshire, North and South Carolina, and Ohio. With out-of-state teacher training being widespread, it is crucial that state standards of HQT go beyond the reciprocity agreements of pre-NCLB years and require high standards of in-state as well as out-of-state teachers.

Rural schools have many of the same shortage problems as inner-city, high-poverty, and high-minority schools. Reacting to this, the U.S. Department of Education loosened its timeline for HQT in rural districts. Rural districts are defined as those serving fewer than 600 students or those who are located in counties with fewer than 10 persons per square mile (Paige, 2004). Teachers in these systems often instruct in multiple subject areas but have only attained HQT status in one field. Relief was provided by the USDOE by allowing these teachers three years to become highly qualified in the additional content areas.

In Arkansas, a rural state, the ESEA-mandated *State Report Card* stated that 7.4% of *all* Arkansas classes were taught by teachers not designated as highly qualified in 2006. The percentage in high-poverty schools was higher at 14.8% while, in low-poverty schools, the percent of classes not taught by highly qualified teachers was 5.3% (“Arkansas Report Card,” 2006). The 2009 *State Report Card* indicated that these percentages had dropped to 9.6% and 2.7%, respectively (“State Report,” 2010).

It was noted that 51% of those Arkansas teachers identified as *not* highly qualified were teaching in an academic shortage area, specifically, mathematics, science, social studies, art,

music, or a foreign language (Williams, 2006). In the 2005-2006 school year, as many as 508 Arkansas mathematics classrooms did not have a highly qualified mathematics teacher while 497 did not benefit from an endorsed science teacher. On the other hand, nationally and in Arkansas, English teachers are not in short supply (Darling-Hammond & Sykes, 2003). In 2005-2006, only 192 Arkansas classrooms were without a highly qualified English teacher (Williams, 2006). Data reported for the 2006-2007 school year revealed that 0.0725% of core academic classes were not taught by highly qualified teachers ("Number of Core," 2007).

Summary of Teacher Shortages and Out-of-field Teaching

Shortages of highly qualified teachers in certain fields such as mathematics, science, limited English proficient, and special education have made HQT difficult to achieve nationally. However, certain fields such as English and Elementary Education are in surplus. The U.S. far surpassed the countries of the Ingersoll (2006) study in their percentage of teachers possessing a master's degree or higher. But, the U.S. exceeded several of the countries in its proportion of educators teaching out-of-field.

U.S. students have been outscored internationally on the PISA and TIMSS. Results were contrary to what would be expected with 49% of teachers possessing master's degrees. Teacher preparation, professional development, and college majors were explanations given for the continued success of students of other countries.

Teacher shortages are a continuing problem for rural and inner-city schools. Rural teachers were given three years to become highly qualified in multiple subjects. In Arkansas, the percentage of high-poverty classes taught by non-highly qualified teachers was over three times that of their low-poverty schools.

Retention of Teachers

It is essential, for academic and financial reasons, to retain teachers, especially highly qualified ones. On the national level, between 25-35% of new teachers quit teaching after one year and 50% within five years (Moritz, 2008). On the state level, Texas reported an annual teacher turnover rate of 15.5% in 1999, as many as 43% of which were beginning teachers departing in their first three years (Texas Center for Educational Research, 2000). Estimates from 1999 were that Texas lost as much as $216 million per year due to teacher turnover. It was estimated that the annual cost in the U.S. exceeded $5 billion for the 394,000 teachers who did not return to the classroom in the fall of 2005 ("Teacher and Principal," 2006). Globally, teacher attrition is very costly and places an additional burden on financially struggling inner-city and rural schools (Darling-Hammond & Sykes, 2003).

A study of new and minority teachers using the 2008-2009 Schools and Staffing Survey (SASS) and Teacher Follow-Up Survey (TFS) revealed that 84.5% of teachers stayed in the school identified in the Staffing Survey while 7.5% had moved schools and 8% had left the profession ("Teacher Attrition," 2009). More likely to have moved, African American and Hispanic teachers registered at above 10% each. Teachers most likely to stay at their current schools were early childhood/elementary, art/music, and mathematics teachers. The teachers with the highest salaries stayed at their current schools 86.2% of the time while the lowest paid, those making less than $30,000, stayed 85.8% of the time. Salary was not crucial to staying, moving schools, or leaving the profession.

Kissel et al. (2006) examined the retention of minority teachers within the teaching field and revealed that male, minority teachers were more than twice as likely as their female counterparts

to leave teaching. The authors reported that minority teachers certified in their primary area of teaching were only about half as likely to leave the field.

Arkansas reported improvements in retention rates since 2001. The percent of first- year teachers departing decreased by 13% while those leaving teaching after five years dropped 5% since the 2001-2002 school year (Moritz, 2008). Legislative action to increase teacher salaries and state support for financing facilities and programs was credited for the improvement in retention.

One state's answer to the retention dilemma was the model exemplified by New Mexico. Their three-tiered system of licensure allows teachers to progress through the tiers through use of mentoring, successful classroom experience, and professional-development dossiers (Keller, 2007). Minimum salaries are tied to each level. Over the last six years, the state has seen the number of teaching waivers drop from 10% to 1%. The number of teachers overall has increased as has the proportion of teachers outlasting three years. Three-fourths of new teachers continue to teach after three years as opposed to two-thirds a decade ago. These incentives have successfully been completed by 85% of aspirants.

Inequity

A problem closely associated with teacher shortages, out-of-field teaching, and retention is inequity of qualified teachers in inner-city and rural school districts (Spelling, 2006). A disproportionate number of educators on waivers teach in high-poverty, high-minority schools. Wang (2003) revealed that 44% of Middle school students and half of students in high-poverty Middle schools took at least one class with a teacher who did not have a college major or minor in the subject taught. Twenty-two (22) percent of Secondary students had at least one class with an unqualified teacher without a minor, and the proportion was 32% in high-poverty Secondary

schools. Again, Figure 1 reports percentages of highly qualified teachers in high- and low-poverty schools by state.

Though the inequity is problematic, for purposes here, this issue is not so much an HQT problem as it is an issue with inexperienced teachers and retention. The retention of qualified teachers is essential to minimize shortages and limit the use of teacher waivers. But, the retention-caused inequity in high-poverty and high-minority schools has no direct role in distinguishing between highly qualified teachers and those who are less so.

Alternative Certification

A relatively new area of research is the impact of alternative teacher licensure programs. A system of licensing teachers who have not completed traditional educator preparation programs in colleges and universities is uncommon in other countries (Wang, Ashaki, Coley, & Phelps, 2003). But, the Highly Qualified Teacher provisions make no distinction on the route to licensure. If the reported 2.2 million retiring teachers is accurate, the alternate route for teacher certification may be warranted (Nagy & Wang, 2006). All states and the District of Columbia are currently implementing some type of alternative licensure program (Feistritzer, 2007).

Alternative programs accept college graduates with a major corresponding to a specific content area studied in schools. This different approach to teacher licensure is based on the premise that a graduate of a content area with outside experience will be proficient as a teacher of the subject if aided in classroom management, learning styles, school policies, and pedagogy (Legler, 2002). The alternative system is well-suited for Secondary schools, yet there are programs for graduates to become Elementary teachers as well. It has been found that the most successful alternative programs had high entrance standards, offered new-teacher mentoring and supervision, and provided extensive pedagogical, classroom management, curriculum, and

diversity training (Spelling, 2005). Practice in making lesson plans and high exit standards contributed to the success of these programs. Secretary Spelling (2006) also revealed that there was little difference between licensure examination pass rates within states for the alternatively and traditionally trained teachers.

Preliminary data reveal that the alternate routes to certification graduated approximately 35,000 individuals from these programs in 2002-2003 (Spelling, 2005). In 2003-2004, the 110 alternative programs produced approximately 41,000 teachers, an increase of over 15%, while the numbers of those traditionally trained increased by only 5% (Spelling, 2006). From 2000-01 to 2004-05, the number of alternatively trained teachers increased by 23% (Duncan, 2009). In 2007, over 480 alternative-route programs existed in the U.S., most operated by Colleges of Education (Honawar, 2007).

Nagy and Wang (2006) reported that in New Jersey, 24% of teachers had attained certification through the alternate route. But, a substantial proportion (40%) were teaching in areas outside of their college degree or former occupation, thus leaving the non-traditional teacher's skills untapped. Authors also reported that most non-traditionally trained teachers had teaching experience before embarking on the alternative route to certification.

One success story is from the city of Newport News, Virginia. This urban district's student demographics were 46.6% low SES and 40% limited English proficient. To fill teacher shortages, the district capitalized on the Transition to Teaching (T2T) program to attain alternatively trained teachers. A study conducted by Gimbert, Cristol, and Sene (2007) compared first-year non-traditional teachers to first-year traditionally trained teachers in their Algebra I classrooms. They reported that student achievement was higher the first nine-weeks for the traditionally trained teachers but, for the remainder of the year, the non-traditionally trained

teachers saw the highest student gains in Algebra I. Though the number of teachers used in the study was small, the results supported the growing body of evidence that non-traditionally trained teachers, who come to the profession possessing content knowledge, can do an exceptional job. The researchers noted another difference between teachers beyond just the training method. Contributing to classroom success, the T2T teachers had cognitive coaches or mentors to help them through the year.

Another example of alternatively certified teachers "measuring up" to the achievement level of traditionally certified teachers was the 2007 research of Kane, Rockoff, and Staiger. During the timeframe 1999 to 2004, 20% of new teachers hired in the New York City public schools were alternatively trained, predominantly through the New York City Teaching Fellows program. From their research of 10,000 New York City Elementary and Middle school teachers (2007), authors revealed that the type of teacher certification had little effect on student achievement in year one of teaching. By the second year of experience, uncertified and alternatively trained teachers surpassed traditionally certified teachers in their impact on math scores. In reading, the alternatively trained teachers demonstrated greater value added than the traditionally certified teachers after the first year of teaching.

California, under the leadership of Governor Schwarzenegger, has actively pursued professionals in mathematics, science, and technology as teachers (Jacobson, 2007). California is projecting that they will need 33,000 new science and math teachers over the next decade. The plan, EnCorps Teachers Program, responds to the lack of teachers prepared for teaching in these fields. Additionally, California envisions that the retiree-teachers add "relevancy" to the subjects taught. Companies such as IBM, Chevrolet, and Qualcomm have partnered with the state to support veteran employees with stipends as they complete teaching requirements and enter the

teaching force. Since its launch in 2007, EnCorps has trained 100 new teachers ("EnCorps," 2010).

A supplier of large numbers of alternatively trained teachers is the Troops to Teachers program. In a study examining reading and mathematics achievement in Florida, it was revealed that students of teachers trained through the program performed equally well in reading and better in math when compared to students of all Florida teachers (Nunnery, Kaplan, Owings, & Pribesh, 2009). When experience and subject matter were controlled for, the Troops to Teachers significantly outperformed their peers.

The Arkansas Department of Education offers a Non-Traditional Licensure Program (NTLP) for eligible candidates desiring to enter the classroom. This program is a modification of an existing program that was founded in 1987. It was designed to ensure that program completers would be on track to receive a standard teaching license and would also meet the state requirements for HQT. To enter the NTLP, an applicant was required to have a minimum of a bachelor's degree with at least a 2.5 grade point average. Passage of all Praxis I and II content area and pedagogy exams was a program prerequisite. In addition, employment in an Arkansas school as a teacher was necessary ("Teachers Non-Traditional," 2006). Candidates were trained in pedagogical techniques and education practices by completing instructional modules on weekends and during the summer. State-paid mentors were supplied through the schools to the teacher-trainees to guide them through their first two years of teaching (James, 2006). Between years 1999 and 2008, 1,706 candidates completed the alternative certification in Arkansas (Servedio, personal communication, February 12, 2009).

The debate continues on whether alternative programs prepare educators adequately for the classroom. A report from Public Agenda and the National Comprehensive Center for Teacher

Quality noted that only half of alternatively trained teachers felt that they were prepared for the first year of teaching in high-needs schools as opposed to 80% of traditionally trained teachers (Honawar, 2007). Those surveyed were asked to describe the feedback and mentoring that they received from cooperating teachers in their training programs. The items referred to training received in personalized instruction and classroom management. More alternatively trained teachers responded *good* to the items where the traditionally trained were more apt to respond *excellent*.

Mathematica Policy Research, Inc. reported recently that student achievement in reading and mathematics did not correlate to the type of preparatory program that teachers completed (Constantine et al., 2009). The study followed 2,600 randomly assigned students in the Elementary classrooms of 87 alternatively trained and 87 traditionally trained teachers. Teachers spanned 63 schools in seven states. Educators had completed many different preparatory programs. Students of those alternately trained "did no worse" than those taught by traditionally trained teachers. Researchers also revealed that there was no association between teacher effectiveness and the amount or content of teacher-training coursework.

From the alternative certification movement has evolved urban teacher residency programs (Honawar, 2008). Already instituted for seven years in Boston, the program trains prospective teachers in academic and disciplinary measures in the urban schools that they would be serving. Aspiring educators receive a stipend, health insurance, and tuition. Teacher retention for longer than three years is a startling 90% for residency graduates. Ethnic mix was improved as half of recruits were from minority groups.

Summary of Alternative Certification

Alternative certification, an answer to the shortfall in highly qualified teachers, licenses as teachers college graduates with a major corresponding to a subject area. Professional knowledge (i.e. pedagogy) is taught in the alternative program or learned on the job. All states and the District of Columbia have implemented some type of alternate certification. By the end of the 2003-2004 school year, over 41,000 teachers had completed the alternative route to teaching. The number of alternatively trained teachers declined 20% between 2003-2004 and 2004-2005 (Duncan, 2009).

The Arkansas Department of Education offers a Non-Traditional Licensure Program for prospective teachers with a bachelor's degree. Passage of Praxis I and II exams in pedagogy and content area are program prerequisites. Teacher mentoring assists new Arkansas teachers in developing their skills.

Licensure Examinations

Where the accountability provisions of NCLB have created the greatest public concern, the HQT provision may be the greatest contributor to aiding schools make adequate yearly progress (AYP). Research has revealed that the single most important factor in student achievement is having a highly qualified teacher ("Unfulfilled," 2004). To reiterate, as defined in to the NCLB Act, to be highly qualified, teachers must have a college degree, be fully licensed, and demonstrate content knowledge in the subjects they are teaching.

The importance of teacher content knowledge to student achievement is confirmed by much research. Research by Croninger, Rice, Rathbun, and Nishio (2007) bolstered the supposition that student achievement is affected by teacher qualifications. In their study of first grade students, they discovered that higher scores in mathematics and reading were achieved where

teachers had completed more coursework in those subject areas. Reviewing, results from Greenwald, Hedges, and Laine (1996) revealed student achievement gains of one quarter of a standard deviation for every $500 spent on teacher education. Darling-Hammond et al. (2005) reported that teachers with standard certification raised student achievement scores significantly more than teachers without standard certification. Goldhaber, as cited in two of his many studies on teacher quality, revealed empirical evidence linking higher levels of teacher content knowledge with student achievement.

Additional support for the value added through content knowledge is supplied by the American Board for Certification of Teacher Excellence (ABCTE). In their 2007 study of 78 Tennessee Middle school math teachers, they revealed that students of teachers that had achieved higher scores on the ABCTE math exam significantly outscored students of teachers scoring 1.00 standard deviation below the mean.

SEAs, in order to meet HQT requirements, have chosen to measure teacher content knowledge through passing pre- and post-graduate licensing examinations.

State requirements. One of the most direct routes to licensure and HQT status is to pass the content area exams required by the State Educational Agencies (SEA). Forty-five states plus the District of Columbia use at least one of over 140 available ETS Praxis Series tests ("State Requirements," 2010). The number of required tests varies widely by subject area and grade level within and between SEAs. Thirteen SEAs have developed their own licensing tests aided by National Evaluation Systems (NES). Examples are the Arizona Education Proficiency Assessments (AEPA) and the Texas Examinations for Educator Standards and Examination for the Certification of Educators in Texas (TExES/ExCET). Nine states use some Praxis examinations in conjunction with their state-devised tests.

Presently, all states require some form of testing, whether directly or indirectly. Iowa only recently mandated their first content knowledge examination, a Praxis II exam for Elementary teachers. The cut score, indicating HQT, was set in February 2007. Montana indirectly requires an examination. New elementary teachers must pass a Praxis II assessment to complete their college Education programs. Without the exam, the graduates could not be recommended for licensure or meet HQT in Montana (E. Keller, personal communication, October 14, 2008). Since that time, Montana has required passing the three content area exams for Secondary education plus a content area exam for Elementary teachers. Two SEAs utilize Praxis exams but have not set passing scores.

Pedagogy examinations. Though the emphasis of the HQT provisions is content knowledge, additional topics that should be discussed when evaluating highly qualified teachers are pedagogy and professional knowledge. A teacher with substantial content knowledge, but without the means to adequately communicate it to students, would be ineffective. Acknowledging this, over half the states require a Praxis II pedagogy exam for teaching Elementary school or meeting the HQT requirements in their state. An additional 12 states administer their own form of pedagogy test to their prospective teachers.

Arkansas requires the ETS Praxis II Principles of Learning and Teaching for Early Childhood for Elementary teachers, PLT for Grades 5-9 for Middle school teachers, the PLT for Grades 7-12 for Secondary teachers, and subject specific pedagogy assessments for content area teachers ("State Requirements," 2010).

Examination scoring. Licensure testing for teachers fell into three categories: entry-level exams (Praxis I), pedagogy for grade level and subject areas (e.g. Praxis II Principles of Learning and Teaching) and subject area exams (Praxis II) with state-specific tests following a comparable

scheme. Most of the Praxis examinations are reportedly scored out of a possible score of 200, though the minimum score is 100. So, in actuality, 100 points are possible on these tests. A few exams have a maximum score of 990, though ETS states that, often, the highest achievable score is less than 990. The maximum can be as low as 780 ("Understanding," 2009). The NES-developed assessments are scored between 100 and 300 points.

Difficulty level of licensure examinations. In their study on how teacher licensing tests fall short, Mitchell and Barth (1999), in cooperation with Education Trust staff and a national review panel, analyzed nationally-used content area assessments designed by ETS and NES. The English/language arts, mathematics, and science content areas were examined, with particular attention paid to the highest level tests. Test items were scrutinized with an emphasis on the following attributes: grade level of the items, challenge to the test-taker, and relevance to teaching.

On the ETS Praxis I "Pre-Professional Skills Test," the researchers reported that none of the sections exceeded high school level. But, authors noted that the Praxis I could be given at any point in the educators' collegiate career, not necessarily at completion of the preparation programs. At least two-thirds of the mathematics items appeared to be on a Middle school level. The literacy section, likened by authors to reading from *National Geographic*, was observed to be far less difficult than both the SAT and ACT which, paradoxically, teacher candidates were required to take to enter college.

Praxis II tests for Secondary licensure also proved disappointing to the researchers. Only 16% of the items in the "Mathematics: Content Knowledge" exam appeared to be college level. But, a significant number of items did cause test-takers to apply concepts. The "Mathematics: Proofs, Models, and Problems" was open-ended, but less than 30% of topics assessed were on a college

level. The Massachusetts NES exam for Secondary mathematics was no more sophisticated. In general, "a B+ graduating senior in high school could pass the tests," opined one of the reviewers.

Mitchell and Barth (1999) reported that the "Biology: Content Knowledge, Part II" was an adequate examination. It reflected what colleagues would expect a beginning biology teacher to know. Otherwise, the Praxis II biology tests were found to be inadequate in their topic selections. With regard to the NES science section, Mitchell and Barth revealed that sampled items required scientific and engineering knowledge to answer all parts, an improvement over most of the Praxis II science tests.

The Praxis II "English Language, Literature, and Composition: Content Knowledge and Essays" was evaluated as well. Mitchell and Barth (1999) reported that a superficial treatment was given to the content base, and a depth of knowledge was unnecessary to pass. The essays required knowledge closer to that expected of a junior in college majoring in English, but was judged to be the best of the exams analyzed. The NES English/language arts exams were on the level of a college survey class. As opposed to the Praxis II examination, the NES essays did not tap the test-taker's abilities in literary criticism.

The researchers concluded, in general, that this sampling of teacher licensure tests and the low passing scores that were required for passage in most states left the candidate with credentials comparable to a high school diploma.

Massachusetts, in an effort to more adequately test the mathematics knowledge of Elementary teachers, instituted a new math-specific assessment in March 2009 (Miners, 2009). This first attempt yielded disappointing results as only 27% of aspiring teachers passed the exam. Addressing critical shortages in special education, a measure was enacted to allow unsuccessful

candidates to obtain teaching licenses despite results with the provision that the math test must be passed within five years.

Stotsky, in her 2008 position paper on teacher quality in Arkansas, supported requiring subject area tests for Elementary and Middle school teachers as well as raising passing scores for subject area tests on a regular basis. She noted that the "Early Childhood: Content Knowledge" Praxis exam, used to license Arkansas P – 4 teachers, only minimally assesses mathematics and literacy knowledge, further stating that literacy and mathematics knowledge together only constitute half of the exam. She questioned the validity of the "Middle School: Content Knowledge" exam for licensure in Arkansas. Stotsky concluded that use of academically weak assessments and pedagogical exams have undermined Arkansas's effort to ensure that classroom teachers are equipped with sufficient content knowledge.

Setting cut scores. To demystify how states select their teacher licensure examinations and set passing scores, the process is explained by ETS with regard to the Praxis I exam. ETS stated in their "Praxis I Details" (2006):

> before passing scores are set, each state that uses a Praxis test undertakes a validation process and sets standards. Panels of teachers and teacher educators, appointed by each state, review the tests to confirm that they are aligned with state licensing requirements. The panel members also make judgments regarding the difficulty of the questions for beginning teachers. Each state uses those judgments in setting its respective passing scores. Because each state may have slightly different licensing standards and requirements, the scores will vary from one state to another. (p.1)

ETS also states that the passing scores, and in turn the licensing decisions, are meant to protect the public from harm rather than to allow selection of outstanding candidates ("Posted Replies," 2006). According to their psychometricians, most score distributions are markedly skewed and the use of percentile rank to judge achievement on the Praxis tests is not necessarily appropriate. Test scores should simply be interpreted as above or below the passing score set by

the SEA. For Praxis II results, ETS interprets surpassing the cut score as indicating HQT in addition to meeting licensure requirements ("Proper Use," 2006).

The passing scores are set by the SEAs. Oklahoma, which uses its own teacher examination, the Certification Examination for Oklahoma Educators (CEOE), based their passing score on recommendations of a panel of Oklahoma educators ("How to Read," 2006). The panel justified their choice by stating that cut scores were set to reflect the level of knowledge and skills required for effective performance in Oklahoma schools. In New York, the New York State Commissioner of Education, with the aid of professional judgment and advice from New York educators, sets the passing scores for the New York State Teacher Certification Examination (NYSTCE) ("About the NYSTCE," 2006).

Diversity in SEA requirements for HQT is underscored when state passing scores are reviewed. Figure 2 displays the diversity in cut scores among the 34 states that utilized the Praxis II English and mathematics content area exams in 2010. North Carolina also used the exams but published no minimum passing scores for these exams. English content knowledge passing scores ranged from 142 to 172 for SEAs while mathematics scores ranged from 123 to 156. When English and math cut scores are sorted separately by their passing scores, the disparity in levels of cut scores *within* states is evident. Though several states use relatively high or low cut scores for both tests, half of SEAS utilize cut scores in different thirds of the distribution for their Praxis II English and mathematics content knowledge exams. Four of the 34 use a high score for one and a low score for the other.

ETS does not publicly broadcast the descriptive statistics for their examinations. With the multiple administrations annually, test-takers receive statistics particular to their examination cycle, not the population parameters over time. A confidence interval encompassing the true

mean for that administration is provided along with the test-taker's raw and scaled score, the state's passing score, and disclosure of whether the candidate passed or failed (Appendix A).

English	Math
DC	MS
NV	SD
AL	MN
ND	AR
IN	KY
SD	AL
WV	ME
TN	NH
MS	MT
MN	ID
ID	SC
AK	NV
MO	WV
AR	LA
KY	WI
PA	IN
ME	TN
LA	PA
WI	WY
NJ	HI
SC	MO
CO	NJ
WY	KS
DE	CT
MD	UT
HI	ND
NH	OH
KS	DC
MT	DE
OH	MD
UT	VT
VT	AK
CT	VA
VA	CO

Figure 2. Praxis II English and Mathematics content knowledge exam passing scores for states in ascending order. States not listed did not utilize these exams. Eighteen different passing scores were utilized in 2010 by SEAs for English and for math. Dividing the lists of

scores into thirds, individually, the shaded cells signify SEAs employing passing scores in the same third of the distribution.

Reporting of passing rates. The publication of passing rates for licensure examinations was mandated by the Title II Higher Education Act of 1965. The Title II website displayed data from the 2003-2004 school year in the *Secretary's Fifth Annual Report* (Spelling, 2006). Forty-four (44) states and jurisdictions provided summary passing rate data from their individual colleges and universities on state-mandated, teacher licensure exams for that year. Nationally, the passing rate for test-takers was 96% in 2003-2004 and 2004-2005 (Spelling, 2006; Duncan, 2009). Secretary Spelling stated that the high overall pass rate resulted from state minimum passing scores generally remaining lower than the national medians for those same tests. Passing rates from 2007-2008 are available by linking to individual states ("Title II – State," 2009).

The basic skills test for reading, writing, and mathematics had a particularly high pass rate in 2003-2004 for both ETS Praxis I "Pre-Professional Skills Test" and NES state-developed examinations. Eleven states reported 100% for students completing licensing examinations in that year. That occurrence was explained by Huang, Yi, and Haycock (2002), positing that many states, including Alabama, Arkansas, West Virginia, Michigan, Oregon, and others, require that Education students pass the basic skills test before graduation.

A dissertation that included an analysis of the Praxis I basic skills test (Grimes-Crump, 2001) revealed information pertinent to HQT about passing scores and rates in Virginia. The Virginia Board of Education phased out the NTE Core Battery as a requirement for licensure and introduced the Praxis I in the 1990s. The cut scores were set in 1995 as 178 for reading, 178 for mathematics, and 176 for writing. The highest in the country at the time, all were set within one point of the present national median scores. The pass rates for that first year, 1995-1996, were:

72% for reading, 62% for mathematics, and 58% for writing. The next year showed modest increases with 74% of test-takers passing reading, 66% mathematics, and 63% writing. Minority teacher pass rates were less than half of those disclosed for all teachers.

Years later, Virginia pass rates in 2002-2003 and 2003-2004 showed immense progress in achievement on the Praxis I with 97% passing all of the basic skills tests in 2002-2003 and 99% passing in 2003-2004 (Spelling, 2005; 2006). Those pass rates resulted while employing the same cut scores that were established in 1995, demonstrating that educators could meet the challenge of raised expectations. Reported in 2009, 100% of teachers passed the Praxis I in Virginia ("Title II – State," 2009).

Beyond reflecting the level of state licensure cut scores, the passing rates for states serve a purpose in Title II funding to state institutions of higher learning. The average percentage passing is used across the country as a criterion for identifying low-performing educator-training programs in state institutions of higher education (Spelling, 2005). Other criteria listed for commendation are: content major required for Secondary teachers, no more than 18:1 faculty to student ratio, student-teaching for at least 12 weeks, institutional self-assessment of the programs, and accreditation from the National Council for Accreditation of Teacher Education (NCATE).

In 2004, twenty at-risk or low-performing institutions providing Education or content area baccalaureate degrees (Spelling, 2005) were identified in 11 states. Familiar names on the list were Wichita State University, the University of Chicago, and Florida A & M. Jackson State University, designated at-risk in 2002, was an example of how an Education program improved after accreditation was in jeopardy. They elevated their Education unit up to the expected standard for Mississippi through intervention measures, curricular revisions, research-based

professional development, teacher recruitment, technology enhancement, and school administrator leadership training. The faculty at Jackson State went so far as to take the Praxis exams themselves. By 2005, Wichita State University, Jackson State, and Florida A & M had moved off of the at-risk list. In the 2009 Title II data, 14 institutions appeared on the at-risk list (Duncan, 2009). Listed as at-risk in 2006 were various Education programs for Ashford University in Iowa, Georgia Southwestern State University, and St. Thomas University in Florida, to name a few.

Arkansas cut scores and passing rates. Arkansas, along with a large majority of states, has had an exceptionally high passing rate on the Praxis I and II examinations required for licensure. The latest data from Title II showed 98% of the 1,487 test-takers from the 17 colleges or universities with Education programs passing *all* exams taken in 2007-2008 ("Title II - State," 2009). Further, there was a 100% pass rate on all parts of the Praxis I basic skills test in that same year. Of the 347 taking the professional knowledge PLT 7 – 12 exams, 96% passed. A lofty 99% passed their academic content examinations while 97% of the 167 testing in "other" content areas passed. Educational agencies champion these and other state results as evidence of excellent teacher preparation programs, but as Secretary Spelling (2006) stated, the cut scores were generally too low to differentiate qualified and highly qualified teachers.

In light of the need for fully licensed teachers, there has been job market pressure in Arkansas to pass more teachers in certain content areas. Instead of increasing requirements to differentiate prospective teachers in content knowledge, a discussion was underway to allow alternate test scores on four high-failure examinations in Arkansas: "Mathematics: Content Knowledge," "Social Studies: Analytical Essays," "Art Making," and "Spanish: Productive Language Skills" (Minutes, 2001, April 9). A member of the Arkansas Board of Education

suggested that the passing score be "the lowest score of the second quartile" for scores on each test while alternative passing scores could be investigated (Minutes, 2001, April 9). Another board member expressed concern that the new cut scores would not be able to assure quality teachers in the classroom. Later that year, under the guidance of a committee directed by ETS, the passing scores for 13 licensing exams were recommended. One board member, again, commented that recommended scores were well below other national scores. She stated that student achievement could not be expected to rise as long as the expectation for teachers was set so low (Minutes, 2001, November 19).

Though the four high-failure exams were investigated for cut score changes in 2001, only the cut score for "Social Studies: Analytical Essays" was changed effective 2001 ("Praxis Series Testing," 2010). Recent changes to licensure cut scores have been few. In September, 2008 Arkansas increased the passing scores for content knowledge in mathematics to 125, "Middle School Content Knowledge" to 144, and physical education to 149 ("Praxis Series Testing," 2010).

Summary of Licensure Examinations

Confirmed by much research, teacher content knowledge plays a crucial role in student learning. The most common way for SEAs to measure teacher knowledge of content area has been through ETS Praxis examinations or NES state-developed assessments.

Licensure examination requirements differ by state. Whereas Iowa only employed an exam for Elementary teachers in 2006, the state of Arkansas utilizes 65 ETS Praxis exams to qualify its teachers and support personnel in different subject areas. Passing scores are set by SEAs with advice from educator panels and are meant to protect the public from harm rather than allow selection of outstanding candidates. The difficulty levels of the exams, both ETS and state-

specific, have been revealed as unchallenging in most cases. Passing rates on basic skills, content knowledge, and other state licensure exams have predominantly remained high at 95% and above. For 2007-2008, 98% of Arkansas test-takers passed all of their Praxis examinations. Secretary Spelling (2005) has expressed concern about the low levels for cut scores, most set lower than the national medians for these examinations.

College Indicators for Prospective Educators

Where licensure examinations should act as a strong defense against unqualified teachers entering the classroom, collegiate credentials should supply the underpinnings to a unified HQT plan. Without high achieving students entering college Education programs, the prospects are dim for having talented teachers emerge.

A study conducted by Wang, Ashaki, Coley, and Phelps (2003) found that of the eight highly-industrialized countries studied, most had higher entry requirements for college admittance than the United States. Admittance to college Education programs in the Netherlands, England, and Singapore, to name only a few, were based on GPA and comprehensive examinations taken in Secondary school. Not only were the foreign Education programs very competitive, but in some countries the educators-to-be were selected and groomed well before they finished Secondary school. Though college admittance in the U.S. is partially based on high school grade point average, the Colleges of Education themselves are not so selective about credentials once the student is admitted at the university level.

Pennsylvania took exception to these low standards and through their “Teachers for the 21st Century” initiative chose to reshape traditional Education programs while expanding alternative routes to certification (Hickok & Poliakoff, 1999). Previous to 1999, undergraduates could enter a state Education program with a C+ average. In the initiative, the requirement was raised to a B

average, and the admittance GPA was made exclusive of Education courses. Secondary teachers were encouraged to fulfill the same course requirements as students seeking a major in an academic discipline (e.g. biology or mathematics). In addition, qualifying scores on Praxis licensure examinations for teachers, found to be in the bottom deciles, were raised systematically. The passing score for their Elementary Education examination was raised to the highest in the country. In addition, their Praxis biology exam (Part I) passing score was increased 12 points to 156 (range 100 to 200). A candidate could no longer miss half of the items and be granted licensure. Even with raised standards, 88% of prospective teachers passed all of their licensing exams in 2003-2004 (Spelling, 2006). Reported for 2007-2008, 97% of Pennsylvania teachers passed all of their licensure exams ("Title II – State," 2009).

Palmaffy (1999) interpreted ETS data on SAT scores for candidates passing the Praxis II content area exams by licensing areas. Results revealed that the prospective teachers of mathematics, science, languages, English, and social studies scored, on the average, above the mean SAT score for college-bound seniors in high school. However, Elementary, special education, and physical education teachers scored below the mean. Palmaffy also stated that Education majors were more likely to be in the bottom quartile on their college entrance examinations and less likely to be in the top quartile than any other major. Also disconcerting, Palmaffy related that Graduate Record Examination (GRE) scores from the late 1980s were lowest for undergraduate Education majors pursuing graduate work in Education. Comparing teachers to the college-educated population in general, his interpretation was that teachers performed equally well to the population on prose, document, and quantitative literacy, but only 50% of teachers scored at the upper level of the National Adult Literacy Survey which tested these three types of literacy. The author expressed concern that only half the nation's teachers

were able to summarize an argument from a newspaper article, use mathematical information from an article, or use a bus schedule correctly.

More recently, SAT scores, as reported by the College Board, a non-profit affiliate of ETS, revealed paradoxes within the population of college-bound high school students. As cited by reformk12.com ("Future Teachers," 2004), in 2003, those students planning on an Education major in college scored "embarrassingly" low on both the mathematics and verbal parts of the test. Taking for granted that the mathematics majors would score highest in mathematics, a closer examination was completed on the Education majors. The Education majors were 143 points behind the mathematics majors and 67 points below the language and literature majors on the mathematics section. A similar pattern was revealed on the verbal section. As would be expected, the language and literature majors scored highest on the verbal section, but the teachers-to-be were outscored by 63 points by the unlikely mathematics majors on this same section. Education majors, along with home economics, technical and vocational, agriculture and natural resource, and public affairs majors, ranked near the bottom on both the math and verbal parts of the SAT. The SAT subtest scaled scores range from 200 – 800 ("How the Test," 2009).

Data from on the SAT Reasoning test provided no evidence of better academic preparation for aspiring teachers. For the 81,000 test-takers expressing a desire to major in Education, averages in performance were near the bottom. The only intended college majors scoring lower than the 480 scored by Education majors on the critical reading test were home economics, public affairs, and technical/vocational ("Total Group," 2006). Education majors' mathematics average of 484 and writing test average of 478 also placed them in the bottom tier of entering college students along with home economics, public affairs, and technical/vocational majors. As a comparison, the mean critical reading score for all entering students in 2006 was

503, for mathematics 518, and for writing 497 with standard deviations of 113, 115, and 109, respectively.

SAT Verbal scores for certain prospective teachers had improved since the mid-1990s. For those who had taken an ETS Praxis content area exam between 2002 and 2005, the verbal scores for these same students had risen (Dillon, 2007). The verbal scores for those taking the content area exams surpassed the average score for all college graduates. SAT verbal scores for Elementary Education and Physical Education majors remained below that for all graduates.

The 2002 ACT, though analyzed with different career choices than the SAT, revealed comparable results to the SAT. The average composite score for core-completers, those planning to attend college, was 21.8 while the average for those planning employment in the teaching occupations ranged from 20.1 to 20.4, depending on the kind of teaching career sought ("ACT High School," 2003). The only intended fields averaging lower were the trade and industrial career choices, human and family consumer science, community and personnel services, marketing, office work, and agriculture. Management and health professionals scored similarly to the Education aspirants. Higher averages came from a wide variety of fields, including: social sciences (21.8), foreign languages (23.2), computer and information science (21.2), letters (24.4), and mathematics (24.1). For the graduating class of 2006, the average composite score for core-or-more completers had risen to 22.0 while those for Education majors continued to lag with average scores of 20.4 and 20.9 ("2006 ACT," 2007), depending on the type of teaching occupation sought. Though the composite score for core-or-more completers remained the same in 2008, the averages for Education aspirants were lower with means of 20.2 and 20.7 ("2008 ACT," 2008).

Summary of College Level Indicators

Preceding the licensure exams with their generally low cut scores are the lagging college credentials of prospective educators. Wang et al. (2003) reported that college admittance requirements outside of the U.S. far exceeded those for college Education programs in the U.S. Pennsylvania, in an effort to upgrade their college Education programs, raised the GPA necessary for admittance as well as course requirements and passing scores on licensing examinations.

Prospective Education majors have scored lower than numerous other fields on the SAT and ACT. On both college entrance exams, the only fields scoring lower were agriculture, human and family consumer science, technical careers, and public affairs. The ACT results from 2006 and 2008 revealed prospective Education majors lagging behind other core-completers.

Hypotheses

Federal involvement in education has, on the one hand, brought forth required standards for teachers. Alternately, in order to fulfill the requirements, SEAs have maintained licensure standards questionable in their capacity to adjudge the quality of teachers. Licensure examinations, employed by states to demonstrate teacher content knowledge, have been identified as weak in testing college-level content knowledge. In conjunction, the generally high passing rates make doubtful the efficacy of SEA passing scores. Of particular interest are those of Arkansas.

Passing scores and state licensure standards are not established in a vacuum. If licensure expectations are truly low, then at what point in the teacher education process are expectations devalued? Research indicates that teachers in many high achieving countries are identified by their academic credentials and groomed for service rather than the self-selection utilized in the

U.S. The question arises – do the credentials of future teachers compare favorably to their college colleagues or is this the point where teacher expectations break down?

With the reauthorization of ESEA and the wave of education reform attempting to enrich student learning with college and career-ready skills, the real question to be asked is: are present efforts through licensing going to ensure not only quality teachers, but in addition, highly effective teachers? States, including Arkansas, have a great challenge and opportunity to change the rigor, depth, and skill levels of student academics. Identifying the variables inherent to effective teaching is crucial to the success of the Common Core initiative.

These questions, tied together through teacher expectations and the measurement thereof, are formalized in four explorative hypotheses. The goal is to shed light on content knowledge and academic standards as they have existed for teachers during the NCLB years and the impact they have had in identifying highly qualified teachers. A larger question exists though. Can standards, as they presently exist, identify the *effectiveness* of teachers?

Hypothesis I. It is clear that there is inconsistency concerning how states address the HQT provision. But, despite the wide variety of problems with defining, hiring, and retaining qualified teachers, a common thread is evident. Licensure examinations, used across SEAs to demonstrate content knowledge, are not being utilized to the degree that an effective HQT designation should require. In the literature, the supposition was made by Schmidt et al. (2007) that the lagging achievement of U.S. students on international mathematics and science exams was attributable to minimal course work required of U.S. Middle school teachers as compared to other countries of their study. Heck's results (2007) gave evidence that student achievement in reading and math was associated with the collective teacher quality of schools. The importance of the effect that

content knowledge and teacher quality have on student achievement has been supported by the research of Goldhaber and Darling-Hammond as well.

Thus, the first hypothesis to be explored is that cut scores for teacher licensing examinations, in general, are not set high enough to distinguish highly qualified teachers from "just adequate" teachers on content knowledge.

Support for the hypothesis is provided from the remarkably high passing rates on content area licensing exams. A basic tenet of assessment is that the higher cut scores are set, the fewer test-takers will pass. The absence of a relationship between passing scores and passing rates could provide support for the premise that the level of cut scores is below a threshold that could distinguish the highly qualified from those less so.

Hypothesis II. Arkansas, in particular, lags in their standards for passing licensure examinations. The 24,775 national test-takers between years 2006-2009 achieved a median score of 144 on the Praxis II "Mathematics: Content Knowledge" exam, far exceeding the pre-2008, Arkansas passing score of 116 ("Understanding," 2009). Later elevated to 125, the mathematics passing score was still below the national 25th percentile. The median score for the 35,590 national test-takers of the Praxis II English content knowledge exam for those same years was 177, 18 points above the Arkansas passing score. The score at the 25th percentile exceeded the Arkansas English cut score by seven points. The biology content knowledge exam was another example of Arkansas utilizing low cut scores when nationally test-takers scored much higher. Taken by 12,876 national test-takers during those years, the median score was 162, 20 points above the Arkansas passing score of 142. Again, the score at the 25th percentile in the pool of national test-takers was well above the Arkansas biology passing score. High passing rates on academic content area exams and evidence that Arkansas cut scores are below the 25th

percentiles for national test-takers prompts the second hypothesis: *Arkansas cut scores do not distinguish highly qualified teachers from non-highly qualified teachers in content areas.*

U of A Praxis data from the most frequently used ETS academic content area exams were compared to national test-taker data with the expectation that mean scores are not dissimilar. It is surmised that the majority of U of A Praxis II scores fall above the national 25th percentile for all test-takers. Finding minimal differences in U of A educator achievement on the exams as compared to national test-takers could call into question the low level of Arkansas passing scores as compared to those utilized by other SEAs. U of A Praxis II scores on most frequently used content area assessments were examined to estimate the proportion of prospective Arkansas educators that could be employed as teachers in states using comparable tests.

Hypothesis III. The contention is made that the academic credentials of Education majors is lower than that of their peers. The suspicion is that lowered expectations have extended throughout the licensing process. The credentials and level of general content knowledge of Education majors in the College of Education and Health Professions at the University of Arkansas were compared to those from other fields of study. Proposed is that Elementary Education majors enter college with lower high school grade point averages and ACT scores than Secondary and Non-Education/Health Professions majors. Grades attained in core courses were explored, as well, to determine whether Education graduates attain lower levels of general content knowledge than students with other majors. U of A graduate and enrollment data from years 2005-2008 were used in analyses. Evidence to support this hypothesis could call into question the point at which “highly qualified” should be interjected into the teacher credentialing process.

In summary, the third hypothesis to be explored is: Education majors enter the U of A with lower credentials than Secondary and Non-Education majors and exit having attained less general content knowledge as measured by grades in core courses.

Hypothesis IV. Presently there is much discussion of tools and methods to evaluate teacher effectiveness in the classroom. The reauthorization of ESEA will most certainly include measures of student growth as an indicator of teacher effectiveness ("Supporting Teachers," 2010). Supports will also be set in place to aid less effective teachers in raising student achievement. Though supports will always be necessary, a proactive approach to identifying effective teachers might be utilizing the teacher attributes of successful teachers. Content knowledge, a cornerstone in the HQT legislation, is measured in part by licensure examinations and more particularly in the state of Arkansas, by Praxis II content knowledge exams in the teacher's chosen subject area. This measure of academic success could attest to the strong content background of some hirees while indicating areas of support for other beginning teachers. Another attribute to be investigated is the role of total years of teaching experience in effecting student achievement gains.

Exploratory in approach, the fourth hypothesis is: teacher achievement on Praxis II content knowledge examinations and total years of teaching experience can be linked to student achievement gains in the classroom.

As a measure of teacher effectiveness, student gains on Arkansas Augmented Benchmark tests in literacy and math were examined for teachers from a local Arkansas district with between one and five years of teaching experience. Student gains were measured from 2009-2010 to the 2010-2011 school year. The eight sub-categories used to calculate the School Improvement

Gains Index for schools were utilized to measure student growth within classrooms. Also, actual literacy and/or math gains were calculated by classroom to explore teacher effects.

Models predicting student achievement gains were developed with independent variables collected on relatively new teachers. The independent variables were: content area knowledge as measured by licensure exams and total years of teaching experience. One model used the improvement gains sub-categories utilized by the ADE while the other utilized standardized gains from one year to the next. A strong relationship supports the hypothesis that these teacher attributes do make a difference in student learning for relatively new educators. Discussion addresses the efficacy or desirability of raising Praxis content area passing scores in light of years of teaching experience. Attainment of content knowledge in conjunction with experience could be key to raising student achievement.

Summary of Hypotheses

The first of the four hypotheses to be explored is: nationally, cut scores for content area licensure examinations do not distinguish the highly qualified from those who are not. The second, specific to Arkansas, is that cut scores do not differentiate qualified from highly qualified teachers. Supporting evidence could show that average scores of University of Arkansas test-takers are not below national averages but Arkansas passing scores are. Third, in the academic careers of future Arkansas educators, the academic credentials and levels of general content knowledge are lower than those of students attaining Secondary or Non-Education degrees. Finally, the relationship between teacher characteristics and student achievement is explored to better identify the attributes of effective teachers.

All four hypotheses are inextricably linked. Nationally, passing scores for licensing examinations have been set at levels often well below the national median score. Arkansas

passing scores are no exception. Understanding that college admittance credentials are an indication of academic success, the levels at which future educators enter college as opposed to their peers in other fields is explored. Supporting evidence could promote discussion on the standards for admission into Education programs. With effective teachers being part of the focus of the reauthorization of ESEA, identifying teacher attributes that are linked to student achievement gains could be valuable in meeting the goals of the legislation. Discussion follows on realistic requirements for highly qualified teachers as a precursor to the new standard, highly effective teacher.

III. METHOD

Introduction of Data and Analysis

In order to test the interwoven hypotheses, exploratory data analysis was employed to examine the minimum expectations placed on future educators. Nationally, cut scores for the most frequently used content area licensure exams were examined in collaboration with state passing rates to support this contention. The foundational data are presented in Tables 1 – 3. On the state level, Praxis scores from the University of Arkansas (U of A) test-takers revealed the incongruity between actual scores and Arkansas cut scores. Admittance credentials and core grade point averages of University of Arkansas graduates were used to compare future educators to their peers graduating in other fields. With NCLB reauthorization identified as a legislative priority, the highly qualified provisions will be enhanced with measures of effective teaching as gauged by student academic performance. Identifying academic indicators of those teachers with the greatest probability of success would be invaluable to meeting the goals of the legislation.

Data

Cut scores for licensure examinations set by SEAs.

Sources of information. Cut scores for teacher licensure examinations utilized by states and jurisdictions were accessed from two sources. The first source was the ETS website, www.ets.org. By following the "Praxis" and "State Testing Requirements" links, the desired licensure examination information can be identified. An overview of the SEA's testing requirements is displayed as well as the required assessments and their associated cut scores. Special notations indicate tests without cut scores and examinations that are being phased in or out. States not listed by ETS in "State Testing Requirements" do not employ Praxis examinations. Those not listed use state-devised assessments to address their state standards for

educators or testing is embedded in teacher preparatory programs. Clarification of information on cut scores for state-specific tests was accessed from individual SEA websites.

With the large number of tests available from ETS, in addition to the state-developed tests, a meaningful analysis of cut scores could not take place for SEAs without some distillation. The conceived framework for exploration focused on the tests necessary to become an Elementary school teacher, a Middle school teacher, and a Secondary teacher of English, mathematics, and science. Though the foci of the present study were the content area examinations, pedagogical exams that are frequently utilized for licensure were identified as well. After tabulating the frequency-of-use for all the examinations required by states and jurisdictions, the most common examinations were identified. Cut scores from 2010, as reported by ETS, were utilized.

Elementary level. A wide variety of Praxis examinations are used to measure content knowledge and pedagogy for Elementary teachers. First, many educator programs and SEAs require the Praxis I "Pre-Professional Skills Test," a series of three basic skills tests in mathematics, reading, and writing. As stated earlier, this content-based exam was identified by Mitchell and Barth (1999) to be on a Middle school or High school level. This assessment is not necessarily taken at the culmination of undergraduate educator training as many colleges require passing the Praxis I as early as a student's sophomore year. As reported by ETS in 2010, 27 states (including Washington, D.C.) utilized the "Praxis I: Pre-Professional Skill Test." This basic skills test was included in the exploration of Elementary Education passing scores.

Beyond the Praxis I, three of the most-used Praxis II exams were selected for disclosure of cut scores on the Elementary level: "Principles of Learning and Teaching: (PLT) K-6," "Elementary Education: Content Knowledge," and "Elementary Education: Curriculum, Instruction, and Assessment" (CIA). The PLT assesses a novice teacher's knowledge of pedagogy, human

development, classroom management, and other professional topics ("Principles of Learning," 2010). The CIA is designed to measure professional knowledge on the Elementary level with most questions placed in the context of the core subjects taught ("Elementary Education: Curriculum," 2010). The "Elementary Education: Content Knowledge" examination measures teacher knowledge of social studies, language arts, mathematics, and science ("Elementary Education: Content," 2010). Arkansas, which requires the "PLT: Early Childhood" rather than the PLT for grades K-6, was included in the PLT: K-6 category as an exception. On the Elementary level, in 2010, the PLT was used by 15 states, the content knowledge by 22, and the CIA by 17. Sixteen states used two or three of the aforementioned examinations together. Twelve states developed their own licensure assessments for Elementary teachers.

The Elementary educator Praxis II examinations used for analyses are scored out of 200 points possible with a minimum of 100 points. So, in actuality, scores range from 100-200 for these Praxis II examinations. A scoring range of 150-190 is utilized for each of the Praxis I subtests. The state-developed assessments are scored between 100 and 300. Percentages required for passing state-developed exams are displayed as reported by SEAs.

Middle and Secondary levels. On the Middle and Secondary levels, SEA testing requirements vary widely. For example, some states, like Arkansas, require a physical science and earth/space science content area exam to teach physical science while other states mandate that the individual exams for chemistry, physics, and biology be passed for science certification. Some states use a single content area test while others require content knowledge exams in conjunction with pedagogy tests in the same subject area. Three states do not require a content area examination strictly for Secondary licensure though content requirements and testing may be built into teacher preparation programs.

To distinguish the most-used Praxis II assessments for grades 7 – 12, as for grades K - 6, testing requirements of all SEAs were researched. Because the emphasis of the HQT provision is demonstration of content knowledge, the subject area exams, and more particularly the core subjects, English, mathematics, and science, became targets for inclusion in the tabular data.

Most commonly in SEA licensure requirements, Middle school was defined as grades 5 – 8. For Middle school licensure, 29 SEAs utilized a combination of the Praxis tests, "Middle School English," "Middle School Mathematics," and "Middle School Science," each with scores ranging between 100 and 200 points. Twelve SEAs developed their own assessments of middle grades educators. Middle school assessment cut scores became a minor facet of the HQT analyses.

The most widely used Praxis II content knowledge assessments for Secondary licensing were the "English Language, Literature and Composition: Content Knowledge," "Mathematics: Content Knowledge," and for science, "Biology: Content Knowledge." As reported in 2010, 35 SEAs utilized the ETS English and math content knowledge exams while 32 employed the biology examination. Not all SEAs reported passing scores at that time. Three states employed an ETS general science or biology exam other than the one focused on here. In 2010, thirteen SEAs used state-developed assessments for licensure in Secondary education for English, mathematics, and biology. The aforementioned exams are scored in the same way as the Elementary licensing assessments, 100-200 points for the Praxis II examinations and 100-300 for the state-developed exams.

Also widely used at the Secondary level was the "Principles of Learning and Teaching: 7-12." Although utilized to test pedagogical knowledge rather than content knowledge, its recurrence within 17 state requirements warranted its inclusion in the analyses.

Table structure of cut scores for states. As a first step in analyzing the passing scores required by states, the cut scores or percentages required for passing were reported for the three education levels, Elementary, Middle, and Secondary. The first table reports cut scores for the Elementary level, including the Praxis I "Pre-Professional Skills Test." Table 2 includes cut scores by SEA for Middle and Secondary teacher licensing. Passing scores as reported in 2010 were disclosed. For states that use an NES-developed assessment for licensing, percentages or ratios for passing are reported, as well.

In the cut score tables, a special notation was included for Oregon, Nebraska, and Wyoming. The three adopted cut scores for demonstrating HQT specifically even though they employed licensing cut scores for other tests. Another exception, the Arkansas requirement of the "PLT: Early Childhood," was included under the "PLT: K-6" category, as was stated earlier. Colorado and Wisconsin require the Praxis II "General Science: Content Knowledge" exam for licensing their Secondary science teachers. Cut scores were included, with notation, in the biology category as were those of South Carolina who uses the Praxis II "Biology and General Science" exam. These exceptions were not part of analyses.

Table 1

Passing Scores by State for Elementary Teacher Licensure

	Praxis II			State-Devised	Praxis I
	K-6 PLT	Elem. Ed. Content Knowledge	Elem. Ed. Curriculum/ Instruction/Assessment	Prof. Knowledge or multi-subject	Math, Reading Writing
Median	175	164	177		179, 178, 176
Possible Score Range	100-200	100-200	100-200		150-190
State/Jurisdiction					
Alabama		137			
Alaska		143	156		173,175,174
Arizona				70%[a]	
Arkansas	159[b]	157[b]			171,172,173
California				60%[a]	
Colorado		147			
Connecticut			163		171,172,171
D.C.		145			174,172,171
Delaware		151			174,175,173
Florida				65%[a]	
Georgia				60%[a]	
Hawaii	163		164		174,172,171
Idaho	161	143			
Illinois				70%[a]	
Indiana			165		175,176,172
Iowa		142 or	151		
Kansas	161		163		
Kentucky	161	148			[c], [c], [c]
Louisiana	161	150			175,176,175

Table 1 *(continued)*

	Praxis II			State-Devised	Praxis I
	K-6 PLT	Elem. Ed. Content Knowledge	Elem. Ed. Curriculum/ Instruction/Assessment	Prof. Knowledge or multi-subject	Math, Reading Writing
Median	175	164	177		179, 178, 176
Possible Score Range	100-200	100-200	100-200		150-190
State/Jurisdiction					
Maine	166	145			175,176,175
Maryland		142			177,177,173
Massachusetts				70% [a]	
Michigan				60%[a]	
Minnesota	159	145			171,173,172
Mississippi	152		158		169,170,172
Missouri			164		
Montana		154			
Nebraska			159(HQT)		171,170,172
Nevada	169		158		172,174,172
New Hampshire		148			172,174,172
New Jersey		141			
New Mexico				70%	
New York				60%	
North Carolina			[c]		173,176, 173
North Dakota	162		158		170,173,173
Ohio	168				
Oklahoma				70%	171,173,172
Oregon				66%	175,174,171
Pennsylvania			168		173,172,173

Table 1 *(continued)*

	Praxis II			State-Devised	Praxis I
	K-6 PLT	Elem. Ed. Content Knowledge	Elem. Ed. Curriculum/ Instruction/Assessment	Prof. Knowledge or multi-subject	Math, Reading Writing
Median	175	164	177		179, 178, 176
Possible Score Range	100-200	100-200	100-200		150-190
State/Jurisdiction					
Rhode Island		145			
South Carolina	165		164		172,175,173
South Dakota	153	140			
Tennessee	155	140	159		173,174,173
Texas				70% [a]	
Utah		150			
Vermont		148			175,177,174
Virginia		143			178,178,176
Washington		[d]			
West Virginia	165		155		172,174,172
Wisconsin		147			173,175,174
Wyoming			160		

Note. Principles of Learning and Teaching (PLT). (HQT) for highly qualified status only.
[a] Percentages on State Professional Knowledge test calculated from percentage out of 200 points. [b] Early Childhood exam. [c] Passing score not disclosed. [d] Praxis phased out; university program assessment presently in place with Professional Portfolio requirement in 2011.

Table 2

Passing Scores by State for Middle School and High School Teacher Licensure

	Middle School Praxis				Secondary Praxis II		
	MS English	MS Math	MS Science	7-12 PLT	English Content Knowledge	Math Content Knowledge	Biology Content Knowledge
Median	174	162	158	173	177	144	162
Possible Score (unless otherwise noted)	100-200	100-200	100-200	100-200	100-200	100-200	100-200
State/Jurisdiction							
Alabama	148	149	142		151	126	143
Alaska	154	145	136		158	146	139
Arizona	[a]	70% [a]	[a]	70% [a]	70% [a]	70% [a]	70% [a]
Arkansas				164	159	125	142
California	60% [a]	60% [a]	60% [a]	60% [a]	60% [a]	60% [a]	60% [a]
Colorado					162	156	152 (Gen.Sc.)
Connecticut	164	158	162		172	137	152
D.C.					142	141	150
Delaware	161	148	146		163	141	157
Florida	70% [e]	69% [a]	70% [a]	73% [a]	70% [e]	71% [a]	61% [a]
Georgia	60% [a]	60% [a]	60% [a]	60% [a]	60% [a]	60% [a]	60% [a]
Hawaii	160	143	148	157	164	136	151 [c]
Idaho	158 [c]	150	139 [c]		158	129	139
Illinois	70% [a]	70% [a]	70% [a]	70% [a]	70% [a]	70% [a]	70% [a]
Indiana	152	156	137		153	136	154
Iowa							
Kansas	165	158	149	161	165	137	150
Kentucky	158	148	144	161	160	125	146

Table 2 *(continued)*

	Middle School Praxis				Secondary Praxis II		
	MS English	MS Math	MS Science	7-12 PLT	English Content Knowledge	Math Content Knowledge	Biology Content Knowledge
Median	174	162	158	173	177	144	162
Possible Score (unless otherwise noted)	100-200	100-200	100-200	100-200	100-200	100-200	100-200
State/Jurisdiction							
Louisiana	160	148	150	161	160	135	150
Maine	155	148	142	162	160	126	150
Maryland	160	152	145		164	141	150
Massachusetts	70% [a]	70% [a]	70% [a]	70% [a]	70% [a]	70% [a]	70% [a]
Michigan	60% [a]	60% [a]	60% [a]	60% [a]	60% [a]	60% [a]	60% [a]
Minnesota	161	152	150	157	157	125	152
Mississippi	145	140	135	152	157	123	150
Missouri	163	158	149	160	158	137	150
Montana					166	128	151
Nebraska							
Nevada	158	139	143	161	150	133	145 [c]
New Hampshire	155	151	147 [c]		164	127	153
New Jersey	156	152	145		162	137	152
New Mexico				70% [a]	70% [a]	70% [a]	70% [a]
New York	60% [a]	60% [a]	60% [a]	60% [a]	60% [a]	60% [a]	60% [a]
North Carolina	145	141	134		[b]	[b]	[b]
North Dakota	157	148	145	160 [c]	151	139	153
Ohio	156	143	144	165	167	139	148
Oklahoma	70% [a]	70% [a]	70% [a]	70% [a]	70% [a]	70% [a]	70% [a]

Table 2 *(continued)*

	Middle School Praxis				Secondary Praxis II		
	MS English	MS Math	MS Science	7-12 PLT	English Content Knowledge	Math Content Knowledge	Biology Content Knowledge
Median	174	162	158	173	177	144	162
Possible Score (unless otherwise noted)	100-200	100-200	100-200	100-200	100-200	100-200	100-200
State/Jurisdiction							
Oregon	61% [a]	63% [a]	64% [a]		68% [a]	63% [a]	60% [a]
Pennsylvania	163	151	144		160	136	147
Rhode Island	162	158	154	167			
South Carolina	155	149	145	165	162	131	570/990 (Biol & Gen.Sc.)
South Dakota	150	140	138	153	154	124	147
Tennessee				159	157	136	148
Texas	70% [a]	70% [a]	70% [a]	70% [a]	70% [a]	70% [a]	70% [a]
Utah		145 [c]			168	138	149
Vermont	154	161	157		172	141	151 [c]
Virginia	164	163	162		172	147	155
Washington		70%	70% [d]		70%	70%	70%
West Virginia	147	148	151	156	155	133	152
Wisconsin					160	135	154 (Gen. Sc.)
Wyoming					163(HQT) [c]	136(HQT) [c]	148(HQT) [c]

Note. Middle School (MS). (Gen.Sc.) Praxis II, General Science: Content Knowledge used instead of biology. (HQT) for highly qualified status only. [a] State assessment used, not the Praxis Series. Percentage based on scaled score out of 200 point range. [b] Praxis II used but passing score not published. [c] New or different Praxis II exam utilized. [d] Praxis phased out; university program assessment presently in place with Professional Portfolio requirement in 2011. [e] State assessment used, additionally 30% on essay must be scored

State passing rates for licensure examinations. The first and second hypotheses of this study focus on cut scores for licensure exams and their ability to distinguish between highly qualified and minimally qualified candidates, both nationally and within Arkansas. The greatest manifestation of the problem is the high level of passing rates across all states and jurisdictions. In order to examine the passing rates, the Title II website, https://title2.ed.gov, was utilized to display licensure examination passing rates from the 2007-2008 school year. These data are embedded in the *Title II - State Reports 2009,* the most current reporting year with summaries. Summaries and individual content area examination pass rates were identified by accessing states separately through the provided link. Forty-eight (48) states and jurisdictions reported at least summary pass rates for 2007-2008 while 36 also reported content specific pass rates.

The Title II variables displayed in tabular form were English, mathematics, and biology examination pass rates on Praxis II and state-developed content area exams, summary pass rates for all exams, and number attempting licensure exams (Table 3). Though Title II data are reported for all colleges and universities that house Education programs, only state summaries were utilized. The values reported in the *Summary* category represent the proportion of test-takers passing *all* tests during that year. The number of test-takers in total is reflected in the *Number Attempting*. Though pass rates for Basic Skills exams were reported to Title II, the diversity of methods used by SEAs made reporting these statistics inadvisable.

Table 3

2007-2008 Percentages Passing Content Area and All Examinations

State	English	Mathematics	Biology	Summary	Number Attempting
Alabama	100	100	100	99	2,171
Alaska	100			93	178
Arizona				92	3,304
Arkansas	99	100	100	98	1,487
California				99	12,651
Colorado	95	100		97	1,278
Connecticut	98	96	100	98	1,913
Delaware	100	80		97	636
D.C.	100			88	285
Florida		100	100	100	5,745
Georgia	100	96		95	4,631
Hawaii	100	90		83	602
Idaho	100	100	100	99	974
Illinois				99	10,087
Indiana	100	96	100	99	3,680
Kansas	94	96	93	94	1,601
Kentucky	96	100	100	95	2,532
Louisiana	100	95	100	100	1,313

Table 3 (*continued)*

State	English	Mathematics	Biology	Summary	Number Attempting
Maine	100	100	100	99	517
Maryland	98	100	100	96	2,156
Massachusetts				98	3,937
Michigan				100	6,737
Minnesota	97	100	96	91	3,094
Mississippi	95	98	88	96	1,221
Missouri	100	95	100	97	3,736
Nevada	100	79		90	777
New Hampshire	91	100	100	93	736
New Jersey	95	96	88	97	4,375
New Mexico	100	92		93	1,081
New York				94	23,041
North Carolina				98	2,339
North Dakota	94	100		98	2,679
Ohio	96	96	97	96	7,129
Oklahoma				97	1,769
Oregon	100	100		100	2,170
Pennsylvania	99	99	91	97	10,881
Rhode Island				97	856

Table 3 *(continued)*

State	English	Mathematics	Biology	Summary	Number Attempting
South Carolina	99	97		96	2,198
South Dakota	100	100		99	560
Tennessee	99	98	99	98	3,527
Texas				95	13,114
Utah	91	92	100	93	1,610
Vermont	94			97	432
Virginia	99	95	100	99	2,867
Washington	100	99	100	100	2,688
West Virginia	100	100	100	100	1,552
Wisconsin	100	100		100	3,426
Wyoming				92	118

Note. Percents assembled from the *Title II – State Report 2009.* Passing rates were reported for 2007-2008. Missing data resulted from less than 10 tests taken. This compilation included only educators taking the traditional route. States reporting no percentages were not included.

Praxis data from the University of Arkansas. Praxis I and II scores were used to assess the strength of content knowledge of prospective and experienced teachers testing at the University of Arkansas, Fayetteville. Hypothesis II stated that Arkansas passing scores do not distinguish highly qualified from non-highly qualified teachers within the state. University of Arkansas Praxis I and II data were employed to compare mean exam scores to national measures with the supposition that there are small differences. The supporting

evidence calls into question the minimum passing scores required in Arkansas.

The National Office for Research on Measurement and Evaluation Systems (NORMES) provided the Praxis data for the present study. Test-takers were from the educator preparatory programs within the College of Education and Health Professions (COEHP), the alternative licensure program, out-of-state teachers attempting to fulfill Arkansas requirements for licensure, and individuals with a developing interest in the teaching profession. No information was available on whether a candidate was seeking licensure through the traditional route as opposed to the alternative route; nor was there a way to detect those test-takers coming to Arkansas fully licensed in another state or seeking additional certifications. The common denominator for those listed in the data was that they attempted their Praxis I or II examination(s) at the University of Arkansas in Fayetteville, between July, 2008 and October, 2010.

The Praxis data contained a record for each exam that an individual had attempted. Though a plethora of information was available for test-takers, the Praxis variables utilized from the data were: social security number, test date, test code, test score, raw scores within subcategories, and the Arkansas passing scores. The recognition of excellence indicator (ROE), which distinguishes future educators that score in the top 15% on a particular exam, was also utilized. Adjoined to the NORMES Praxis data were U of A graduation and enrollment data provided by the Office of Institutional Research (OIR) matched on social security numbers.

The Praxis data set consisted of 5,959 tests attempted by 1,749 individuals. Taken most often were the computerized Praxis I "Pre-Professional Skills Test" (PPST) in reading, writing, and mathematics with 1,075, 1,210, and 1,085 test attempts, respectively. The paper version of the PPST reading, writing, and math subtests were taken 103, 111, and 101 times, respectively. A requirement for Elementary certification in Arkansas, the Praxis II "Principles of Learning and

Teaching: Early Childhood (PLT)," was attempted 246 times during the timeframe. Another Elementary educator requirement, the Praxis II "Early Childhood: Content Knowledge," was attempted 166 times. On the Secondary level, the "PLT: Grades 7 – 12" was taken 251 times. Praxis II content area exams, focused on in Table 2, the "English Language, Literature, and Composition: Content Knowledge," "Mathematics: Content Knowledge," and "Biology: Content Knowledge," were attempted 56, 40, and 29 times, respectively, during the timeframe.

U of A graduate and enrollment data.

Data structure and manipulation. The third hypothesis referred to the low standards for licensure, as manifested in minimum cut scores, as a continuation of low expectations of future educators. The contention is that the process begins with college admittance. A comprehensive data set from the University of Arkansas Office of Institutional Research (OIR) was utilized to explore teaching credentials. Two data sets comprised the OIR data, a graduate file and an enrollment file.

Graduate data included two identification numbers, graduation date, primary bachelor's degree, secondary bachelor's degree, ACT composite, ACT subscores in mathematics, English, reading, and science, and high school GPA. Primary and secondary degrees were further defined by degree name, award, department, and college though secondary degrees identified were completed in the same college as the primary degree. This data set was comprised of 6,854 U of A graduate records with graduation dates ranging from August 2005 to May 2008. Of these graduates, 399 had attained a second undergraduate degree at the time of the primary degree.

ACT composite scores, ACT subtest scores, and high school GPA were not reported for all graduates. High school GPA was reported for 5,620 graduates with the highest being 5.00 (paired with an ACT composite of 30). The lowest high school GPA for admittance was 1.67

which was posted with an ACT of 24. ACT scores were provided for 5,543 graduates. The highest ACT score was a perfect 36 paired with a high school GPA of 4.44. The lowest ACT composite score was 12 associated with a GPA of 3.06. High school GPA, the ACT composite, and ACT components were variables employed in analysis.

To compare the admittance credentials and core GPAs for the graduates, the groups of primary interest were Elementary Education majors, Secondary-bound graduates, and Non-Education/Health Professions majors. Table 4 discloses the number of graduates in the three groups containing *all* admittance data. The supposition is that the Education majors have weaker admittance credentials and general content knowledge at graduation than the Non-Education majors.

Elementary education graduates. The U of A OIR graduation data revealed three distinguishable Education degrees: BSE degree in Childhood Education, BSE degree in Elementary Education, and BSE in Middle Level Education (now discontinued). All three degrees were achieved through the Department of Curriculum and Instruction (CIED) within the COEHP. Both the Childhood Education and Elementary Education degrees prepare graduates to teach pre-kindergarten students through 4th grade. Differences in the programs are that the Childhood Education degree is sought by graduates with the intent of attaining the Master of Arts in Teaching degree (M.A.T.). The Elementary Education degree, on the other hand, is attained in four years primarily at the Rogers campus ("Programs," 2010). Identified as graduating with the Childhood Education BSE with ACT data available were 188 individuals. Twenty-three students with complete ACT data graduated with the Elementary Education BSE in the timeframe. The graduates of the Childhood Education and Elementary Education were grouped together for analysis.[2]

Secondary-bound graduates. Whereas the Elementary and Middle school educator data were easily identified from the degree program, the Secondary Education data were more difficult to categorize because no Secondary undergraduate degrees are offered at the U of A. Prospective teachers desiring to teach in Secondary schools must first attain a bachelor's degree in a marketable subject area then attain the M.A.T. in Secondary Education ("Master of Arts," 2011). Alternative certification is another option for prospective Secondary teachers.

To identify graduates with the intent of teaching in Secondary schools, the NORMES Praxis data with adjoined OIR graduation/enrollment data were utilized. The assumption was that graduates who had been identified as having taken Praxis II examinations would be destined for Secondary teaching. Likely matches for Secondary Education graduates were individuals with scores on Praxis II content area examinations ("Test Requirements," 2007) which must be completed prior to the M.A.T. internship. Thirty-five Secondary-bound graduate records were identified as containing the ACT variables, high school GPAs, and core course GPAs utilized in the analyses.

Graduates of non-Education majors. Within the OIR graduate data, the majority of graduates were from colleges other than the College of Education and Health Professions. Hence forward these data are referred to as Non-Education graduates. The 35 Secondary-bound graduates with degrees from colleges other than the COEHP (identified above) were removed from the Non-Education data as were the 1,144 graduates of the COEHP. Within the 2005-2008 timeframe, 4,734 Non-Education graduates with ACT composite scores remained. These students graduated with 86 different Bachelor's degrees, crossing five colleges of the U of A. Degrees most widely attained were Finance with 486 and Marketing with 433 graduates.

Table 4

Numbers in Graduate Groups

Graduate Groups	Number of Graduates with ACT Data
Elementary Education	211
Secondary Education	35
Non-Education graduates	4,734

Enrollment data. The OIR enrollment data set was comprised of 15,384 records detailing course work in four core areas: mathematics, English, history, and biology. For mathematics, College Algebra (code 1203) was tracked. Two semesters of English Composition were captured (codes 1013 and 1023) as were two semesters of History of the American People (codes 2003 and 2013). Lastly, grades for Principles of Biology were provided (code 1543). During the 2005-2008 timeframe, 6,516 entry-level English courses were attempted as were 3,552 history courses, 2,550 biology courses, and 2,766 math courses. Letter grades as well as point value accompanied course information. Records existed for courses completed as well as for those not completed (withdrawals). With withdrawals removed, 13,518 records remained.

Enrollment records were not uniquely identified by ID number as most students registered for multiple core courses. Through use of SAS Proc Means procedures, unique records with core course GPAs and number of core courses were created. The data contained course information on 5,224 individual students taking core coursework in academic years 2006, 2007, and 2008.

Core course means were utilized for Hypothesis III where at least one core course was completed. Matching on IDs, core course GPAs and core course frequencies were affixed to unique graduate records using SAS. Fitting this criterion were 4,112 graduates.

Teacher variables for the model predicting effective teachers. In an attempt to identify content area data that might result in teacher effectiveness in the classroom, data from a local school district in Arkansas were collected from personnel files of regular classroom teachers. Teachers with one to five years of total teaching experience at the end of the 2010-2011 school year were identified. Further, only teachers that taught mathematics and/or literacy in regular classrooms were utilized. Forty-four teachers were first identified as meeting the criteria.

Although many variables are available for hired teachers, two independent variables were investigated to assess their relationship to student gains: Praxis II content area exam scores and total years of teaching experience. Content area knowledge has been a key point in NCLB legislation, and the blueprint for the reauthorization has upheld that commitment. Recognizing that many factors are involved in the development of effective teachers, total years of teaching experience was utilized, as well, to assess its impact in conjunction with (or in the absence of) sufficient content knowledge.

In this local school district, during the 2010-2011 school year, 44 teachers were identified as teaching reading, English, or mathematics in grades 4 through 8. Of the 44, 24 were identified as having content area Praxis II scores and total years of experience available. The most common reason for not utilizing a teacher's data in analysis was that the Praxis II exam on record was a pedagogy exam or a state-mandated exam from another state. Of the 24, 19 teachers were female and five were male. Figure 3 illustrates the distribution of years of teaching experience while Table 5 displays the breakdown of the 24 new teachers by grade assignment.

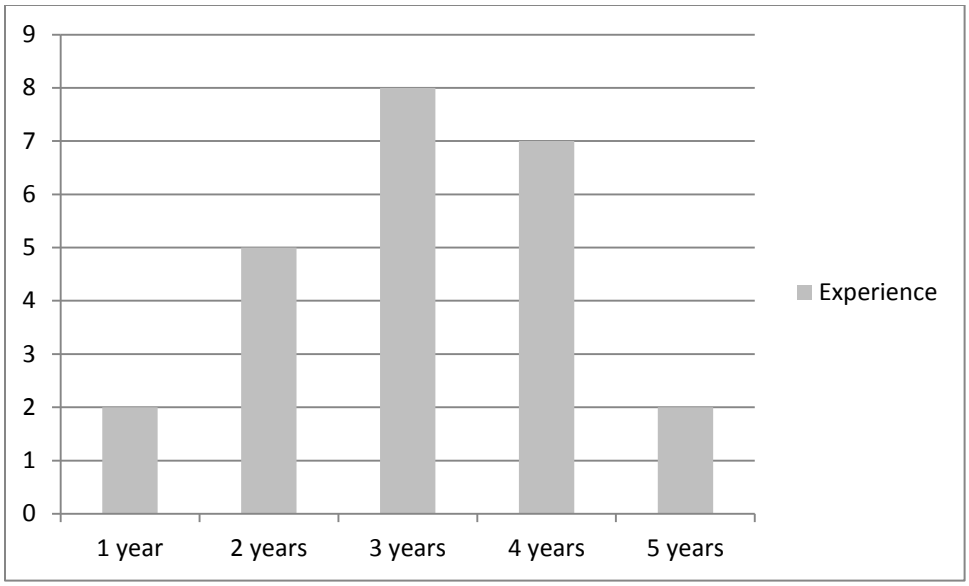


Figure 3. The frequency by total years of teaching experience of the 24 new teachers from a local district. Years of experience was collected at the end of the 2010-2011 school year.

Table 5

Numbers of New Teachers by Grade Levels

	Subjects Taught			
Grade Level	Both	Math	Literacy	Total Classrooms (number of students)
Elementary	3 (66)	1 (22)	1 (21)	5 (109)
Middle School (5-6)		3 (244)	3 (363)	6 (607)
Junior High (7-8)		5 (369)	8 (121)	13 (490)
Total	3 (66)	9 (635)	12 (505)	24 (1,206)

For the students of identified teachers, scale scores on the math and literacy portions of the Augmented Benchmark were collected from NORMES data sets for the 2009-2010 and 2010-2011 school years.

To build a data set for analysis, an Excel file with teacher name, grade assignment, Praxis II exam code, Praxis II scale score, and number of years of total teaching experience was keyed from personnel files. Only teacher records with a Praxis II content knowledge exam were utilized. To calculate a *z-score* from the Praxis II content knowledge scale score, the Excel file also included the most current mean and standard deviation from the Praxis Technical Manual (2010). *Z-scores* were calculated using Excel cell operations. A variable was included for identified teachers to specify the subject areas that the identified teachers were held accountable for: for three Elementary teachers, both English and math (B); for one of the Elementary teachers in a departmentalized setting, math; for another of the Elementary teachers in a departmentalized setting, reading; for Middle school teachers, English or math (E or M); and for Junior High teachers, English or mathematics (E or M). Of the 24 identified teachers, nine had taken the Praxis II "Middle School Generalist" exam for Arkansas licensure, five had taken the "Elementary Education: Content Knowledge" exam, eight the "English Language, Literature, and Composition: Content Knowledge" exam, and two the "Mathematics: Content Knowledge" exam.

For the teachers of the study, class rosters for the 2010-2011 school year were produced from APSCN, the Arkansas Public School Computer Network. Contained in the records were national IDs and student names. Augmented Benchmark scale scores from 2010 and current scores from 2011 were merged (using national IDs) by classroom utilizing Minitab. Carried forward were student names, IDs, literacy scale scores, and math scale scores. As was stated, scores for both

literacy and/or math were utilized for 4th grade classroom teachers while literacy or math scores were collected for students of Middle school and Junior High teachers.

The Improvement Gains proficiency levels of the 2010 and 2011 student scale scores were identified using the Arkansas Performance Report scale from the ADE website (2011) and placed in the Excel file as numeric values. The 2010 level was subtracted from the 2011 level then multiplied by 0.5 to emulate the Improvement Gains Index. Modifications were made for students that achieved level 8 (high advanced) for the two years. Instead of reflecting no change, 0.5 was credited to those students, as in the state model. Means by teacher were calculated using Minitab.

Predictor variables in the model met the multiple regression assumptions of independence, absence of measurement error, and linearity with the criterion variable. The dependent variable in the proposed model, classroom student achievement gains, met the assumptions as a random variable with unassociated errors**.**

Data Analysis

Analysis of national cut scores. In order to explore the diversity of cut scores nationally, boxplots were created to analyze cut scores by SEA for the following tests: Praxis I "Pre-Professional Skills Test" (reading, mathematics, and writing subtests), Praxis II "Elementary Education: Content Knowledge," Praxis II "Middle School English," "Mathematics," and "Science," Praxis II "PLT 7-12," and Praxis II subject area exams in English, mathematics, and biology.

ETS reports national medians and quartiles for Praxis exams. The most current median and quartile scores were from 2007 – 2010 as reported in the *Praxis Technical Manual* (2010). To give the state passing scores perspective, national quartiles accompanied the aforementioned

boxplots. The cut scores for state-developed assessments were not included in boxplots nor were the Praxis exceptions noted earlier. The highest valued cut scores were interpreted as those with the most stringent standards for passing while the lowest values indicated lower standards for passing examinations. Recurrences of certain state cut scores across examinations were addressed and trends identified.

State passing rates. An exploration of state summary passing rate data was conducted using boxplots. Visualization of these data brought into focus the extraordinarily high passing rates reported by SEAs. The passing rates for Praxis English, mathematics, and biology licensure examinations were correlated with corresponding SEA cut scores to assess a possible relationship between the two. Non-significant correlations would support Hypothesis I that the level of cut scores, nationally, are not related to the percent passing content area exams.

Analysis of Arkansas Praxis data and comparison to other states. To address the second hypothesis that Arkansas licensure cut scores do not adequately identify the highly qualified in content areas, descriptive statistics for most frequently used tests were calculated from the Praxis data set of University of Arkansas test-takers for 2008 - 2010. The assessments of interest were the Praxis I subtests and Praxis II examinations: “English Language, Literature, and Composition: Content Knowledge,” “Mathematics: Content Knowledge,” and for science, “Biology: Content Knowledge.” In addition, means for these U of A scores by test code were placed within 2007-2010 ETS reported quartiles to facilitate discussion of unfounded low expectations of Arkansas teachers on licensure exams based on this representative group. All scores were used in analysis even though some test-takers attempted particular tests more than once.

It should be noted here that the Praxis I "Pre-Professional Skills Test" was administered in two ways, on paper and on the computer, differentiated by test codes. ETS, through personal communication (December 15, 2010), related that the exams were identical. Only the method of administration was different. National medians for paper and computer exams differed by only one scale score point. Recognizing this as a minimal difference, all Praxis I scores were grouped together by subtest (mathematics, writing, and reading) for analysis.

Passing rates for the aforementioned tests were calculated by identifying test codes in Praxis records and comparing all scores to the provided Arkansas passing score. In addition to calculating passing rates by the total number of attempts, where at least ten test-takers attempted one of the aforementioned exams, pass rates were calculated by number of test-takers.

Boxplots were used to examine distributions of U of A Praxis scores for the identified assessments. Arkansas cut scores and most current national quartiles (2007 – 2010) were displayed to give perspective on the level of scoring by test-takers. The percentiles at which the Arkansas cut scores fell within the distributions of U of A Praxis scores was identified.

The other charge of the second hypothesis was comparing Arkansas cut scores to the passing scores of states using similar content area assessments for teacher licensure. States were selected on the basis of their 2010 published licensure cut scores on the Praxis II content assessments in English, mathematics, and biology. Virginia, whose scores are high on all three exams, was selected as was Pennsylvania whose passing scores fell in the middle 50% of state cut scores. Alabama, with its generally low passing scores, was included in the comparison as well. Proportions of U of A testers that were qualified in those states (based on Praxis scores) were determined.

The percentage of Recognition of Excellence (ROE) scores that appeared within the data was reported as well as the examination type.

Analysis of U of A graduate/enrollment data.

Elementary Education analysis. Descriptive statistics for high school GPA, the ACT composite and its components, and core course GPAs for Elementary Education graduates were calculated using SAS. As was stated, this group was identified by primary degree name within the graduate data. Correlations between high school GPA, ACT composites and subscores, and core course GPAs were reported. Remediation rates based on ACT English and mathematics scores below 19 were calculated and reported, as well.

Secondary-bound graduate analysis. As stated earlier, there is no Secondary Education undergraduate degree at the U of A. Teaching ranks are filled by students of many majors that later enroll in the M.A.T. for Secondary Education Program or attend the Non-Traditional Licensure Program. Only 35 individuals were identified within the NORMES Praxis data as having complete admittance and core course data. Descriptive statistics for high school GPA, the ACT composite, ACT components, and core course GPAs were calculated using SAS for the aspiring Secondary Education teachers. Remediation rates and correlations between high school GPA, the ACT composite, ACT subscores, and core course GPAs were calculated to avail discussion of the profile of future Secondary educators. With the relatively small number of identified Secondary-bound graduates, descriptive statistics by subject area were not presented.

Graduates in Non-Education majors. Descriptive statistics for high school GPA, the ACT composite and its components, and core course GPAs were calculated using SAS for the Non-Education group. Correlations between high school GPA, the ACT and subscores, and core

GPAs were reported, as they were for the other two groups. Remediation rates based on ACT English and mathematics scores below 19 were calculated for this group, as well.

Group comparisons. The third hypothesis, restated, was that Education majors have lower academic credentials than those from other fields of study. Exploratory in nature, comparisons were made between Elementary Education majors, Secondary-bound, and Non-Education groups on high school GPA, ACT composite, ACT components, and levels of general knowledge as measured by core course GPAs. Again, the core courses investigated were College Algebra, English Composition I and II, History of the American People I and II, and Principles of Biology. Core course GPAs were utilized with as few as one core course per graduate. Expected differences in high school GPAs, the ACT composite, ACT English subscore, ACT math subscore, and core GPAs would provide evidence for discussion of the level of admittance credentialing and general knowledge for future educators.

There was a large disparity between the number of Elementary Education, Secondary, and Non-Education graduates with comprehensive academic data (see Table 4). To explore differences between the variables of future educators and non-Education majors, 1,000 random samples of 35 were selected from the Elementary Education and Non-Education groups, separately. The sample size was selected to reflect the number of Secondary-bound graduates (n=35). Means of high school GPA, the ACT composite, ACT components, and core course GPAs were calculated from the samples for the two groups. Averages of the variables for the Secondary-bound group were calculated, as well. Group averages and differences were reported.

Summary of graduate/enrollment data analysis. Descriptive statistics and correlations were reported for college admittance indicators as well as core course GPAs for three groups, the Elementary Education majors, Secondary-bound graduates, and Non-Education graduates.

Comparisons were made between the Elementary Education, Secondary-bound, and Non-Education groups on college admittance and general knowledge variables.

Model of effective teachers. The reauthorization of No Child Left Behind is projected to contain language supporting effective teaching. A "next step" in the attainment of quality education for all children is measuring effective teaching and the attributes of the educators that succeed. A model to investigate two attributes of effective teachers was attempted using educator and student data from a local school district.

A solid measure of effective teaching and one that has been referred to in the reauthorization blueprint has been student achievement gains. Arkansas mandates a criterion-referenced exam drawn from the Arkansas Curriculum Frameworks. The Augmented Benchmark exams are administered annually, in the spring, for grades 3 through 8. Achievement gains can be assessed from one grade to the next for grades 4 – 8. Student scores on literacy and math are reported and fall into four proficiency levels: Below Basic, Basic, Proficient, and Advanced. Forms of remediation are prescribed for students not Proficient or Advanced.

To measure student growth by school, an Improvement Gain Index is employed by the ADE. When moneys are available, schools are awarded based on the five levels of improvement, from In Need of Immediate Improvement to Excellent. To facilitate the Improvement Gain Index calculations, the proficiency levels for the Augmented Benchmark are divided into eight subcategories (high and low) (2010 Arkansas School Performance Report, 2010). As a student changes from one subcategory to another over one school year, the school is credited or debited multiples of 0.50 depending on the levels of movement. For example, a student who moves from high Basic (Basic 2) to low Proficient (Prof 1) in one year gives the school a credit of 0.5. A decrease in level in one year debits the school 0.5. Increases or decreases of several levels are

multiples of 0.5 while a student maintaining the same subcategory counts as 0.0. Students remaining in the high Advanced (Adv 2) category are credited with a 0.5 rather than the 0.0 given for maintaining the same subcategory. For the Index, math and literacy credits and debits for all students with two years of scores are averaged yielding the index for that school. (See Figure 4 for an example calculation of the School Improvement Gain Index for one student and for one grade.) For Elementary schools utilized in this study, only fourth graders had the two years of scores while Middle and Junior High schools had two grade levels that could be of service.

Student gains are based on movement from a student's performance subcategory on the 3rd grade Augmented Benchmark exam to his/her 4th grade exam. Tabled values are the minimum scale scores from the respective exams used to assign subcategories. An example student that moved from Basic 2 to Prof 2 in literacy is credited with moving 2 subcategories in the positive direction. The number of subcategories moved is multiplied by 0.5 for positive movement and by -0.5 for negative movement. For this student, the gain would be 1.0. Cells with grayed numbering highlight the subcategory movement of this one student.

Scale Score Performance Subcategories									
Grade	Subject	Below Basic 1	Below Basic 2	Basic 1	Basic 2	Prof 1	Prof 2	Adv 1	Adv 2
3	Lit	1-262	263	330	415	500	577	654	745
3	Math	1-369	370	409	454	500	543	586	637
4	Lit	1-292	293	354	456	559	653	748	842
4	Math	1-451	452	495	527	559	599	640	691

Student Movement Across Subcategories for One Example Classroom				
	Literacy Grade 4		Mathematics Grade 4	
Gain Points	Number of Students	Total Gains	Number of Students	Total Gains
-1.5	1	-1.5x1=-1.5	0	-1.5x0=0.0
-1.0	1	-1.0x1=-1.0	4	-1.0x4=-4.0
-0.5	6	-0.5x6=-3.0	9	-0.5x9=-4.5
0.0	7	0.0x7=0.0	5	0.0x5=0.0
0.5	5	0.5x5=2.5	4	0.5x4=2.0
1.0	4	1.0x4=4.0	2	1.0x2=2.0
Sum	24	1.0	24	-4.5

Figure 4 (continued)

Sum of total gains = -3.5
Sum of Numbers of Students = 48
School Improvement Gain Index = Sum of total gains/Sum of Numbers of Students = -3.5/48 = -0.07

Cut Score	Performance Category	Rating
0.25 and above	Schools of excellence for improvement	5
0.13-0.24	Schools exceeding improvement standards	4
0.01-0.12	Schools meeting improvement standards	3
-0.12-0.0	Schools approaching standards (alert)	2
-0.13 and below	Schools in need of immediate improvement	1

If the School Improvement Gain Index of -0.07 had represented the gains of a whole school then the school would have received a rating of 2, Schools approaching standards (alert).

Figure 4. Calculations of the School Improvement Gain Index for one student and one example classroom.

Taking the school index a step further, for the present study, the Improvement Gain Index was calculated for classrooms from a local Arkansas school district. Student math and literacy improvement gains were utilized for classrooms of teachers with one to five years of total teaching experience. Again, the total years of experience was collected at the end of the 2010-2011 school year. Only classroom teachers for grades 4 through 8 were investigated and then only educators that taught literacy and/or math in regular classrooms were included. Meeting these qualifications were 24 teachers.

Elementary educators teach both literacy and mathematics so classroom gains for literacy and math were averaged for use in the model where applicable. Two Elementary teachers taught in a

departmentalized setting so only math *or* literacy gains were utilized. Student gains in English *or* mathematics were utilized for Middle and Junior High teachers in the model. Student test data from 2009-2010 and 2010-2011 were employed.

Descriptive statistics for the teacher variables and classroom achievement gains were reported.

A model utilizing classroom improvement gains as the criterion was developed. The first independent variable used was the identified teachers' Praxis II content knowledge score on the licensure exam mandated for their respective grade level. Praxis II content area scores were normalized using current means and standard deviations reported by ETS (Praxis Technical Manual, 2010).

For Elementary teachers, Praxis II "Early Childhood: Content Knowledge" exam scores were utilized. The exam covers both reading and mathematics. Middle school teachers had scores on the "Middle School Generalist" exam, the state requirement for teaching any of the core subjects at this level. Junior High teachers had "Middle School Generalist" exam scores or subject specific scores on the "Mathematics: Content Knowledge" or "English Language, Literature, and Composition: Content Knowledge" exams.

Another factor attributed to student achievement has been teaching experience. The literature review included research on novice teachers and the likelihood of their being assigned to more challenging classes as well as the retention of beginning teachers. Impact on student achievement was revealed to be highest in math between years one and two (Gordon, Kane, and Staiger, 2006). To explore the impact, the second predictor of teacher effectiveness was total years of teaching experience. As was stated, the identified teachers in the study had taught between one

and five years by the end of 2010-2011. Twenty-four teachers had both total years of teaching experience and a Praxis II content knowledge score available.

Multiple regression analysis was employed using SAS to predict average student gains utilizing the two teacher variables. The model equation was:

$$\text{Gains\_index} = a + b_1 * \text{Praxis\_II}_z + b_2 * \text{Tot\_teaching\_exp} \quad (1)$$

Analysis explored whether a relationship existed between student improvement gains and the teacher attributes, Praxis II content knowledge scores and total years of teaching experience. A significant relationship within the model and an analysis of the extent to which each independent variable added to the relationship would provide a powerful indicator of effectiveness in the classroom.

A more refined approach was utilized, as well, to explore *actual* student gains in literacy and/or math over the school year. Augmented Benchmark scale scores for the students of the identified teachers were standardized with means and standard deviations available on the NORMES website. Normalized gains were substituted in *Equation 1* to assess the relationship between student gains and the two independent variables.

Also, of interest were the characteristics of teachers of students achieving the highest and lowest levels of improvement. Dividing the 24 teachers into two groups dependent on classroom gains, the Praxis II content knowledge score averages were compared. Additionally, the levels of student achievement for teachers with one or two years total experience as opposed to teachers with three or four/five years of experience was explored. Further investigation revealed the classroom gains for the lowest and highest scorers on the Praxis II content knowledge exams.

IV. RESULTS

Licensure Cut Scores for SEAs and Passing Rates

Elementary educator examinations. The Praxis I "Pre-Professional Skills Test" (PPST), with its three subtests, mathematics, reading, and writing, was used by 26 states and jurisdictions to meet degree, certification, and highly qualified requirements. (Throughout, references made to states or SEAs include Washington, D.C., as well.)

Figure 5 displays the generally low 2010 passing scores for the Praxis I mathematics subtest (PPST: Mathematics). The median for national test-takers was 179 in a range of 150 to 190. As can be seen in Figure 4, 100% of SEA cut scores were below the national median score reported by ETS for the three most recent years (179). The lowest cut score was employed by Mississippi and the highest by Virginia. Almost two-thirds of the states that utilized this examination employed cut scores at or below the first quartile for national test-takers. The median cut score for SEAs was 173, six points below the national test-taker median.

For the Praxis I reading subtest (PPST: Reading), a national median of 178 was reported for *all* test-takers from the three years preceding 2010. Again, the range of possible scores was 150-190. Figure 6 displays the generally low 2010 SEA cut scores for the Praxis I reading subtest. The highest cut score used was 178, again employed by Virginia. The lowest score of 170 was utilized by Mississippi and Nebraska. The median of state cut scores was 174, a cut score used by five states. To gauge state cut scores on a national scale, this same median of 174 coincided with the first quartile for national test-takers of this exam. All of the SEA reading cut scores were set below the national median of testers except Virginia.

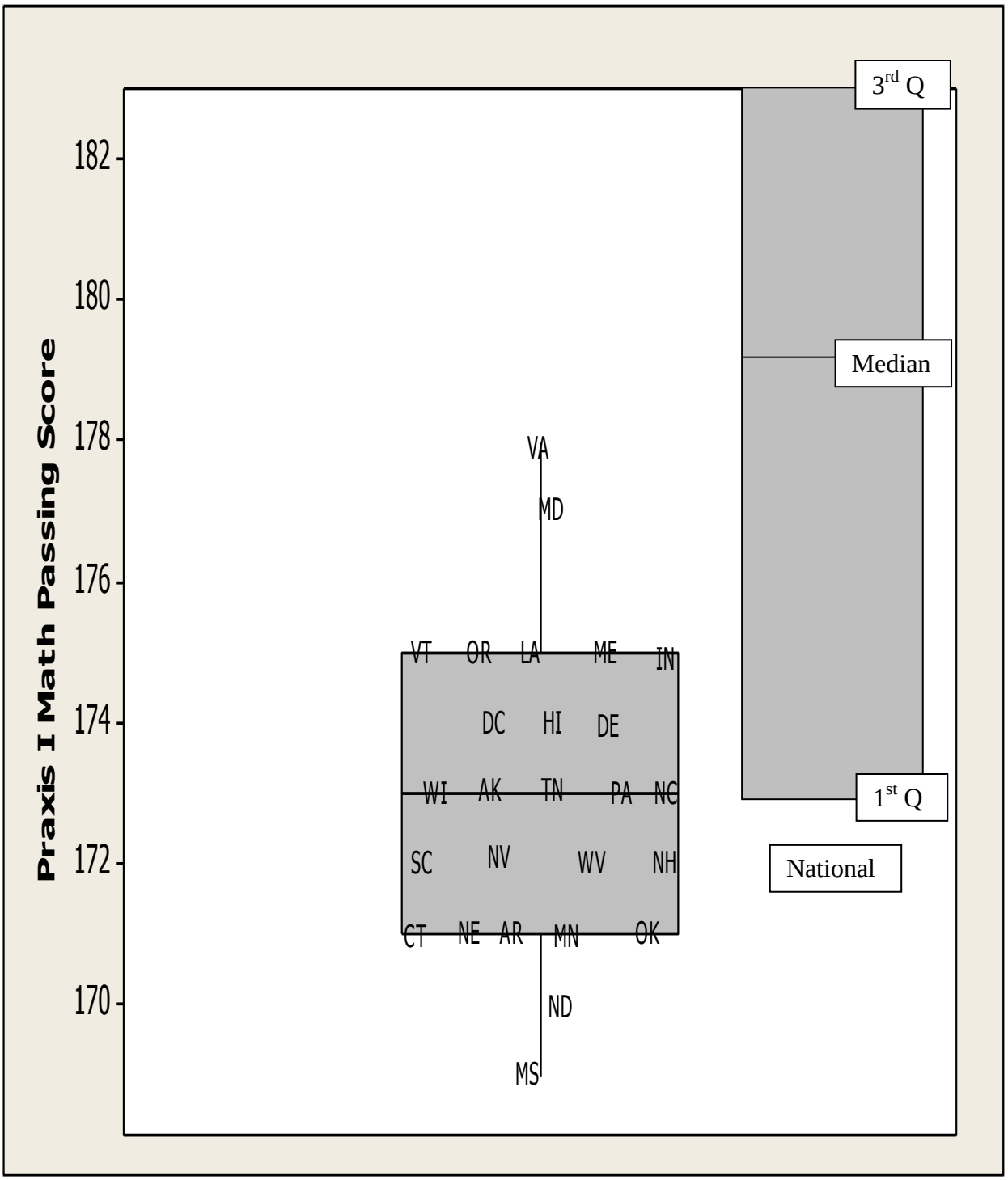


Figure 5. SEA cut scores for the Praxis I "Pre-Professional Skills test: Mathematics" subtest (left). Passing scores were disclosed by 26 states in 2010. Kentucky (not shown) required the exam but provided no cut score. The interquartile range for the national pool of testers 2008-2011 on this exam is displayed on the right.

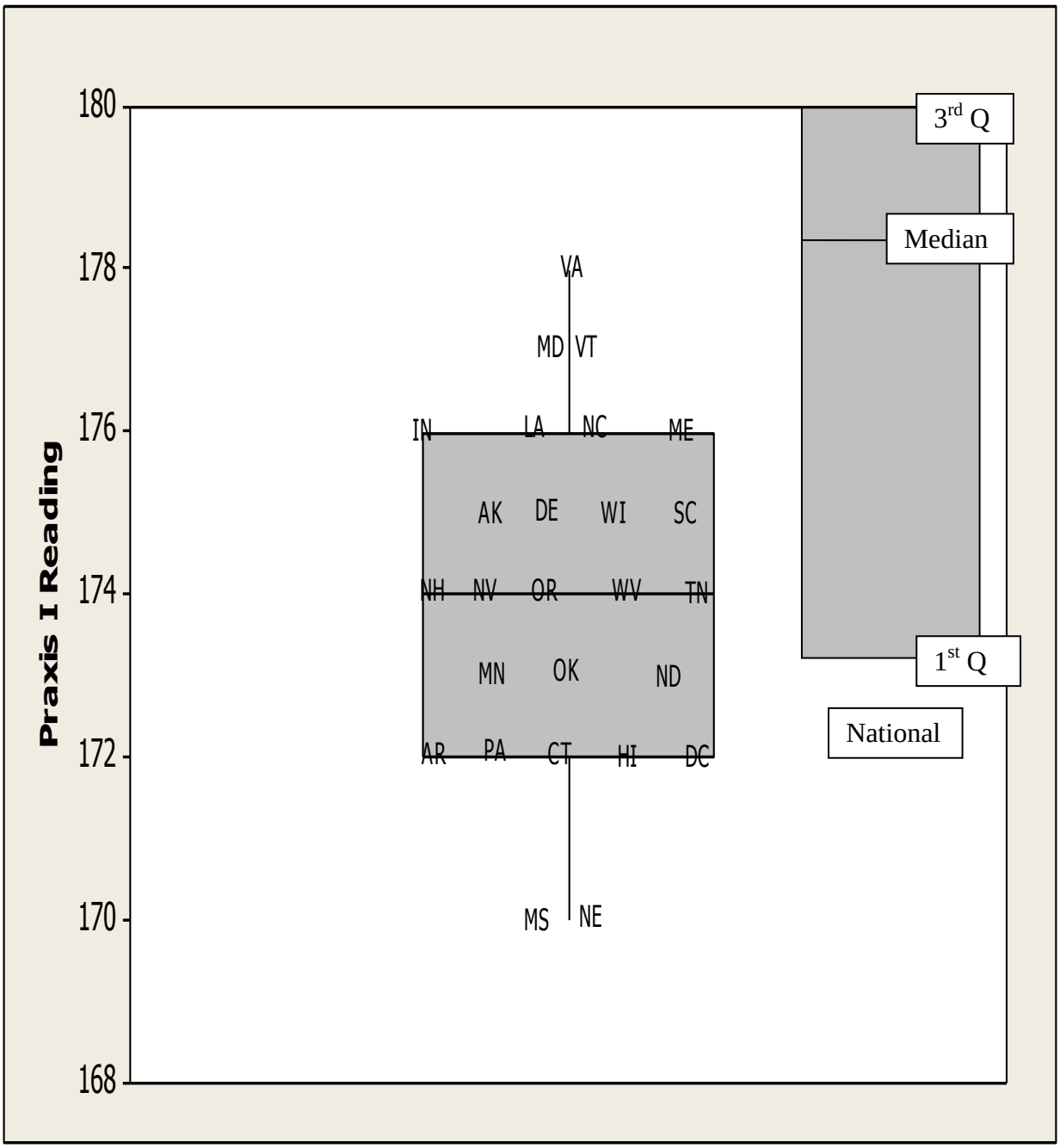
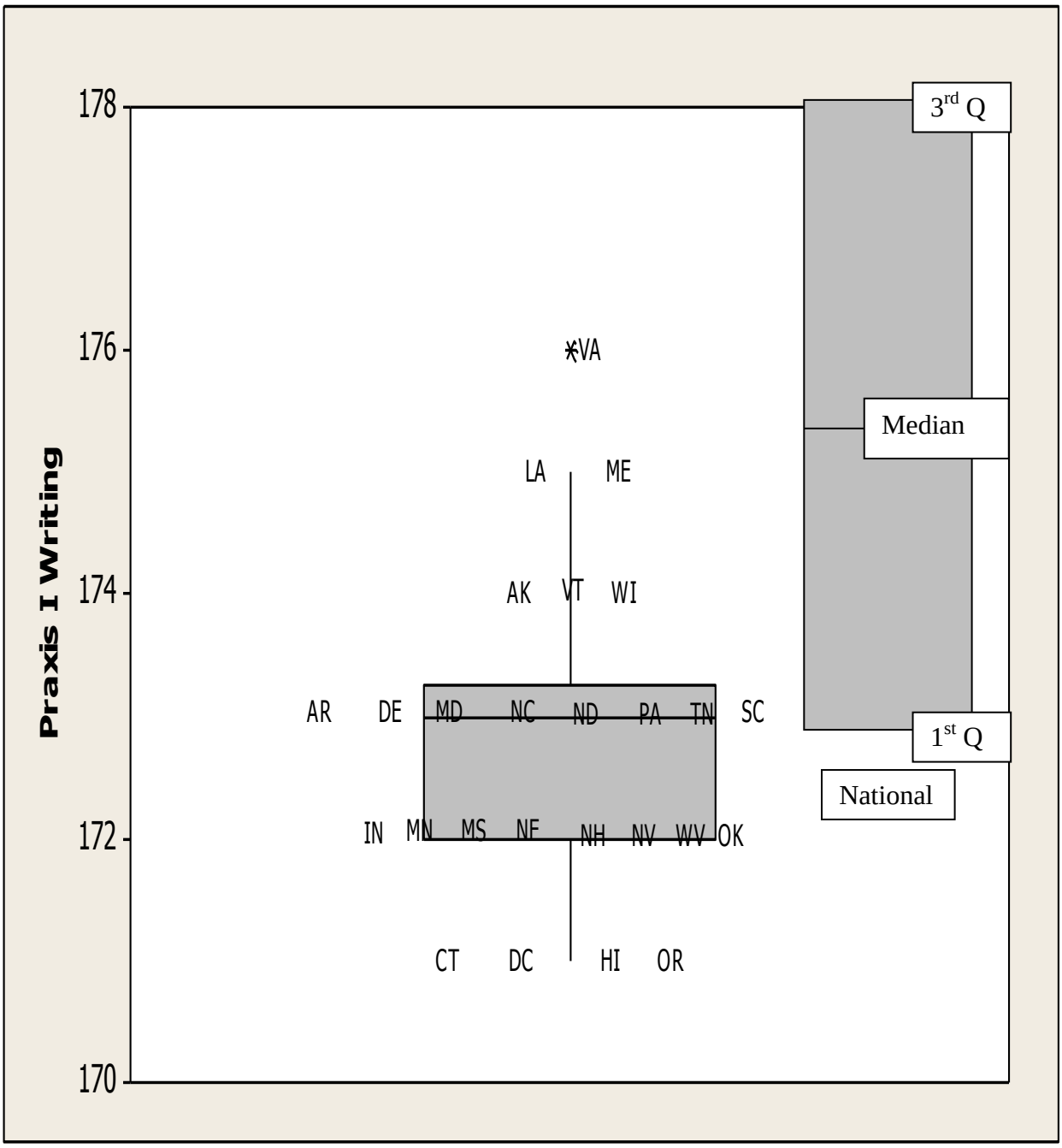


Figure 6. 2010 SEA cut scores for the Praxis I "Pre-Professional Skills Test: Reading" subtest. Passing scores were disclosed by 26 states. Kentucky (not shown) required the exam but provided no cut score. The interquartile range for the national pool of testers 2008-2011 on this exam is displayed on the right.

The Praxis I writing subtest (PPST: Writing), like the reading and mathematics subtests, was scored between 150 and 190. Generally low, writing cut scores for SEAs are revealed in Figure 7. Virginia, again, employed the highest cut score of 176 which coincided with the national median for recent test-takers. The cut scores utilized by Louisiana and Maine were only one point lower than the national median. The third quartile for SEA cut scores coincided with the first quartile for national test-takers. As a result, a test-taker could score at the 25th percentile nationally and have surpassed the cut score in ¾ of the states that used the Praxis I writing subtest.

The Praxis II "Elementary Education: Content Knowledge" examination, employed by 22 SEAs, was also utilized sufficiently to warrant graphical display. The possible score range for this content knowledge exam was 100 to 200, and the national median score for recent test-takers was 164. Published cut scores are displayed in Figure 8. All proved to be below the median score of recent test-takers. Montana was the only state utilizing a cut score at or above the national first quartile of 152. The lowest cut score, utilized by Alabama, was 27 points below the national scoring median.



* outlier

Figure 7. 2010 SEA cut scores for the Praxis I "Pre-Professional Skills Test: Writing" subtest. Passing scores were disclosed by 26 states. Kentucky (not shown) required the exam but provided no cut score. The interquartile range for the national pool of testers 2008-2011 on this exam is displayed on the right.

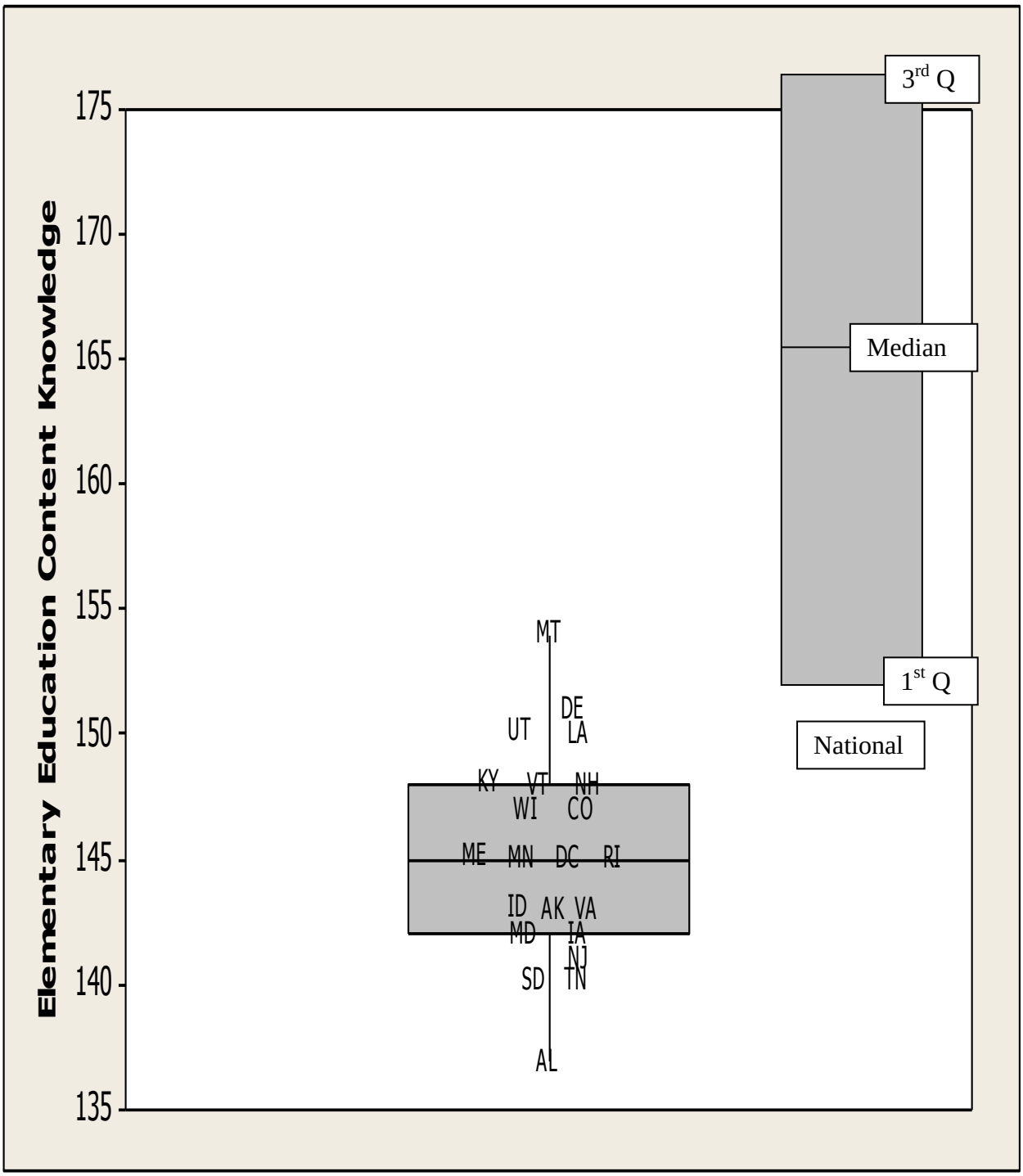


Figure 8. 2010 SEA cut scores for the Praxis II "Elementary Education: Content Knowledge" examination. Passing scores were disclosed by 22 states. The national median for test-takers was 164. The interquartile range for the national pool of testers 2008-2011 on this exam is displayed on the right.

Middle school educator tests. Boxplots revealing the passing scores for Praxis II middle grades subject area assessments are displayed in Figures 9 - 11. Possible scores ranged from 100 to 200. Quartiles for the national pool of recent test-takers are displayed on the graphs.

Twenty-eight SEAs used the Praxis II "Middle School English Language Arts" exam in 2010. The 25th percentile of national test-takers for this exam was 163, coinciding with the 75th percentile of SEA cut scores. Restated, ¾ of cut scores are below a level that would distinguish the lowest quarter of applicants in the national pool from those scoring higher. Kansas, Virginia, and Connecticut were the only SEAs employing this Praxis II exam that used cut scores above the first quartile for national test-takers. Mississippi and North Carolina utilized the lowest passing score of 145. (See Figure 9.)

The range of cut scores for the Praxis II "Middle School Mathematics" exam was 24 points on a 100-point scale (Figure 10). Virginia employed the highest cut score of 163 while Nevada, at 139, had the lowest for SEAs. All states utilizing this Praxis II examination set cut scores below the national median for test-takers except Virginia.

Virginia and Connecticut set the highest standard for passing the Praxis II "Middle School Science" examination, four points above the median for national test-takers. On the opposite end, North Carolina's passing requirement of 134 was 24 points below the national median. Figure 11 displays passing scores for SEAs utilizing this examination.

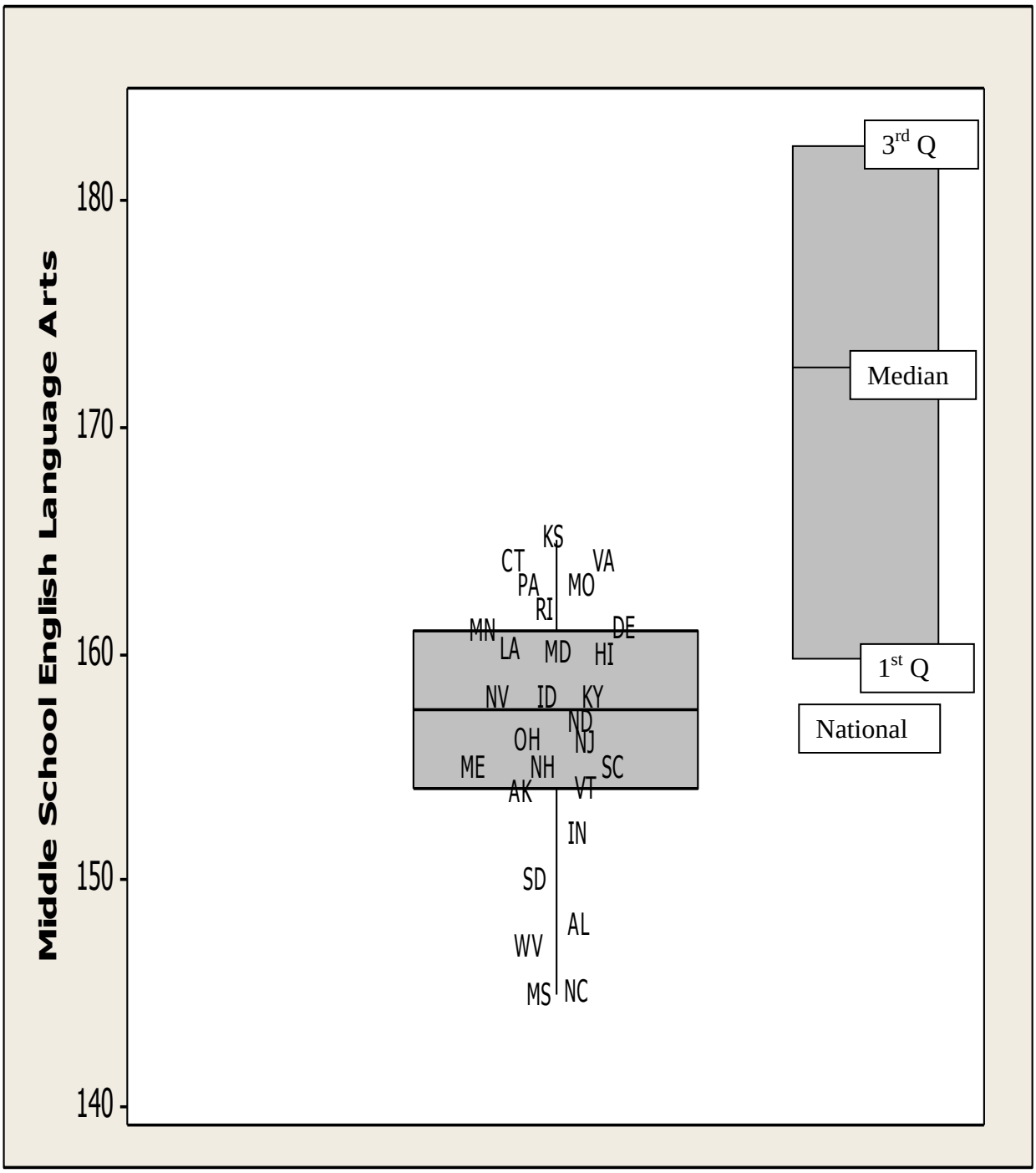


Figure 9. SEA cut scores for the Praxis II "Middle School English Language Arts" examination (2010). The national median for Praxis test-takers was 174. The interquartile range for the national pool of testers 2008-2011 on this exam is displayed on the right.

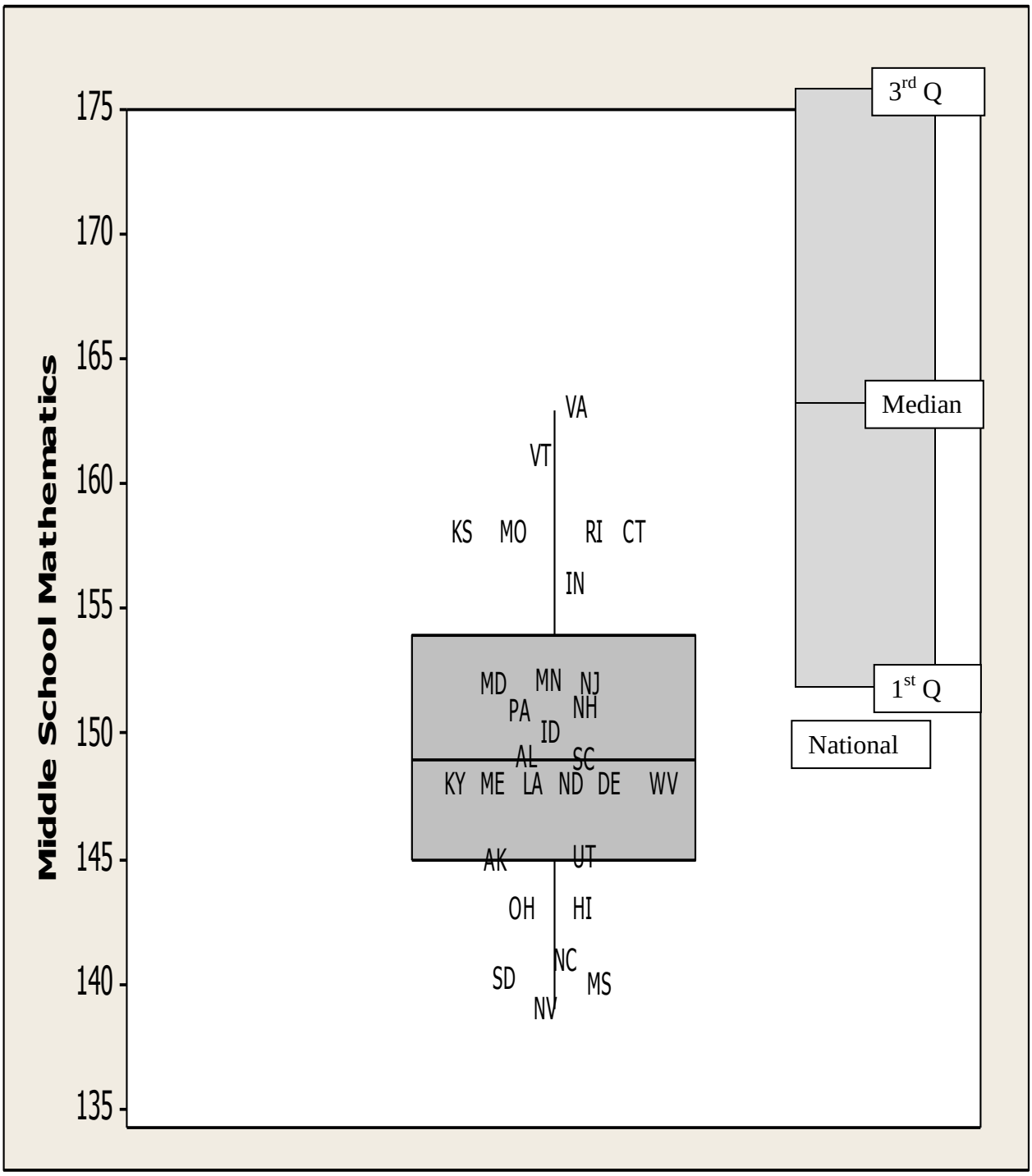
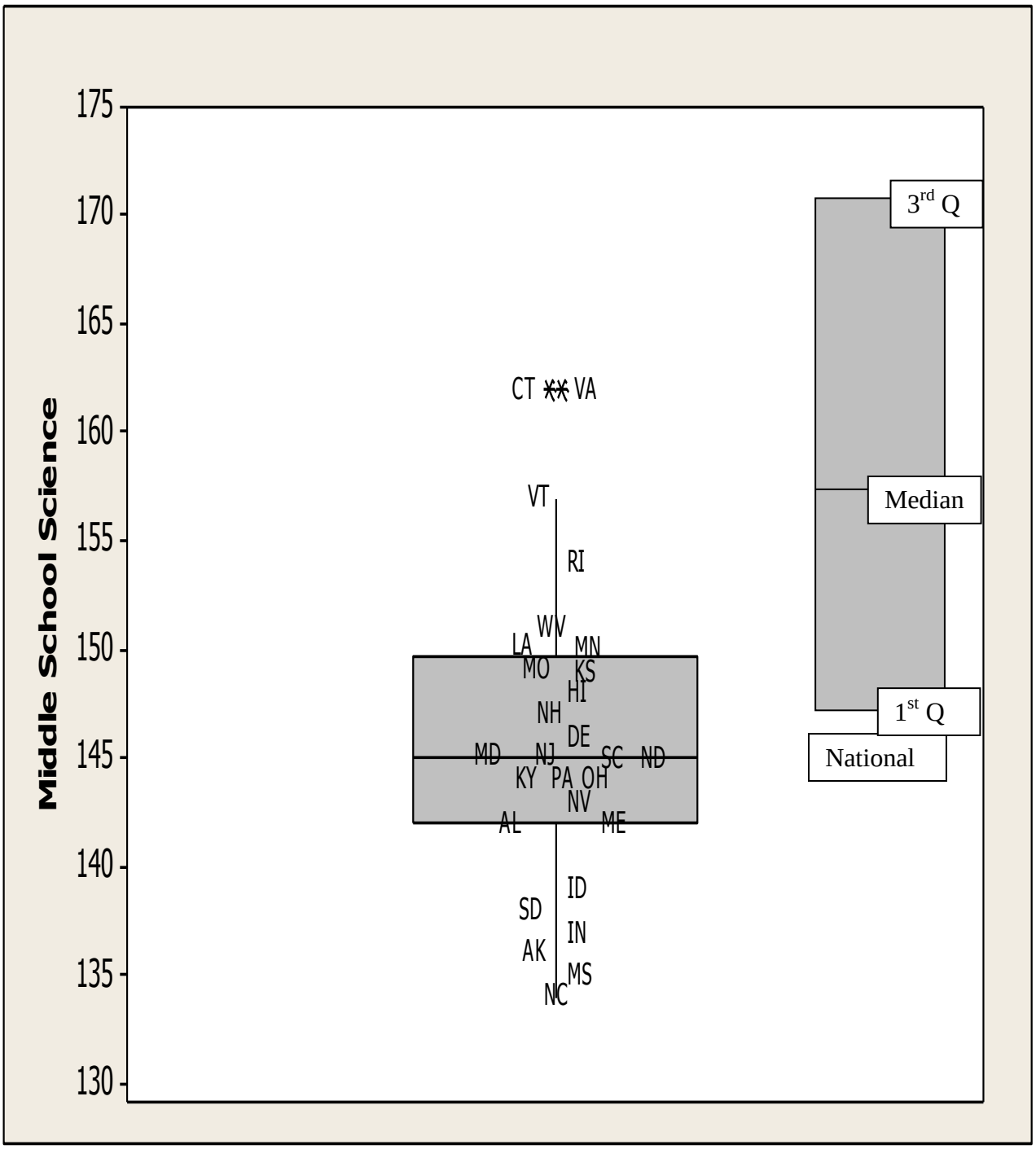


Figure 10. SEA cut scores for the Praxis II "Middle School Mathematics" examination (2010). Praxis passing scores were disclosed by 29 states. The national median for Praxis test-takers was 163. The interquartile range for the national pool of testers 2008-2011 on this exam is displayed on the right.



* outliers

Figure 11. SEA cut scores for the Praxis II "Middle School Science" examination (2010). Praxis passing scores were disclosed by 28 states. The national median for Praxis test-takers was 158. The interquartile range for the national pool of testers 2008-2011 on this exam is displayed on the right.

Thirteen of 28 SEAs utilized cut scores below the first quartile for national test-takers on all three middle school content area assessments. Using scores at or near the bottom on all three tests were North Carolina, Mississippi, and South Dakota. Virginia, Connecticut, and Rhode Island used some of the highest cut scores on all three Middle school Praxis II exams.

Secondary educator examinations. The Praxis II "Principles of Learning and Teaching: Grades 7 – 12" was utilized by 17 SEAs in 2010. Though categorized as a pedagogy assessment rather than content knowledge, the PLT was revealed to be an important piece in states' perceptions of HQT (Figure 12). The median score for national test-takers was 173 in a scoring range of 100 to 200. The highest required passing score of 167 was utilized by Rhode Island. This passing score coincided with the first quartile for national test-takers. All national testers at or above the first quartile would have fulfilled their PLT requirement in the 17 states utilizing this exam.

Three content area exams were frequently used for licensure and HQT for Secondary teachers. For English, the Praxis II "English Language, Literature, and Composition: Content Knowledge" exam was commonly utilized. The Praxis II "Mathematics: Content Knowledge" examination was most commonly used for testing mathematics teachers while the Praxis II "Biology: Content Knowledge" exam was used for science and biology. Thirty-five (35) states and jurisdictions employed the English and mathematics content knowledge exams while 32 employed this biology content knowledge exam. The diversity of cut scores for English, mathematics, and biology are graphically represented in Figures 13 – 15 alongside national test-taker data. The three exceptions noted in Table 2 for the biology content knowledge exam were not included.

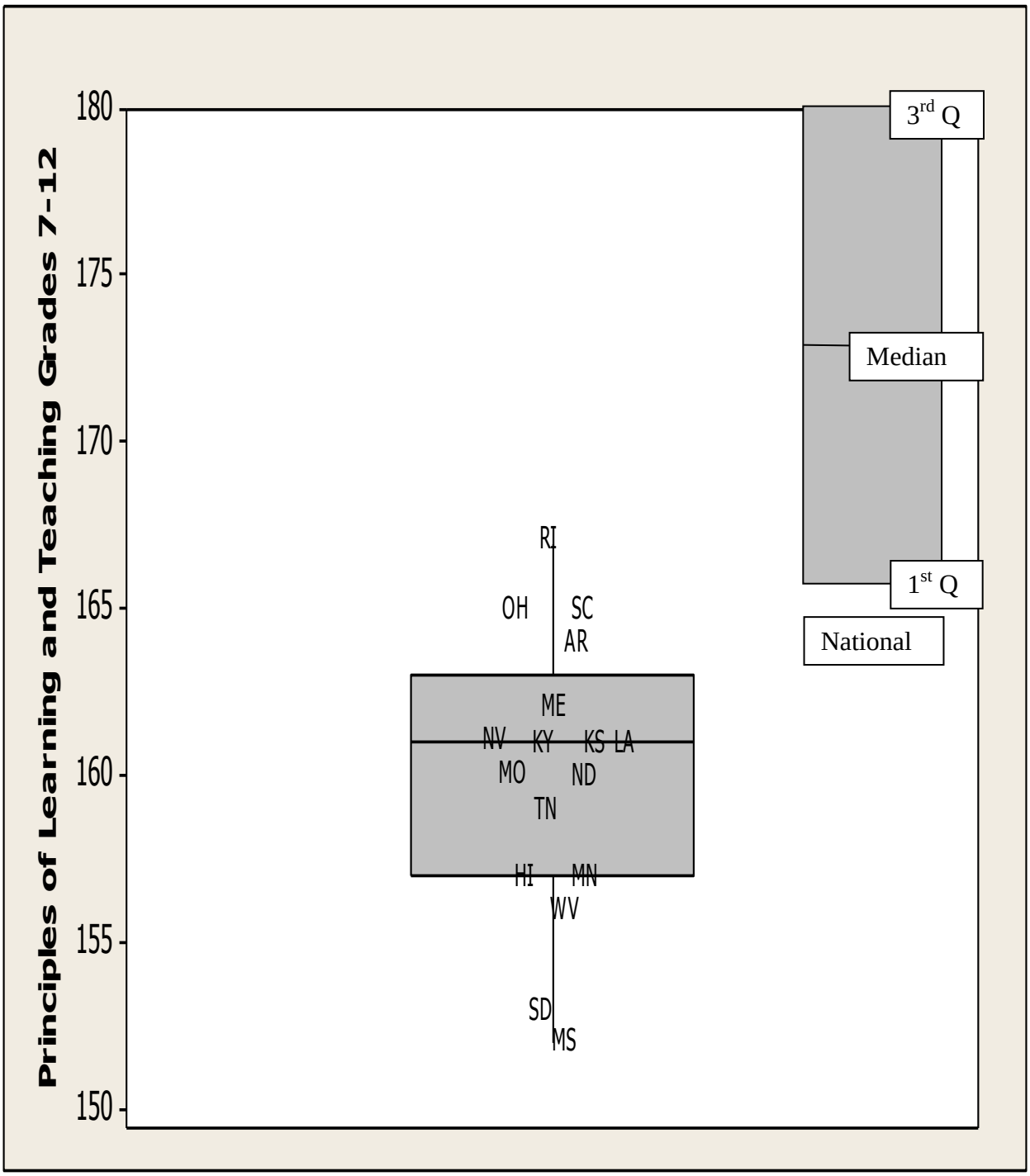
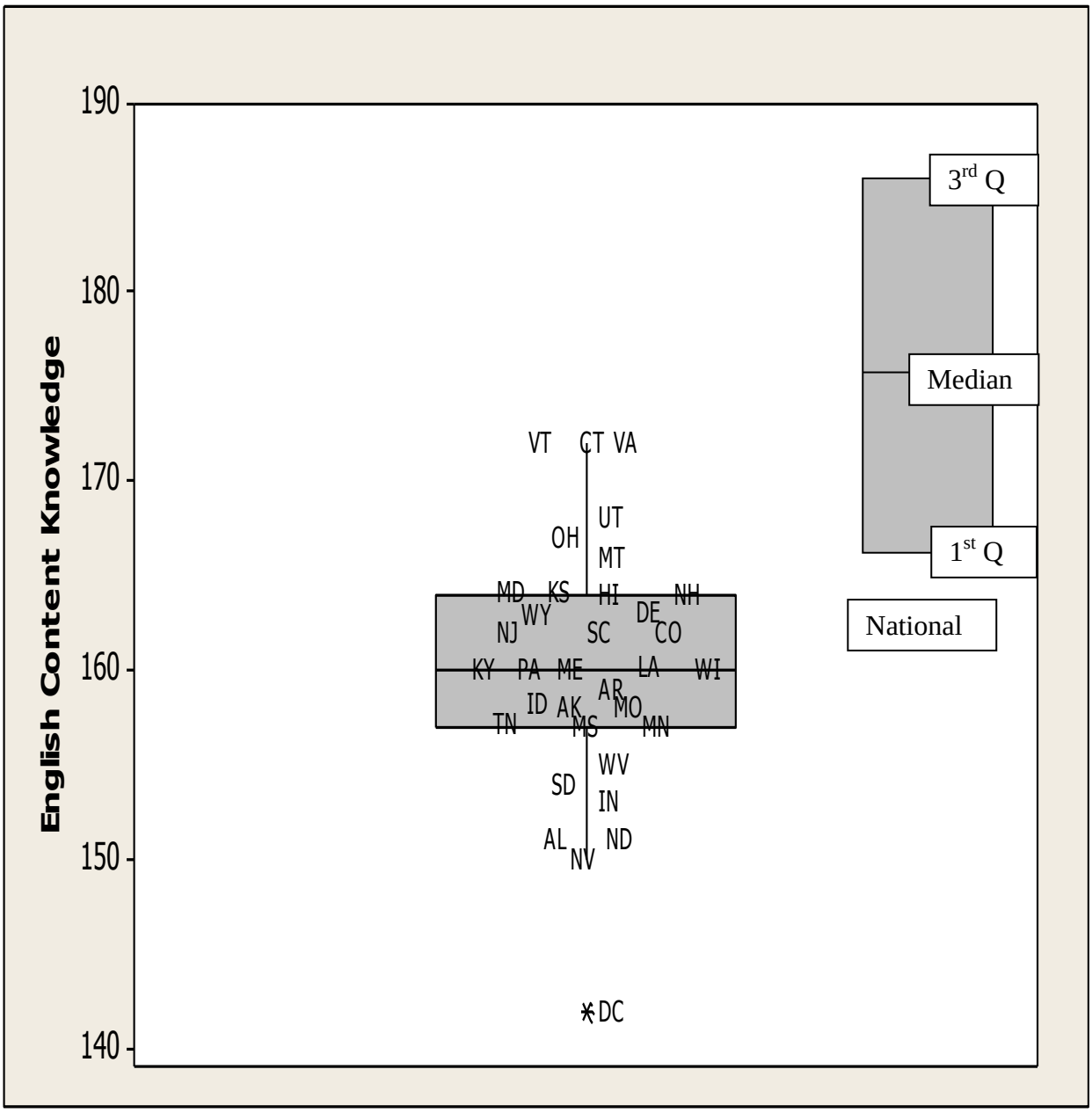


Figure 12. SEA cut scores for the Praxis II "Principles of Learning and Teaching: Grades 7-12" examination (2010). Praxis passing scores were disclosed by 17 states. The national median for Praxis II PLT 7-12 test-takers was 173. The interquartile range for the national pool of testers 2008-2011 on this exam is displayed on the right.

The Praxis II English content knowledge examination was used by 35 states and jurisdictions though one, North Carolina, had not set cut scores for this exam. The median score for Praxis national test-takers was 177. Virginia, Vermont, and Connecticut utilized the highest Praxis II cut scores for English content area (172). The lowest Praxis cut score was 142, used by Washington, D.C., and was 35 points below the national median. Five states requiring this Praxis II examination used a cut score above the national first quartile (166) leaving 29 cut scores below this minimal demarcation. (See Figure 13.)

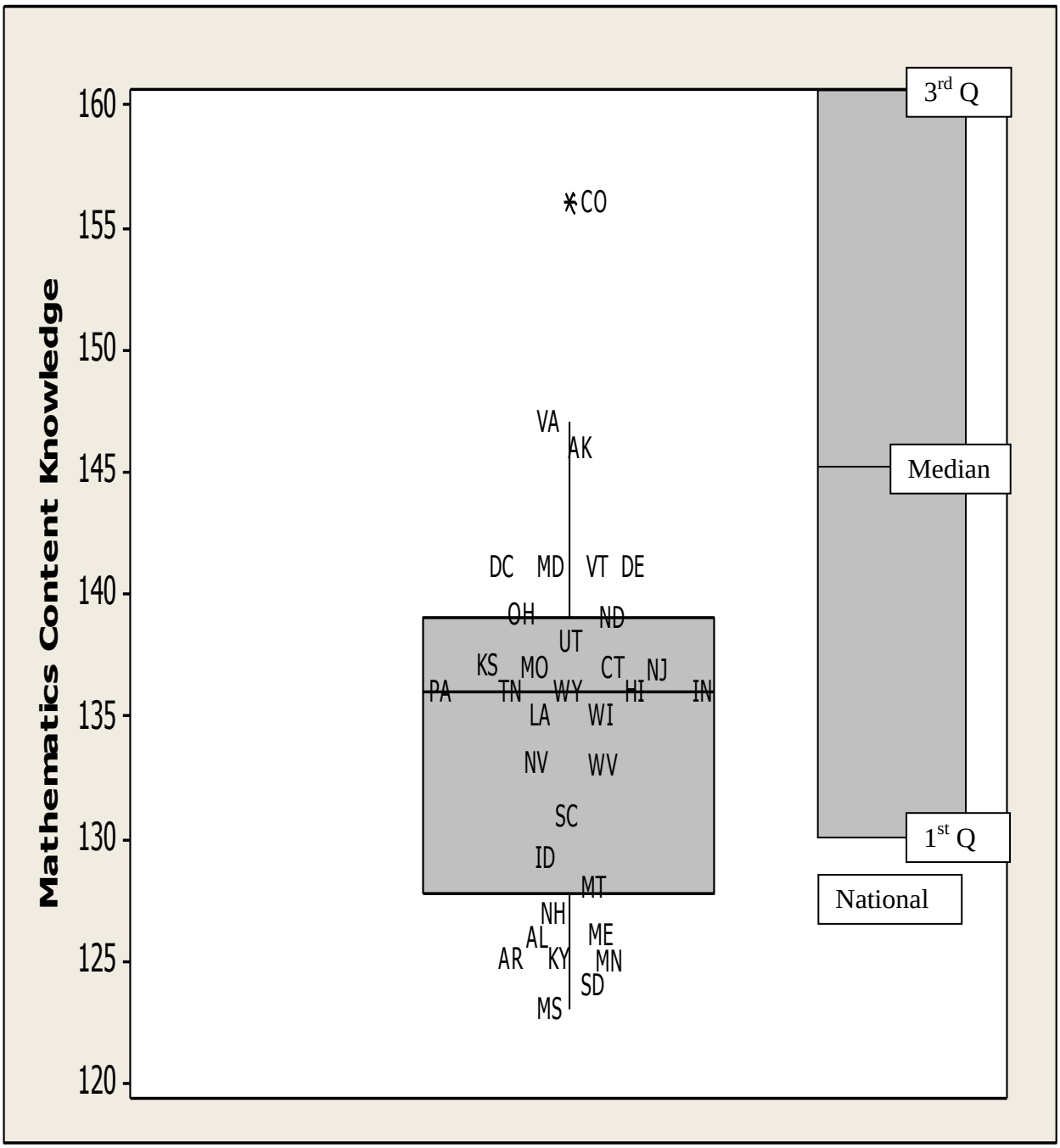


* outlier

Figure 13. SEA cut scores for the Praxis II "English Language, Literature, and Composition: Content Knowledge" examination (2010). Praxis II English content area passing scores were disclosed by 34 states. One state, North Carolina did not report a passing score. The national median for Praxis II test-takers was 177. The interquartile range for the national pool of testers 2008-2011 on this exam is displayed on the right.

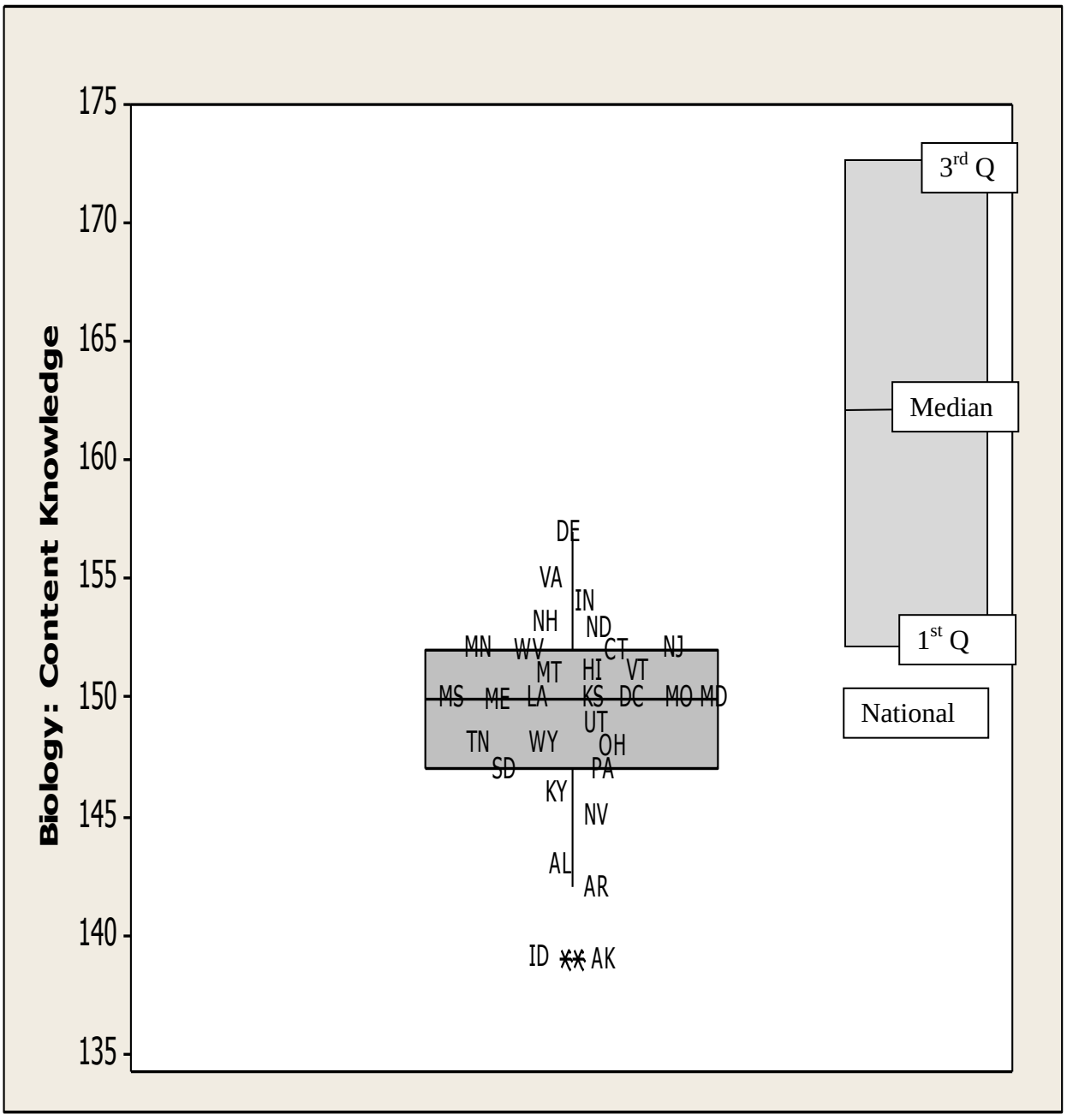
The Praxis II "Mathematics: Content Knowledge" examination was used by the same states and jurisdictions that utilized the English content area exam. The median for all recent test-takers was 145, much reduced from that of English but not necessarily comparable, according to ETS. Cut scores varied widely as can be seen in Figure 14. In 2010, the lowest Praxis II cut score was employed by Mississippi at 123 while the highest was 156 utilized by Colorado. In contrast to the pattern established by English cut scores, only eight states employed math cut scores below the national first quartile of 128 points. Three states, Alaska, Virginia, and Colorado, assigned cut scores for the Praxis II Mathematics exam above the national test-taker median.

The final Praxis II content area assessment explored was biology. It should again be noted that three states used Praxis II general science and other biology exams and were not included in the figure. North Carolina used the Praxis biology exam but had not published cut scores. Of the 31 SEAs reporting passing scores for the Praxis II "Biology: Content Knowledge" examination, none set a cut score for that exam above the national median of 160. Delaware utilized the highest passing score of 157, and Alaska and Idaho employed the lowest passing score of all SEAs at 139. (See Figure 15.)



* outlier

Figure 14. State cut scores for the Praxis II "Mathematics: Content Knowledge" examination (2010). Passing scores were disclosed by 34 states. Though utilized by North Carolina, no passing score was disclosed. The national median for Praxis II test-takers was 145. The interquartile range for the national pool of testers 2008-2011 on this exam is displayed on the right.



* outliers

Figure 15. State cut scores for the Praxis II "Biology: Content Knowledge" examination utilized by 31 SEAs (2010). Though utilized by North Carolina, no passing score was disclosed. The national median for Praxis II test-takers was 162. The interquartile range for the national pool of testers 2008-2011 on this exam is displayed on the right.

Four SEAs, Alabama, South Dakota, Mississippi, and Minnesota, registered in the lowest third of passing scores for both the English and mathematics Praxis II exams. Of this group, the biology passing scores employed by Alabama and South Dakota were also in the lowest third of SEA cut scores for that exam.

On the other end, SEAs appearing in the highest third of SEA passing scores for both English and math were Maryland, Ohio, Utah, Vermont, and Virginia.

Passing licensure examinations through random guessing was explored via binomial distributions for the Praxis II English, mathematics, and biology content knowledge exams. The English exam was reported to have 120 multiple choice items, each with four responses. The lowest cut score utilized by an SEA was 142 on a scale of 100-200. Assuming that the items were equally weighted, to attain 42% of the points possible, there was less than a 1% chance of passing the English exam while randomly guessing. The biology content knowledge exam employed 150 multiple choice questions, each with four responses. The lowest passing score utilized was 139, equivalent to answering 59 items correctly if items were equally weighted. Again, less than a 1% probability of attaining a passing score by random guessing was revealed. The mathematics content knowledge exam was constructed with 50 multiple choice items, each having four responses. The calculated probability of a test-taker passing the math exam by random guessing in Mississippi, which utilized the lowest passing score of 123, was 62%. Nine mathematics cut scores used by SEAs were revealed to have a 36% chance or greater of being passed through random guessing.

State Passing Rates. Thirty-five SEAs reported passing rates for the Praxis II "English Language, Literature, and Composition: Content Knowledge" examination for the 2007-2008 school year. Of these, 17 reported that 100% of test-takers testing in their states had passed the

examination. The lowest rate for 2007-2008 was 91% passing in New Hampshire and Utah. The range for the passing rates was a scant nine percentage points. The median passing rate was 99%. Arkansas reported that 99% of aspiring English teachers passed the examination that year. (See Figure 16.)

Thirty-two SEAs reported passing rates for the Praxis II "Mathematics: Content Knowledge" examination for 2007-2008 on the Title II website. Delaware and Nevada, outliers, declared the lowest passing rates at 80% and 79%, respectively. On the other end of the distribution, 14 SEAs reported 100% passing rates. The median passing rate was 98.5% while the range was 21 percentage points. Arkansas reported that 100% of test-takers passed the math content knowledge exam. (See Figure 17.)

Passing rates for the Praxis II "Biology: Content Knowledge" examination were reported by 22 SEAs for 2007-2008. The range of passing rates was 12 points while the median was 100%. Three passing rates presented as outliers on the low end of the distribution, Pennsylvania, New Jersey, and Mississippi, with passing rates of 91%, 88% and 88%, respectively. (See Figure 18.)

Forty-eight SEAs reported a summary percent passing rate for *all* examinations for 2007-2008. The range was 17 percentage points with seven SEAs reporting that 100% of test-takers within their states had passed their exams that year. The median rate was 97%. There was a single outlier on the low end, Hawaii, with a passing rate of 83%. (See Figure 19.)

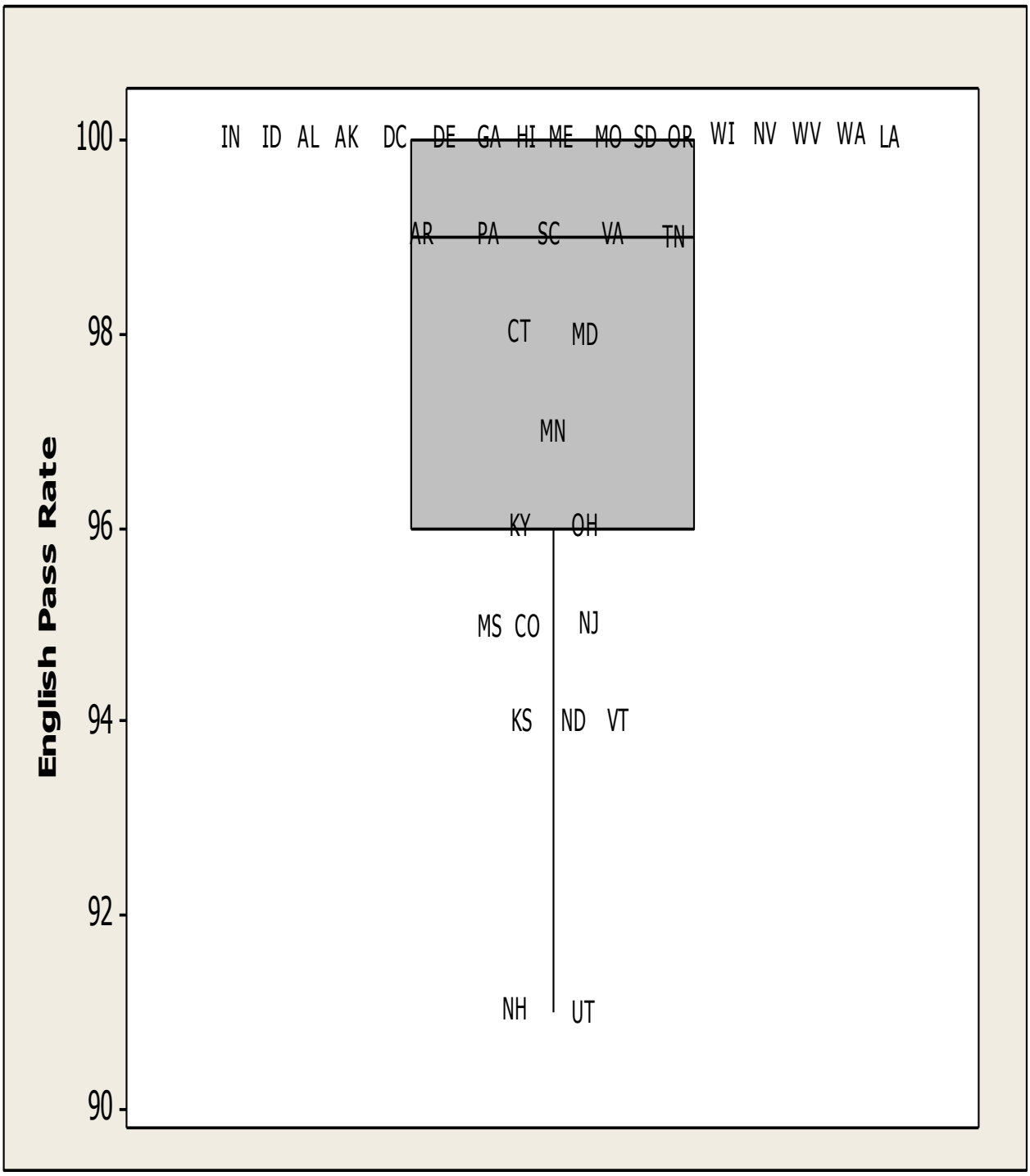
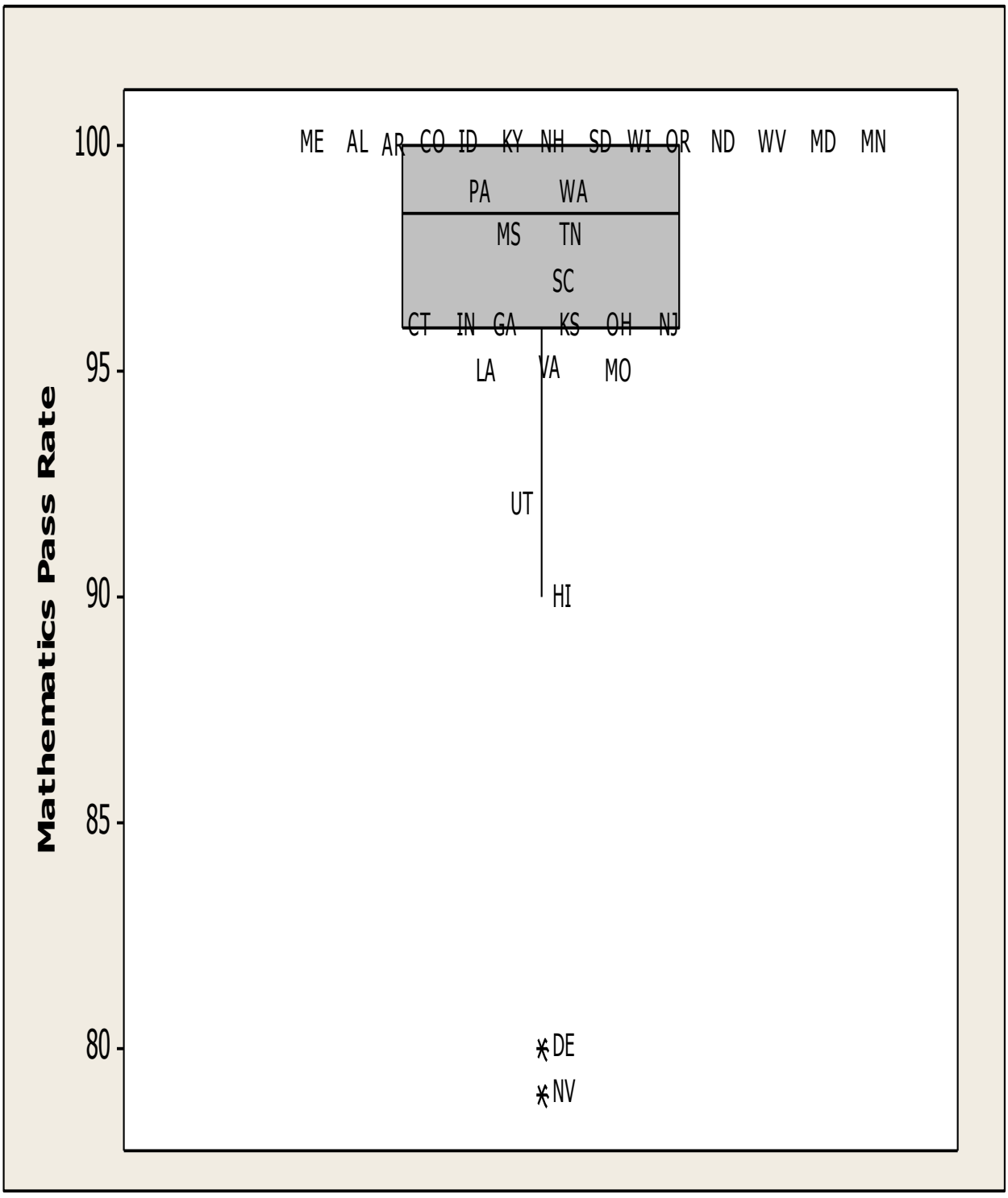
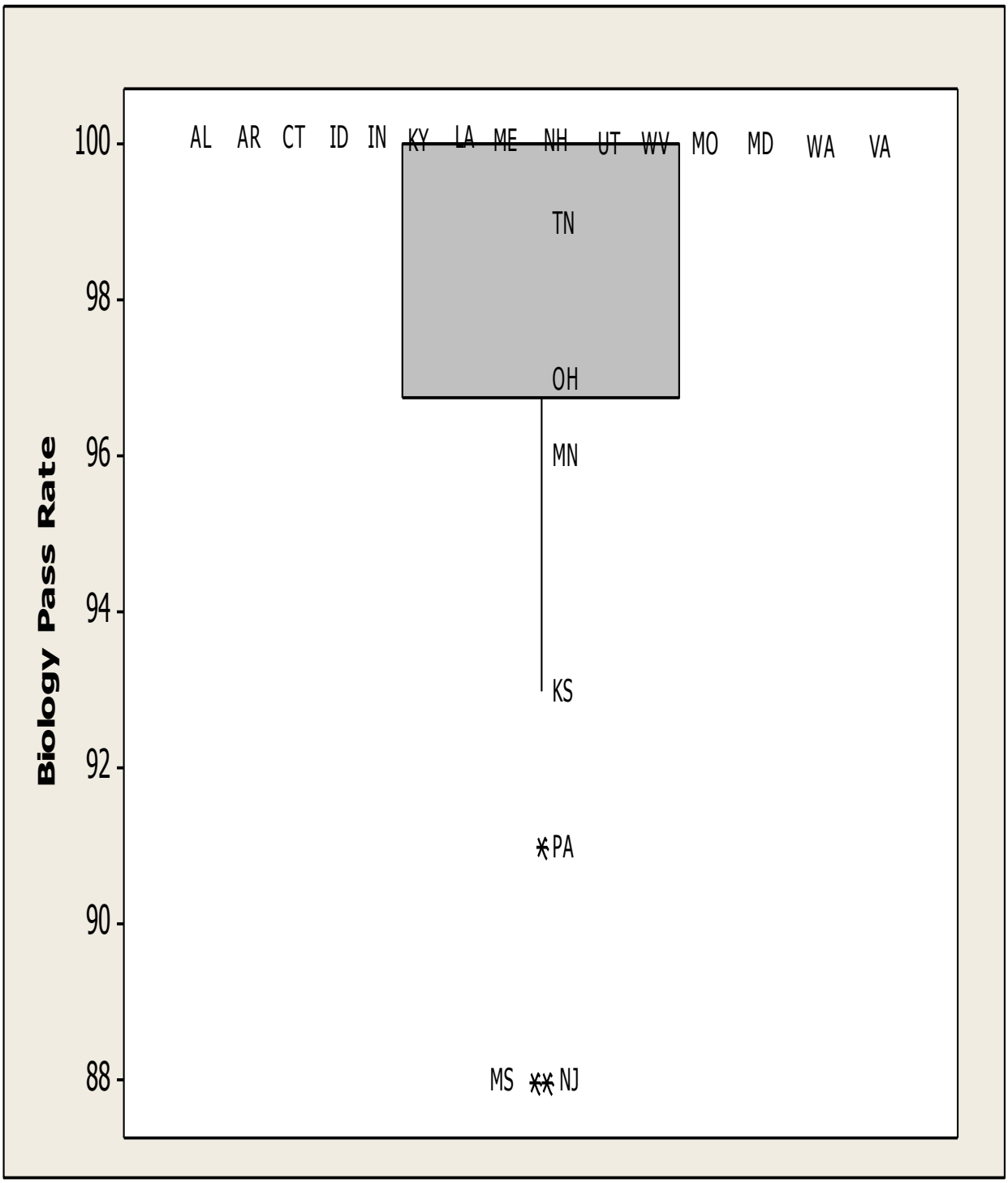


Figure 16. SEA passing rates for the Praxis II "English Language, Literature, and Composition: Content Knowledge" exam as reported in the *Title II – State Report 2009*. Thirty-five (35) SEAs reported passing rates for this exam for 2007-2008.



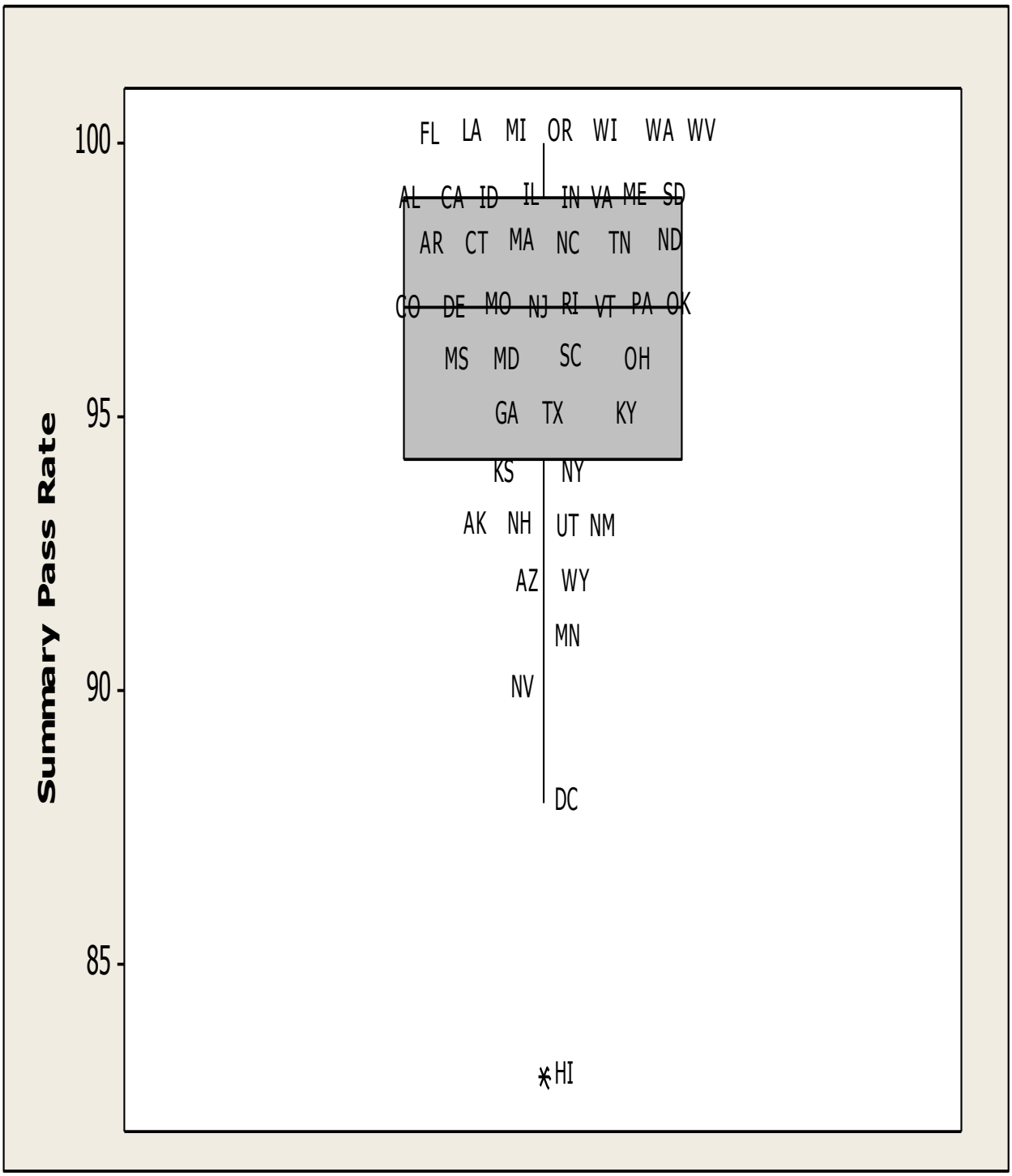
* outliers

Figure 17. SEA passing rates for the Praxis II "Mathematics: Content Knowledge" examination as reported in the *Title II – State Report 2009*. Thirty-two (32) SEAs reported passing rates for this examination for 2007-2008.



* outliers

Figure 18. SEA passing rates for the Praxis II "Biology: Content Knowledge" examination as reported in the *Title II – State Report 2009*. Twenty-two (22) SEAs reported passing rates for this examination for 2007-2008.



* outlier

Figure 19. SEA passing rates in summary for all exams, including state-developed assessments, attempted in 2007-2008 as reported in the *Title II – State Report 2009*. Forty-eight (48) SEAs reported summary passing rates for 2007-2008.

Pearson Product-Moment Correlations were calculated between the SEA passing rates and passing scores for the three associated content area examinations, English, mathematics, and biology. Correlations are reported in Table 6. All three correlations yielded inverse relationships. The correlation between the Praxis II English content area exam and English passing scores revealed a moderate association while a weak relationship was detected for mathematics. The association between biology passing rates and passing scores was negligible at r = -0.12. To differing degrees, higher passing rates were related to lower SEA passing scores. The value of the correlation coefficients was affected by the minimal range of SEA passing rates.

Table 6

Correlations Between SEA Passing Rates and Praxis II Passing Scores

	Praxis II Examinations			Mean	SD
Passing Rate	English	Math	Biology	Passing Sc.	Passing Sc.
English	-0.40 (n = 32)	---	---	160.00	6.58
Math	---	-0.25 (n = 29)	---	134.97	7.42
Biology	---	---	-0.12 (n = 21)	149.10	4.27
Mean Passing Rate	97.97	96.66	97.82		
SD Passing Rate	2.74	5.20	4.02		

University of Arkansas Praxis Data

Praxis I "Pre-Professional Skills Test" (PPST) scores were reported for over a thousand testers attempting the exam at the U of A between 2008 and 2010. Passing the examination remains a requirement for entering the Education program within the COEHP. The three

subtests, math, reading, and writing, are each scored between 150 and 190 scale score points. Descriptive statistics for the U of A reported scores are displayed in Table 7.

Table 7

Descriptive Statistics for Arkansas Praxis I Pre-Professional Skills Test Scores

Praxis I	Mean	Standard Deviation	*n*
Math	177.77	6.76	1185
Reading	177.75	6.16	1178
Writing	175.11	4.53	1321

Note. *n* is the number of tests attempted between 2008 and 2010.

The Praxis I mathematics exam was attempted 1,185 times by 1,074 U of A test-takers between 2008 and 2010. Test-taker data are depicted in boxplots in Figure 20. The minimum score was 158 while 18 test-takers scored a perfect 190. The first and third quartiles coincided with that of the national testing pool while the U of A median was one point lower than the ETS reported median for the mathematics PPST. The Arkansas passing score of 171 fell below the 25^{th} percentile for U of A testers. Seventy-six percent of U of A test-takers fell at or above the national first quartile of 173.

Thirty-eight U of A testers attempted the Praxis I mathematics exam at least one more time unsuccessfully. One tester attempted the exam six times unsuccessfully between 2008 and 2010. Over 83% of U of A test scores met or exceeded the Arkansas passing score between 2008 and 2010.

The Praxis I PPST reading exam results for U of A testers are depicted in Figure 20 as well. During the 2008-2010 timeframe, 1,178 exams were attempted by 1,060 test-takers. The minimum score was 155 scored by two testers while the maximum was 186 scored by 25

individuals. The first quartile of U of A testers coincided with the national statistic while the U of A median and third quartile exceeded those of the national pool of testers. Thirteen scores at or below 160 presented as outliers in the distribution. During the timeframe of this study, 84% of the exams attempted were passed. Of the testers with non-passing scores, the highest number of attempts was five with the tester passing on the sixth attempt.

The Praxis I writing test as depicted by the boxplot in Figure 20 revealed no outliers. Attempting the 1,321 writing exams were 1,097 Arkansas test-takers. The maximum score of 189 was scored by two individuals while the minimum of 152 was obtained by one test-taker. The Arkansas passing score of 172 for this exam fell at the 25^{th} percentile of test-takers. The U of A test-taker quartiles closely resembled that of national test-takers with the U of A first quartile and median being one point below the associated national statistics. The third quartiles coincided. Seventy-one percent of U of A scores were at or above the national first quartile of 173. The pass rate of exams attempted was 79% during the 2008-2010 timeframe. Of the non-passing scores, 43 test-takers attempted the exam at least one more time, unsuccessfully. One test-taker passed the writing examination on the seventh attempt.

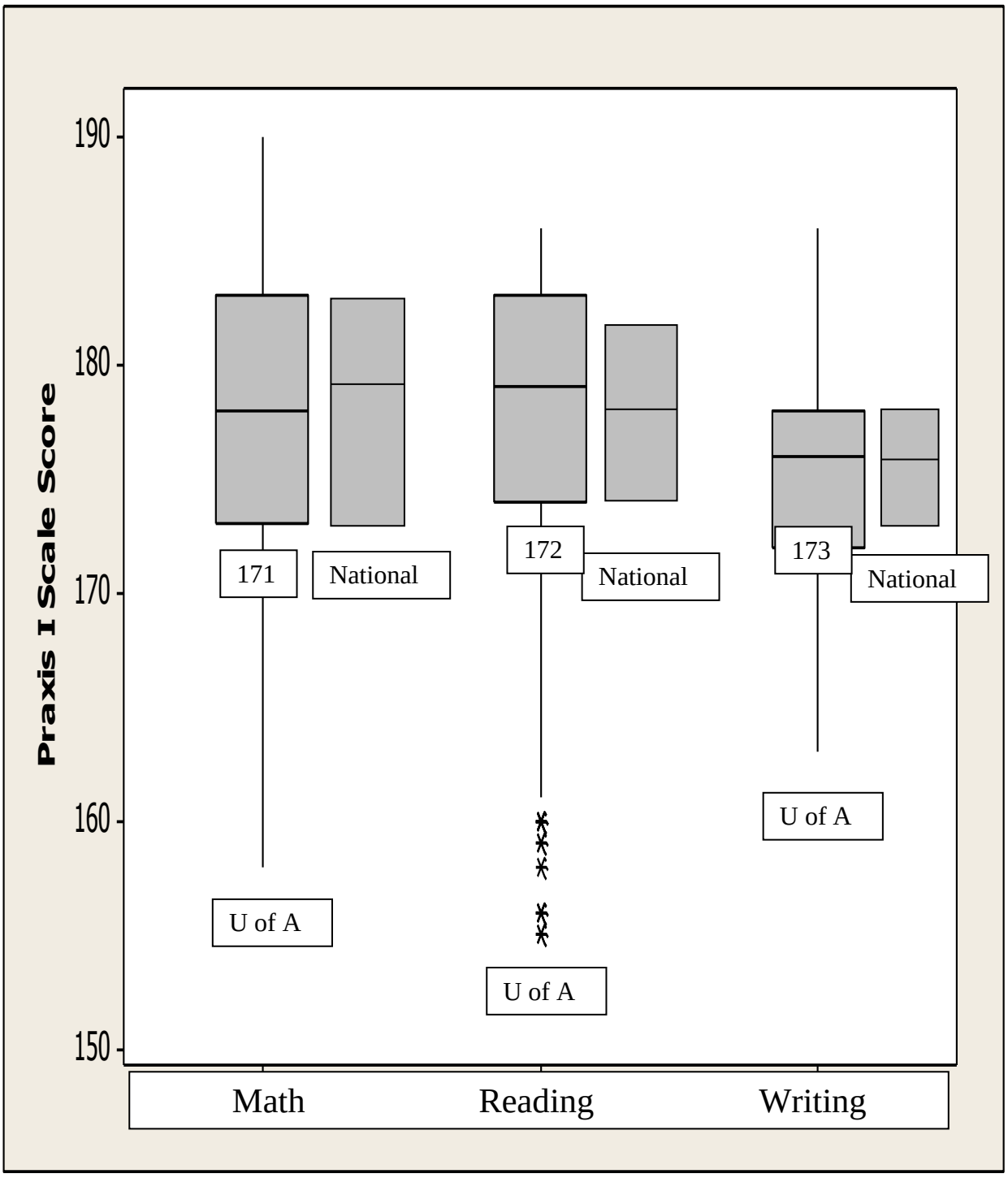


Figure 20. The Praxis I "Pre-Professional Skills Test: Mathematics, Reading, and Writing." Computerized and paper tests both included for each. Interquartile ranges of national test-takers accompany U of A boxplots to the right of each. Arkansas passing scores are super-imposed on the U of A boxplots.

The three high-frequency examinations utilized in Arkansas for Secondary licensure were the "English Language, Literature, and Composition: Content Knowledge," "Mathematics: Content Knowledge," and "Biology: Content Knowledge." Descriptive statistics are displayed in Table 8.

Table 8

Descriptive Statistics for Arkansas Praxis II Content Knowledge Exams

Praxis II	Mean	Standard Deviation	n
English	185.70	12.29	56
Math	144.03	20.87	40
Biology	158.34	15.67	29

Note. Exams are "English Language, Literature, and Composition: Content Knowledge," "Mathematics: Content Knowledge," and "Biology: Content Knowledge."

Fifty-six scores were revealed for the Praxis II "English Language, Literature, and Composition: Content Knowledge" examination for test-takers at the U of A. No tester attempted the examination more than once. Only two individuals did not pass this exam (3.6%) thus yielding a pass rate of 96.4%. The median scale score was 186.5, 10.5 points higher than the median for national test-takers during the timeframe 2008-2011. The lowest score was 154 while the highest score was a perfect 200, scored by four Arkansas test-takers. Almost half of University of Arkansas test-takers scored above the third national quartile with only 14% scoring in the national first quartile. Twenty-four Arkansas attempters (43%) were awarded the Recognition of Excellence (ROE) designation for scoring in the top 15% nationally. The Arkansas passing score of 159 fell at the 5th percentile in the distribution. (See Figure 21.)

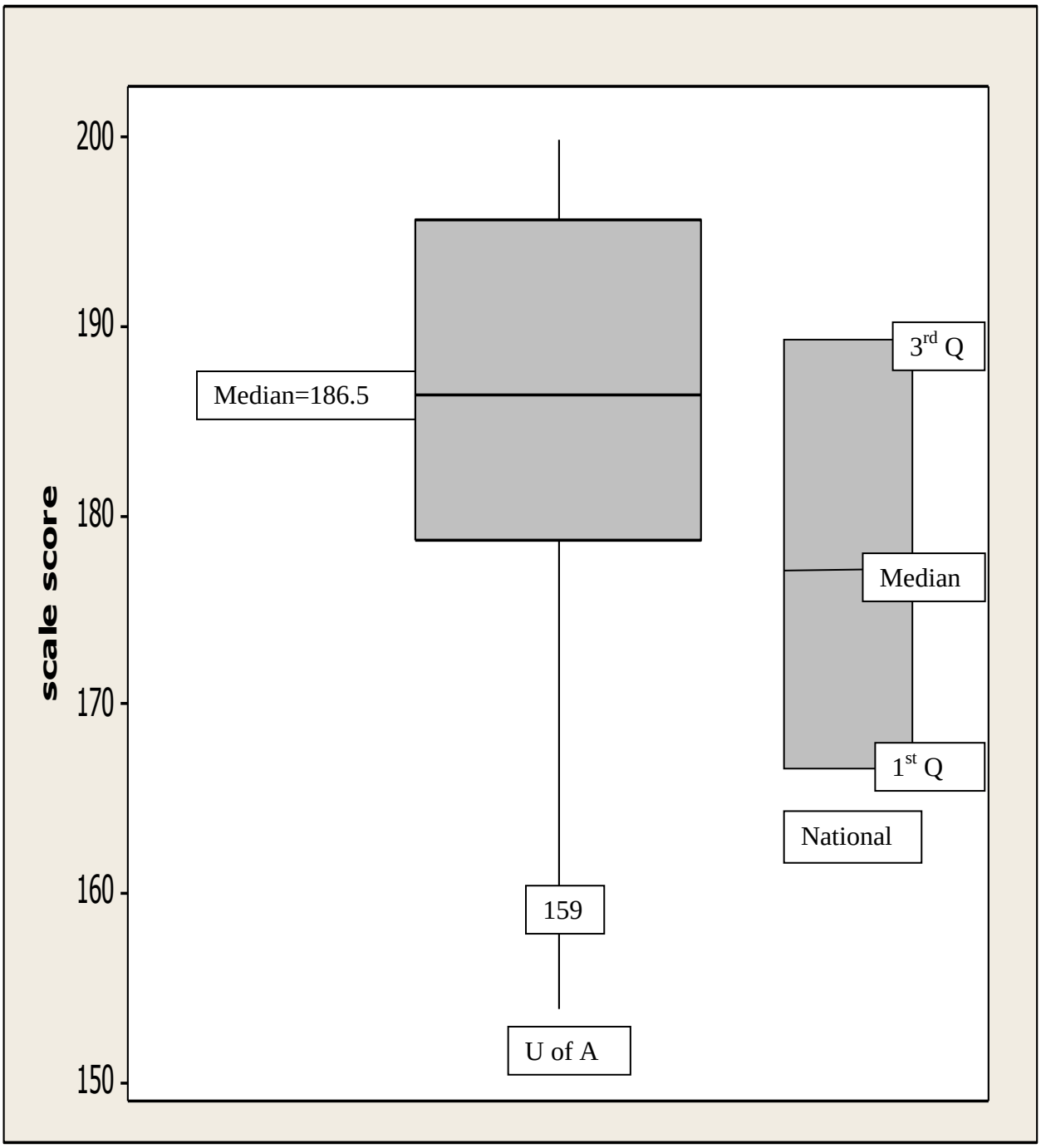


Figure 21. 2008-2010 Arkansas scale scores on the Praxis II "English Language, Literature, and Composition: Content Knowledge" exam. *N* = 56. The interquartile range from 2008-2011 national testers accompanies the Arkansas boxplot. The Arkansas passing score is super-imposed on the U of A boxplot.

Answering the question on how U of A test-takers would have fared in other states, Virginia, Pennsylvania, and Alabama were selected as states with high, middle, and low Praxis passing scores, respectively. Of the U of A testers, 84% would have surpassed the English cut score in Virginia, 96% in Pennsylvania, and 100% in Alabama.

Thirty-eight individuals attempted 40 Praxis II "Mathematics: Content Knowledge" exams between 2008 and 2010 at the U of A. Two test-takers failed to surpass the 125 cut score on their first attempt, but both passed on their second attempt. The passing rate by number of tests attempted was 80% while the pass rate by number of test-takers was 79%. The highest score was 181 while the lowest was 104 on a scoring scale of 100 to 200. The median for U of A test-takers was 144, one point below the national median.

Comparing Arkansas test-takers to the national group, as expected, 23% of University of Arkansas exam scores fell below the first quartile while the third quartile coincided with that of the national distribution. Seven of the 38 test-takers (18%) were awarded the ROE for scoring in the top 15% of national test-takers. The passing score of 125 fell at the 22^{nd} percentile in the distribution of Arkansas scores. Arkansas scores are displayed in Figure 22 with the interquartile range for the distribution of national testers accompanying the boxplot on the right.

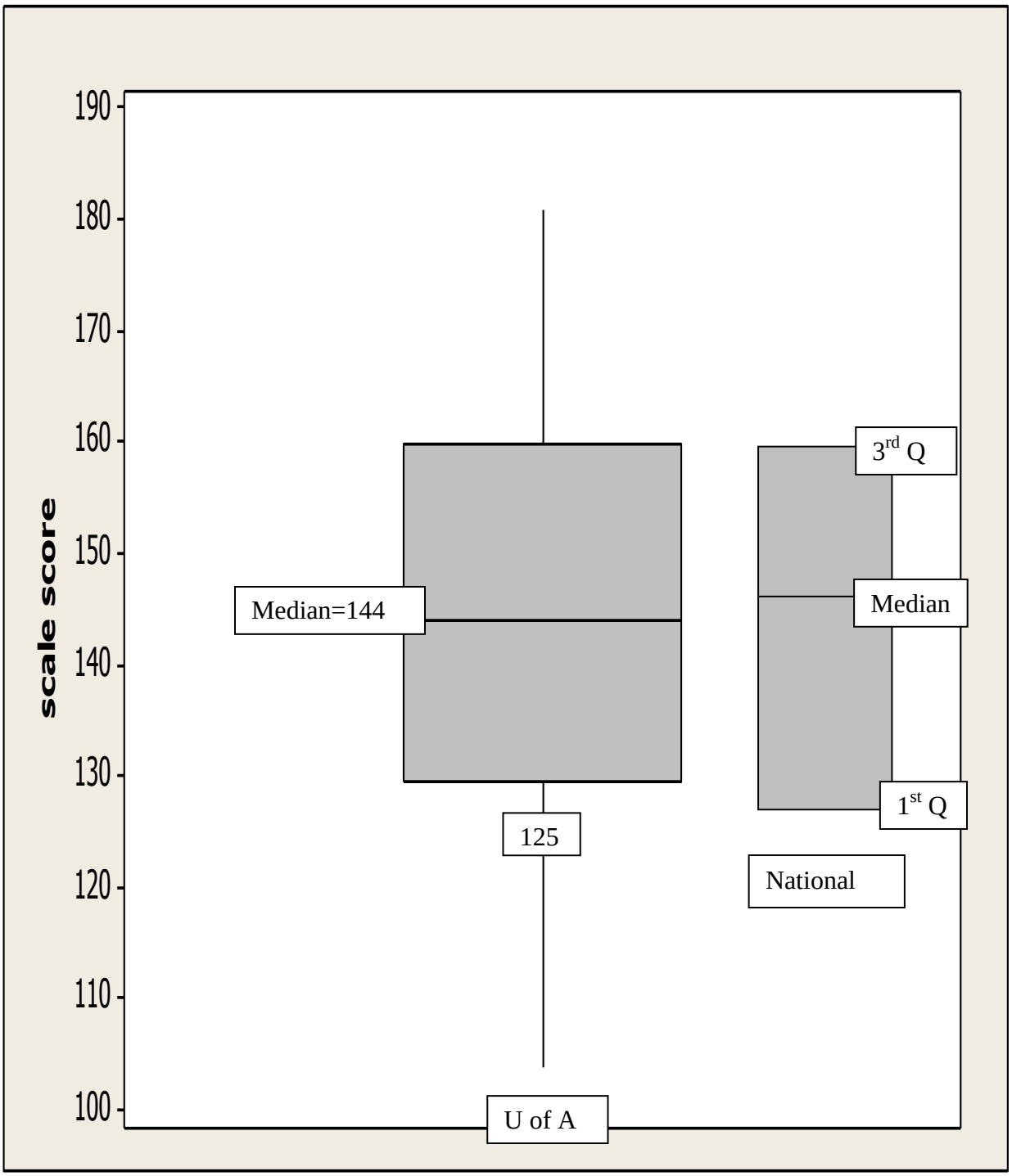


Figure 22. 2008-2010 Arkansas scale scores on the Praxis "Mathematics: Content Knowledge" exam. *N* = 40. The national tester interquartile range from 2007-2010 accompanies the boxplot on the right. The Arkansas passing score is super-imposed on the U of A boxplot.

Half of University of Arkansas test-takers would have surpassed the mathematics content knowledge exam passing score in Virginia. In Pennsylvania, 60% of these testers would have passed while in Alabama, whose passing score is only one point higher than in Arkansas, 79% of test-takers would have passed the exam.

Twenty-nine U of A testers attempted the Praxis II "Biology: Content Knowledge" examination between 2008-2010. No second attempts were made. The highest score achieved on a scale of 100-200 was 189 while the lowest was 130 scale score points. (See Figure 23.) The passing rate within this group of Arkansas testers was 83%. Thirty-four percent of Arkansas test-takers fell in the national first quartile while 55% were at the national median or below. Fourteen percent of Arkansas test-takers scored above the national third quartile. Only two of the 29 scores (7%) were awarded the ROE for scoring in the top 15%, nationally. The passing score in Arkansas of 142 fell at the 19th percentile among Arkansas scores.

In Virginia, with its biology passing score of 155, 59% of U of A biology test-takers would have passed the Praxis II "Biology: Content Knowledge" examination. In Pennsylvania (passing score of 147), 76% of test-takers would have surpassed the cut score. Alabama, utilizing a passing score one point higher than in Arkansas, would have passed 83%, equivalent to that of Arkansas.

Passing the English and biology content knowledge examinations through random guessing was virtually an impossibility though passing the mathematics exam for Arkansas licensure while guessing was 49%.

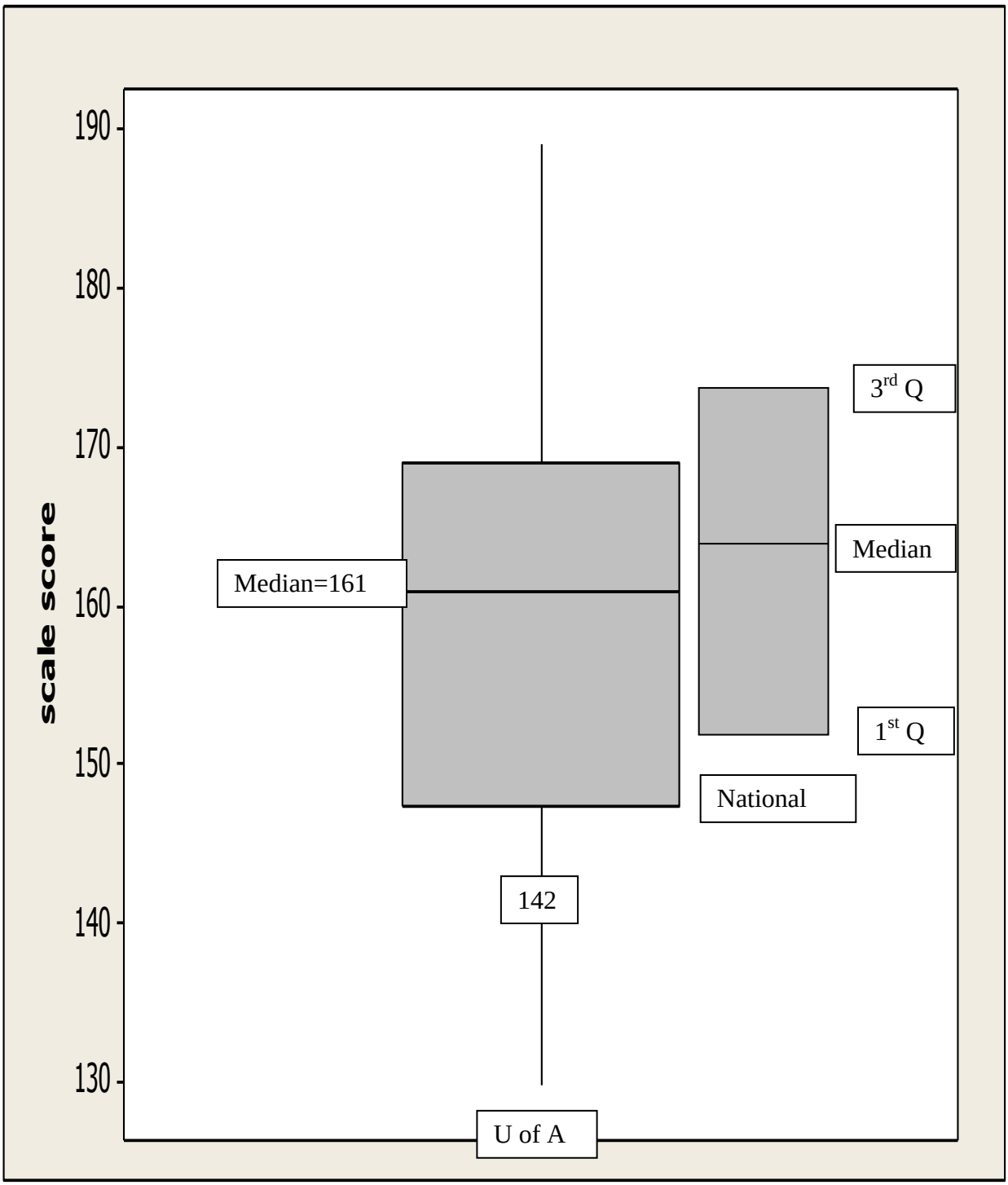


Figure 23. 2008-2010 Arkansas scale scores on the Praxis II "Biology: Content Knowledge" exam. *N* = 29. The national tester IQR from 2007-2010 accompanies the boxplot on the right. The Arkansas passing score is super-imposed on the U of A boxplot.

University of Arkansas Graduate/Enrollment Data

The academic credentials for three U of A graduate groups from years 2005-2008 are displayed in Table 9. The *N* signifies the number of individuals in each group with the associated variable included. The ACT and grade point variables in the table are followed by the average number of core courses completed by individuals in the three groups.

On the ACT composite, the ACT subtests, high school GPA, and core course GPA, the group categorized as prospective Secondary educators scored the highest of the three groups. The Secondary group was followed by the Non-Education group in all seven cases with the Elementary Education group averaging the lowest. The effect size between the Secondary and Elementary groups was noted as large on the ACT variables and moderate on the high school and core course GPAs. The Secondary and Non-Education groups were separated by small effect sizes on the ACT composite, ACT reading, ACT science, high school GPA, and core course GPA with virtually no separation on the ACT mathematics scores. A moderate effect size was detected between the Secondary and Non-Education groups on the ACT English variable. The effect sizes were larger between the Non-Education and Elementary Education groups than between the Secondary and Non-Education groups. The largest effect sizes between the Non-Education and Elementary Education groups were detected on the ACT math and science subtests.

Elementary Education graduates had the highest average number of core courses completed followed by the Non-Education group. The prospective Secondary educators, on the average, attempted the least number of core courses. Again, a large effect size was detected between the Secondary and Elementary Education groups. Moderate effects were revealed in the average number of core courses in the other two combinations.

Table 9

Descriptive Statistics for Elementary Education, Prospective Secondary Educators, and Non-Education Graduates

	Elementary		Secondary		Non-Education	
	N	*M* (*s*)	*N*	*M* (*s*)	*N*	*M* (*s*)
ACT Composite	211	22.70 (3.64)	35	26.11 (4.27)	4,734	25.38 (4.33)
ACT Math	211	21.10 (3.89)	35	24.20 (4.04)	4,734	24.18 (4.86)
ACT English	211	23.66 (4.58)	35	27.40 (5.31)	4,734	25.76 (5.04)
ACT Reading	211	23.50 (4.90)	35	27.17 (5.80)	4,713	26.21 (5.36)
ACT Science	211	22.09 (3.27)	35	25.17 (4.32)	4,713	24.86 (4.30)
High School GPA	227	3.53 (0.44)	35	3.68 (0.48)	4,817	3.62 (0.49)
Core Course GPA	187	2.65 (0.91)	35	2.99 (0.97)	5,065	2.86 (0.95)
Number of Core Courses	187	3.47 (1.71)	35	2.46 (1.54)	5,065	2.97 (1.65)

Correlations between the academic variables are displayed for Elementary Education graduates in Table 10. Correlations are expectedly high between the ACT composite score and subtest scores. Correlations between ACT subtest scores were relatively strong within this group with the strongest relationship being between the English and reading subtests. The weakest relationship was between ACT reading and math scores. The ACT math scores were more closely associated to high school GPA and core course GPA than other subscores. High school GPA and college core course GPA were moderately associated.

Table 10

Correlation Matrix for Academic Variables of Elementary Education Graduates

Variables	ACT	ACT(1)	ACT(2)	ACT(3)	ACT(4)	HS GPA	Core GPA
ACT Comp.	1.00	0.84	0.91	0.88	0.87	0.59	0.42
ACT Math (1)		1.00	0.71	0.59	0.70	0.61	0.43
ACT English (2)			1.00	0.76	0.72	0.56	0.38
ACT Reading (3)				1.00	0.70	0.46	0.33
ACT Science (4)					1.00	0.49	0.34
HS GPA						1.00	0.50
Core GPA							1.00

Within the Elementary Education graduates, 13% of those with reported ACT scores would have required remediation in math based on ACT mathematics subscores of 18 or lower. Ten percent would have required remediation in English, also based on subscores of 18 or less.

Correlations for prospective Secondary education graduates are displayed in Table 11. These 35 graduates were identified through Praxis II content knowledge examination scores with the assumption that attempting the exam indicated a possible career in Secondary education. Six degree fields were discovered for the prospective Secondary group: English, mathematics, science, foreign language, art, and music. Again, the strongest relationship between subtests for this group was for English and reading. The weakest was between English and science. High school GPA was most closely related to the ACT English subscore and least to the college core course GPA. Core course GPA was more closely related to the ACT composite than to any one of the subscores. Again, high school GPA was moderately related to college core course GPA.

Table 11

Correlation Matrix for Academic Variables of Prospective Secondary Education Graduates

Variables	ACT	ACT(1)	ACT(2)	ACT(3)	ACT(4)	HS GPA	Core GPA
ACT Comp.	1.00	0.86	0.88	0.92	0.87	0.56	0.57
ACT Math		1.00	0.77	0.67	0.68	0.56	0.48
ACT English			1.00	0.77	0.62	0.62	0.37
ACT Reading				1.00	0.76	0.53	0.55
ACT Science					1.00	0.24	0.56
HS GPA						1.00	0.50
Core GPA							1.00

The number of Secondary-bound graduates that would have been required to remediate in math or English based on ACT subscores was low. Two students would have required remediation in math and one in English.

The Non-Education group, restated, consisted of all students graduating from colleges other than the COEHP with the prospective Secondary graduates removed as well. Correlations for the academic high school and collegiate variables for the Non-Education group are displayed in Table 12. Amongst the ACT subscores, the strongest relationships were between math and science and English and reading. For this group, the high school GPA was more closely related to the ACT composite than for the other two groups. High school GPA, again, had a moderate association with the college core course GPA.

Table 12

Correlation Matrix for Academic Variables of Non-Education Graduates

Variables	ACT	ACT(1)	ACT(2)	ACT(3)	ACT(4)	HS GPA	Core GPA
ACT Comp.	1.00	0.86	0.90	0.87	0.90	0.62	0.46
ACT Math		1.00	0.69	0.61	0.77	0.61	0.46
ACT English			1.00	0.77	0.72	0.59	0.42
ACT Reading				1.00	0.74	0.50	0.37
ACT Science					1.00	0.53	0.39
HS GPA						1.00	0.53
Core GPA							1.00

The remediation rate for the Non-Education majors in mathematics, based on ACT math scores, was 14%, comparable to that of the Elementary educator group but far greater than that of the prospective Secondary group. The remediation rate for English was 7%, below that of the Elementary Education group but far above the rate of Secondary graduates requiring remediation.

With the disparity between groups in the number of academic variables present in the data, the Elementary and Non-Education group variables were randomly sampled with a sample size of 35. Each academic variable for the two groups was sampled 1,000 times, and means and standard deviations were calculated for each sample. The 1,000 means and standard deviations were averaged and are displayed in Table 13. The Secondary group was not sampled because the group size was 35. Means and standard deviations differed from the population means displayed in Table 9 by minimal amounts. The Secondary group, again, had the highest average for all

academic variables with the Non-Education group following as second. The Elementary academic variables were lower in every case than the other two groups.

Table 13

Descriptive Statistics for Elementary Education, Prospective Secondary Educators, and Non-Education Graduates after Sampling

	Elementary		Secondary*		Non-Education	
	n	*M(s)*	*N*	*M(s)*	*n*	*M(s)*
ACT Composite	35	22.69(3.61)	35	26.11(4.27)	35	25.34(4.29)
ACT Math	35	21.11(3.85)	35	24.20(4.04)	35	24.19(4.82)
ACT English	35	23.65(4.52)	35	27.40(5.31)	35	25.75(4.99)
ACT Reading	35	23.49(4.86)	35	27.17(5.80)	35	26.25(5.33)
ACT Science	35	22.10(3.23)	35	25.17(4.32)	35	24.82(4.24)
High School GPA	35	3.52(0.43)	35	3.68(0.48)	35	3.62(0.49)
Core Course GPA	35	2.65(0.89)	35	2.99(0.97)	35	2.98(0.73)

Note. * Secondary not sampled. Elementary and Non-Education groups sampled with *n*=35, 1000 samples.

After sampling, large effect sizes ($\alpha = 0.05$, power = 0.95) were detected between the lowest, the Elementary graduates, and the highest, the prospective Secondary graduates, on the ACT composite ($d = 0.86$), ACT math ($d = 0.79$), ACT English ($d = 0.77$), ACT reading ($d = 0.69$), and ACT science ($d = 0.81$). Between the highest and lowest groups, small effect sizes were found for high school GPA and core course GPA, $d = 0.33$ and 0.27, respectively. Sufficient power to detect a small effect size was lacking.

Model of Effective Teachers

To briefly restate the method, student gains on the Arkansas Augmented Benchmark examination from one school year to the next were calculated based on an improvement gains model employed by the ADE. Tailoring the model for the present application, the improvement gains in English and/or mathematics were calculated from the 2009-2010 examination to the 2010-2011 examination. Only classrooms of teachers with 1-5 years of total teaching experience in grades 4-8 were identified for analysis. Henceforward, the term "classroom" refers to all students assigned to that teacher regardless of section.

The four Benchmark performance levels reported for students, Below Basic, Basic, Proficient, and Advanced, were bifurcated in the model (emulating ADE subcategories) to have high and low subcategories. Students received positive scores for moving up subcategories, negative scores for moving down, or zero where the level stayed constant. Students that scored in the highest level for the two years, high Advanced, also received a positive score. Improvement gains were calculated separately for English and mathematics and were averaged together only for classrooms where the teacher taught both math and English (4^{th} grade). Otherwise, gains were calculated for only English or math, depending on the teacher's content area.

Teacher content knowledge licensure scaled scores were normalized using current ETS Praxis II data, and a model was created predicting classroom gains utilizing *z*-scores of licensure exams and total years of teaching experience.

Classroom improvement gains were calculated for 24 Elementary, Middle school, and Junior High teachers with 1-5 years of teaching experience. Descriptive statistics for the improvement gains achieved by students of these teachers of English and/or mathematics are displayed in Table 14.

Table 14

Descriptive Statistics for Classroom Improvement Gain for Teachers of English and/or Mathematics with 1-5 years of Teaching Experience

	Student Gains Mean	*s*	Number of Students	Number of Teachers	Mean years of Teaching Experience
Reading/Math	0.09	0.57	66	3	1.33
English	0.10	0.53	505	13	3.50
Math	0.17	0.56	635	8	3.11

Note. 1-5 years of teaching experience at the end of the 2010-2011 school year.

Table 15 displays the correlation matrix for the variables in the model. The classroom gains in English and mathematics revealed only a marginal association with Praxis II content knowledge examination and teacher experience.

Table 15

Correlation Matrix for Variables in the Teacher Effectiveness Model

Variables	Y	X_1	X_2
Y Classroom Gains	1.00		
X_1 Praxis II Content Knowledge Scores	0.14	1.00	
X_2 Total Years of Teaching Experience	-0.07	-0.37	1.00

Yielding no support for Hypothesis IV, the regression model proved non-significant ($F(2,21) = 0.20$, $p = 0.82$) with neither predictor accounting for a significant portion of the variance in gains. The resulting equation was:

$$\text{Gains\_index} = 0.191 + 0.0368 * \text{Praxis\_II}_z - 0.0031 * \text{Tot\_teaching\_exp} \quad (2)$$

Two outliers were detected with standardized residuals greater than |2|. Both were retained in analysis because they contained the maximum and minimum classroom gains thus expanding the diversity of the dependent variable. A meager 1.9% of variance was explained by the independent variables.

To further analyze gains on the Augmented Benchmark examination, *z*-scores were calculated for students in grades 4-8 in the classrooms of teachers with 1 – 5 years of teaching experience. Data from 2010 and 2011 were utilized for the students. As with the model predicting proficiency level gains, only math scores were used for classrooms of math teachers and literacy scores for classrooms of literacy teachers. On the Elementary level, student math and literacy *z*-score gains were averaged where the teachers taught both subjects. The dependent variable in the previous model was replaced by the *z*-score gains while the independent variables, Praxis II content knowledge *z*-scores and total years of teaching experience, were again the independent variables in the model. This further refinement of the data did not produce significant results ($F(2,21) = 0.95$, $p = 0.40$) although the variability in gains accounted for by the independent variables rose ($R^2 = 0.083$). The resulting equation of the model using z-scores gains was:

$$\text{Gains\_index} = 0.1484 + 0.072 * \text{Praxis\_II}_z - 0.00144 * \text{Tot\_teaching\_exp} \quad (3)$$

Of the 12 English/literacy teachers, ten classroom averages were positive, indicating that students, on the average, made progress under the tutelage of these teachers. Two English teachers had negative classroom improvement gains. The negative values indicated that those student groups had not progressed on the Augmented Benchmark thus not meeting standard improvement. For mathematics, all of the nine classrooms scored positively on the gains index.

Three of the classrooms were from Elementary schools, grade 4, where the teachers taught both English and mathematics. The English and math gains were averaged for these teachers before entering the model. Viewed separately, for Elementary, the English gains were positive. Of the three classrooms, two had positive math gains while one had negative gains.

Figure 24 displays the frequencies of the levels of Improvement Gain for the 24 classrooms. Only two of the 24 averaged below Meeting Standards. Both were in Middle or Junior High school English. As was stated, one of the Elementary classrooms showed a lack of improvement in mathematics but when averaged with reading, gains proved positive. Further exploration revealed that removing the two classrooms with negative gains from regression analysis improved the R^2 to 17.8%.

Dividing the 24 classrooms into two groups dependent on the level of classroom gains, Praxis II content knowledge score averages are displayed in Table 16. The low group included classrooms ‘in need of immediate improvement’ and those ‘meeting standards.’ The high group were those at levels 4 and 5. Means were not significantly different ($t(22) = -0.96$, $p = 0.35$). The power estimate to find a medium effect ($d = 0.38$) between the two groups with a sample size of 35 was 0.15.

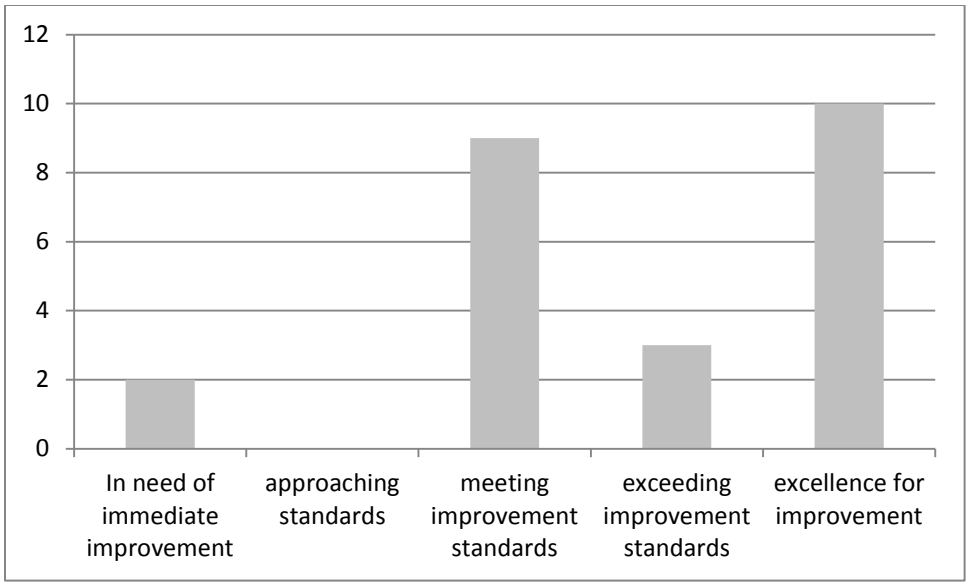


Figure 24. Frequencies of Improvement Gains levels for teachers from a local district. $n = 24$.

Table 16

Praxis II Content Knowledge Exam Scores for Classrooms Grouped by Student Gains

Classroom Gains	Praxis II Mean	*s*	*n*
Low	-0.005	0.638	11
High	0.257	0.684	13

To explore the effect of total years of teaching experience on student gains, the 24 classrooms were divided into three groups, 1-2 years, 3 years, and 4-5 years. Results are displayed in Table 17. A significant difference between means was not observed ($F(2,21) = 0.12$, $p = 0.89$). Teachers with 1-2 years of total teaching experience had average gains equivalent to teachers with 4-5 years of experience.

Table 17

Classrooms Grouped by Total Years of Teaching Experience and Student Gains

Years	Student Improvement Gains	*s*	*n*
1-2	0.20	0.11	7
3	0.16	0.14	8
4-5	0.20	0.27	9

To further explore the high and low ends of the spectrum, the 24 classrooms were divided into two groups dependent on Praxis II content knowledge *z*-scores. Natural gaps in scores conveniently placed 12 in each group. The lower group spanned *z*-scores from -1.146 to 0.197 while the higher group included *z*-scores from 0.378 to 1.303. Classroom gains calculated for the two groups differed only slightly ($t(22) = -0.32$, $p = 0.75$). (See Table 18.) The power to detect the small effect size observed between the two groups was less than 6%.

Table 18

Classrooms Grouped by Praxis II Content Knowledge Scores

Praxis II	Classroom Gains	*s*	*n*
Low	0.1734	0.1947	12
High	0.1986	0.1904	12

V. DISCUSSION

In early 2012, No Child Left Behind (ESEA) is still in the process of being reauthorized as it has been since 2007. Though the reauthorization has bipartisan support, the expansiveness of the bill has caused idealogical divisions. Some of the common themes that have remained constant through numerous rewrites are college and career readiness, teacher evaluations based on student achievement, and attention to the lowest 5% of schools ("Elementary & Secondary," 2011). The highly qualified teacher provision is not expressly noted as it was in NCLB. But, the reauthorization does spell out the need for the recruitment of academically high-achieving teachers from collegians, graduates, and professionals, especially in the high-needs areas of students with disabilities, English as a Second Language, mathematics, and science (Klein, 2011).

The present study was an effort to explore the successes and failings of the highly qualified provisions via graphs, tables, statistical calculations, and analytical models. SEA passing scores for teacher licensure tests were examined for frequently utilized content knowledge exams under the supposition that cut scores are set too low, including those of Arkansas. Arkansas passing scores and educator achievement were explored by means of Praxis scores of University of Arkansas (U of A) test-takers. Academic data for future educators that graduated from the U of A were compared to their peers in other fields in an effort to reveal differences that have ultimately led to lowered expectations for teachers. Finally, actual teacher data from a local school district were utilized to explore the connection between educator achievement on content knowledge licensure exams, experience, and student achievement. Inferences, tapping the four levels of data, are made about passing scores and the efficacy of employing content knowledge licensure exams to identify highly qualified teachers.

National Passing Scores and Passing Rates

Hypothesis I contended that cut scores for teacher licensing examinations, in general, were not set high enough to distinguish highly qualified teachers from "just adequate" or even ineffective teachers on content knowledge. Teacher content knowledge, noted as key to meeting the NCLB requirements and elevating student achievement, is assessed through Praxis and state-developed licensure exams in all states and jurisdictions. States have defined HQT through the employed measures and set a diverse array of passing scores that have become the reference points within their respective states. The examined assessments are required at the beginning of the licensure process and, of high import, they serve as the *final* test of content knowledge in teachers' careers. Revisiting the visual displays of passing scores and passing rates on content knowledge and pedagogy examinations, it is evident that standards are set much below the national scoring trends of testers. A nation striving to train all students to be college and career ready necessitates a higher bar for teacher recommendation.

Elementary education examinations. Though the exams designed for the Secondary level offer the purest form of testing content knowledge, assessments to matriculate or license Elementary educators test only a baseline of content knowledge. The Praxis I math, reading, and writing subtests are often used as prerequisites for entering Education degree programs. The Praxis I "Pre-Professional Skills Test" was noted to be on the high school level or below by authors Mitchell and Barth (1999) with 2/3 of mathematics items on the Middle school level. No subtest was judged to be of the difficulty level of the ACT or SAT, both determinants of college admittance. Used pervasively as a screener for students matriculating into Colleges of Education, the Praxis I is also used as a requirement in many states for teacher licensure.

The Praxis I allows aspiring teachers to enter the field at an unquestionably low level. The median score of the national pool of testers allows a candidate eligibility for program entry or licensure in *all* of the states utilizing this exam with the exception of Virginia. The subtest passing scores in half of the 26 states utilizing this series allow students to move ahead in the licensure process by attaining approximately half of the points possible. Seven SEAs employed passing scores at or below the 1st quartile of national test scores barring only the lowest performers from entering the field. Boxplots revealed that actual educator achievement and present standards are grossly mismatched. Further emphasizing this, the top quarter of the national pool scored at or near the maximum score.

These low standards assume that the balance of the content knowledge necessary to be a highly qualified teacher to Elementary children will be acquired at some point in a teacher's career. The paradox lies in the fact that the knowledge tested by the Praxis I series should have been acquired in high school or certainly the first two years of college when most core requirements are completed. If this baseline of content knowledge has not been attained by this point in future teachers' educational careers, where is the accountability that it will be?

The other assessment explored on the Elementary level was the Praxis II "Elementary Education: Content Knowledge" examination. This exam which measures knowledge in the four core areas was employed by 22 SEAS. Arkansas, alternately, employs the "Early Childhood: Content Knowledge" exam. The level of scoring by prospective Elementary teachers, nationally, on this exam was relatively high with half of testers scoring over 60% of the points possible. But, the expectations by SEAs of Elementary teachers were well below the actual trends of national testers. All SEAs (except one) used passing scores below the first quartile of the national pool of testers thus making ineligible only the lowest scoring testers. Of the Praxis II content knowledge

exams investigated, only the biology content knowledge exam for Secondary licensure had such generally low passing scores as compared to the national pool of testers.

Middle school and secondary examinations. The most frequently utilized examinations for Middle school licensure were the Praxis II "Middle School English Language Arts" exam, the "Middle School Mathematics" exam, and the "Middle School Science" exam. With few exceptions, SEAs employed cut scores at or below the median score of the national pool of testers. Of notable departure from the national trend of testers were the scores for the English examination where half of testers attained at least 70% of the points possible. But, 23 of the 28 states utilizing this exam allowed the bottom quarter of testers to pass, scores that if translated to a letter grade would have received an "F." National scoring trends for "Middle School Mathematics" and "Middle School Science" were not as high though a majority of testers scored at least half the points possible. Juxtaposed against these national trends were several SEA passing scores that accepted candidates scoring as few as 35% of the points possible.

The one pedagogy examination focused on for the Middle and Secondary levels was the Praxis II "Principles of Learning and Teaching: Grades 7-12." The exam was utilized by 17 SEAs as a requirement for Middle or Secondary licensure. Nationally, the distribution of test scores revealed high achievement with half of testers scoring at least 70% of the points possible. Counter to national trends, all SEA passing scores with the exception of one were revealed to be below the national first quartile. This dichotomy between achievement and expectation ensures that the teaching ranks include some of the lowest scoring testers on subject matter that was central to their Education degrees.

Key to the No Child Left Behind legislation was the highly qualified teacher requirement of demonstrable content knowledge in subjects taught. Content knowledge examinations, developed

by ETS or by the states, have been utilized by SEAs for teacher licensure and, in the last decade, used to support the K-12 highly qualified mandate. No examinations are more pointedly used for this purpose than the Praxis II content knowledge examinations for the Secondary level. Most frequently used were the Praxis II "English Language, Literature, and Composition: Content Knowledge," the "Mathematics: Content Knowledge," and the "Biology: Content Knowledge" examinations.

The Secondary content knowledge exams were passed with cut scores generally below the median of national testers. The only exceptions where Colorado, Virginia, and Alaska that used passing scores at or above the median of national testers on the Praxis II "Mathematics: Content Knowledge" exam. Colorado, utilizing the highest passing score on the math exam, employed a passing score at almost the national third quartile though it should be noted that the score represented the attainment of only 55% of the points possible. Thirty-one of the 34 SEAs employing the Praxis II math examination required attainment of less than 45% of the points possible. Further emphasizing the minimal standard for passing, seven of the passing scores were set at such a low level that candidates had almost a 50/50 chance or better of passing by random guessing.

Average achievement, nationally, on the math exam was disappointingly low with half of testers scoring below 45% of the points possible. The low national scores on the Praxis II math exam raise further concern as test difficulty for this exam was noted to be generally below college level (Mitchell & Barth, 1999). Assuming that a majority of testers had attained a mathematics degree, a disconnect surfaces between test scores and content knowledge. The low national scores from the Praxis II math exam add weight to the assertions of Ingersoll (2006) and Akiba, LeTendre, and Scribner (2007) that U.S. teachers of mathematics did not have the

credentials of foreign math teachers. Affecting both math and science, Schmidt et al. (2007) specified that Middle school math teachers received less instruction in several areas than their foreign colleagues. Inferences were made by the authors that this was the cause of American students' mediocre performance on the TIMSS and PISA.

Though the national trend on the Praxis II math examination was disappointingly low, it should not be disregarded that ¼ of attempters scored relatively high. The direction that the ESEA reauthorization has taken is toward the hiring of higher caliber teachers by recruitment. Synchronizing passing scores with the scores achieved by the highest level of candidates would fulfill one facet of this initiative. Pronounced is the need for stiffening selection requirements in Secondary mathematics.

As on the Middle level, testers on the Praxis II "English Language, Literature, and Composition: Content Knowledge" exam revealed high scores with half of testers attaining 70% of the points or more. These testers would have fulfilled the testing requirement in all states utilizing the English content knowledge exam. Contra to the national scoring trends, 80% of the states utilizing this exam accepted passing scores from the lowest quartile.

National data on the "Biology: Content Knowledge" exam also revealed testers outperforming passing scores by large margins. Again, all passing scores were below the national median with the highest passing score requiring attainment of less than 60% of the points possible. As with the English examination, over 80% of SEAs using this exam passed candidates with biology scores in the lowest national quartile.

SEA passing rates. As support for Hypothesis I that passing scores were set too low by SEAs to differentiate highly qualified teachers from those less so, state passing rates were reported and correlated with passing scores. The passing rates in English, mathematics, and biology, as

reported on the Title II website, were generally very high with many SEAs reporting 100% passing rates on these Praxis II content knowledge exams. The lowest passing rates on the three exams were no lower than 80%. For SEAs reporting passing rates summarizing *all* licensure exams attempted, seven reported perfect passing rates on all exams.

The passing rates when related to SEA passing scores revealed some association. Rates on the Praxis II English content knowledge examination were correlated inversely with passing scores to a moderate degree. Alternately, the results in mathematics and science supported Hypothesis I that there was little or no relationship between passing rates and scores thus reinforcing Secretary Spelling's (2005) statement questioning the relationship. Understanding that limited ranges affected the correlations, the results attained in two out of three of the exams studied were congruous with the contention that passing scores were not being used effectively as a determinant of content knowledge but possibly were used as a way to elevate passing rates.

Possible solutions to non-differentiating passing scores. On the Elementary, Middle, and Secondary levels, the question arises – why are passing scores set so low when passing rates are exceedingly high and national trends are revealed to be far above expectations? Referred to as a minimal expectation by ETS (2006), the examination passing scores reflect only a baseline of content knowledge as related by Mitchell and Barth (1999). This early snapshot of content knowledge deteriorates further as years separate the once content-immersed teachers from their favored content degrees. Content knowledge is supplanted by years of curricular scope and sequence with few opportunities for replenishing levels of pure content knowledge.

In light of the higher scores of Praxis I and II national testers on licensure examinations as compared to SEA passing scores, different solutions might be offered. Supposing that licensure exams provide evidence of content knowledge when cut scores are set at appropriate levels,

states might raise passing scores periodically to be closer in accordance to national distributions of scores. With teacher demand high in certain subject areas such as mathematics, science, special education, and English as a Second Language ("Teacher Shortage Areas," 2011), setting cut scores at the first quartile would eliminate the lowest quarter of aspirants from joining those fields while allowing ¾ to fill these the most needy areas within the teaching ranks. In teaching fields where supply is greater than demand, like English and Elementary Education, then passing scores could be elevated toward the median. Stotsky reflected on the 20,000 teachers licensed in one year in Pennsylvania that were vying for 2,000 teaching positions (Pearce, October 31, 2011). Ratcheting up passing scores would still provide the necessary educators while setting a higher content knowledge standard for teachers of content areas.

Passing rate as an indicator of Education program success remains tied to institutions of higher learning through Title II reporting. This conflict of interest promotes higher passing rates through lowered passing scores. A reprieve from current regulation would allow passing scores to be elevated to reflect true levels of content knowledge. Passing rates would no doubt suffer but would ultimately increase to 100% as they did in Virginia, a state that boldly raised Praxis I passing scores.

Nationally standardizing the content area requirements of Elementary, Middle, or Secondary teachers is not espoused here though one solution might be tied to Title II or state funding for teacher preparation programs. With the new requirements of the Common Core State Standards (CCSS) ("In the States," 2011), the new depth of knowledge required of teachers will be vast and at lower grade levels than previously required. The pressure to train American students to be college and career ready and compete on an international level will necessitate teachers at lower grades having more specific content knowledge. A solution for raising the standards to meet the

needs of teaching the CCSS might be funding tied to specialty certifications for mathematics and literacy within Elementary Education programs.

Arkansas Passing Scores and U of A Passing Rates

Elementary. Scores for Praxis I "Pre-Professional Skills Test" subscores in mathematics, reading, and writing were analyzed for University of Arkansas test-takers from school years 2008 - 2010. Passing rates for the subtests were strong, and the distributions of U of A testers were similar in shape and range to the national distributions substantiating one of the assertions surrounding Hypothesis II. Juxtaposed against the distributional data, Arkansas passing scores are set at levels as much as six points below the national median of testers, a substantial margin for an exam with only 40 scale score points possible. All three Arkansas passing scores fell at or below the first quartile of national scores.

As was expressed in the national analysis, assessing this baseline of knowledge with the Praxis I often coincided with entry into Education programs as it does at the College of Education and Health Professions at the University of Arkansas. At the U of A, the Praxis I series must be passed before upper-level Education courses can be attempted ("Childhood," 2011). The attainment of approximately half the points possible on a test noted at the Middle level is unfathomable as a true gauge of content knowledge, especially in light of Secretary Spelling's (2006) issuance of "rigor" as a testing requirement for highly qualified Elementary educators. And, causing more concern, the exam coincides with the completion of core college requirements when the expectation is that content knowledge would be at its pinnacle rather than diminished by elapsed time.

In decisions on licensure and, thus, hiring of teachers, it must be noted that Elementary teachers are not in short supply in Arkansas ("Critical," 2011). An opportunity exists for the

Arkansas Department of Education to raise the licensure passing scores for the Praxis I. A lowered expectation for Arkansas Elementary teachers is not justified by levels of state scoring.

First raising passing scores for the Praxis I to *at least* the national first quartile would encourage a higher basic level of content knowledge now. In light of students' temporal proximity to college core courses in mathematics, reading, and writing, passing scores closer to the national medians should be considered by the state agency. Data from this study indicates that Arkansas passing scores prevent only the lowest quarter of aspirants from freely passing this requirement though a higher standard in the Common Core era would be advisable. By tying passing scores to a national metric, the Education programs, the teaching profession, and, ultimately, Arkansas students would be better-served.

Secondary. Achievement revealed for the University of Arkansas testers on the Praxis II "English Language, Literature, and Composition: Content Knowledge" examination was extremely high with 96% passing the exam in the 2008-2010 timeframe. Considerably higher than national scores, almost half of U of A English scores resided above the national third quartile. Further, three-quarters of Arkansas testers scored 80% of the points possible or better on this exam. With a high pass rate and 43% of testers being awarded the Recognition of Excellence on this examination, the passing score, currently at the 5^{th} percentile in the distribution of Arkansas scores, could be elevated from its present score to at least the national median and still only eliminate the first quartile of English teachers from the state pool.

The University of Arkansas Praxis II "Mathematics: Content Knowledge" exam scores more closely mirrored the generally low distribution of national testers. Educator achievement on this exam left questions beyond those posed on the national level. Why do half of prospective mathematics teachers score, at the most, 44% of the points possible? As stated by ETS, only 12%

of the exam tests the Calculus, 8% Discrete Mathematics, and 12% Data Analysis and Statistics ("Mathematics," 2011). Certainly these courses are part of a mathematics degree program but the balance of the exam would have been learned in high school or in college core courses. The expectation for U of A, M.A.T. students, those seeking a master's degree in Secondary education while holding a content area degree, is passing the examination before entering the program ("Master of Arts," 2011). Again, mathematics knowledge should be at its height at this point in time with all degree courses completed. Highly qualified expectations for beginning mathematics teachers would certainly be above a score residing in the national first quartile.

The Praxis II "Biology: Content Knowledge" scores for U of A testers, like those of mathematics, were similar to the national distribution for this examination. Though the national first and third quartiles were higher than those for the scant 29 University of Arkansas testers, the medians differed by only one point. Half of the Arkansas testers scored more than 60% of the possible points and 83% passed. But, an Arkansas biology passing score positioned in the first quartile of this U of A testing group is not reflective of the achievement offered by and expected from this group of teachers. A goal of raising the passing score from its current level to the national first quartile would serve to raise the entry-level knowledge base for new biology or science teachers toward a truly highly qualified status.

Critical shortage areas in Arkansas can and should affect the licensure and hiring of teachers in the noted fields while not reversing the highly qualified standards. For 2011-2012, English, at the high school level, is not identified as a licensure shortage area ("Critical," 2011). The USDOE lists teacher shortage areas for states from 1990-1991 through 2010-2011 ("Teacher Shortage Areas," 2011). Within the timeframe, high school English was never listed as a teacher shortage area in Arkansas. Again, utilizing at least the national median as a passing score in

Arkansas can be justified if the caliber of all prospective English teachers is not dissimilar to those analyzed in this study. Raising the cut scores from a score presently at the 5th percentile toward the national median would insure a higher baseline of content knowledge at the beginning of an English teacher's career. As a very pertinent aside, at the Middle School level, English, as well as the other core subjects are listed as licensure shortage areas. The University of Arkansas discontinued its Middle School degree program and replaced it with an endorsement for grades 5 and 6.

Mathematics and science, on the other hand, are listed as shortage areas in Arkansas for grades 7-12 for the 2011-2012 school year ("Critical," 2011). Both have been listed as teacher shortage areas in Arkansas every year since 1990-1991 ("Teacher Shortage Areas," 2011). Raising passing scores for licensure may have the undesirable consequences of decreasing the pool even further. Admittedly, the standards setting process lacks reliability in spite of input from a panel of educators and ETS staff (Tannenbaum, 2011). But, the process could be improved and simplified by tying passing scores to a metric. The ADE, with its responsibility to set a content knowledge standard for teachers reflective of college and career readiness goals, could decide to only accept into the profession educators scoring above the national first quartile on the math and biology exams.

Distributions of University of Arkansas and national testers were not dissimilar on the Praxis II mathematics and biology exams. Expectations any lower than the first quartile of either, as are presently employed, would be unjustified even in light of supply and demand. Though still seemingly below what would be expected in the Common Core era, the probability of getting a truly highly qualified teacher in math and science would be enhanced with elevated cut scores.

With these changes, only the lowest quarter of testers would be affected, and they would have the opportunity to gain proficiency in the content area before retesting.

Hypothesis II, the contention that Arkansas passing scores do not distinguish highly qualified teachers from non-highly qualified teacher in content areas, was upheld by the U of A Praxis data. U of A scores and passing rates were high thus answering the question addressed by the title of this study with a distinct "no." In the cases of Elementary Education, mathematics, and biology, Arkansas median scores almost coincided with national medians. U of A English scores were far higher than the pool of national testers. No evidence was revealed from this data that lowered expectations manifested through licensure exam passing scores would have been necessitated.

University of Arkansas Elementary Education, Secondary, and Non-Education Graduates

Having explored passing scores both for SEAs and Arkansas, specifically, the inference drawn is that passing scores are set too low to distinguish highly qualified teachers from those less so. These lowered expectations of teacher ability to pass content knowledge and pedagogy licensure examinations have in some cases been affected by supply and demand. In others, such as High School English, neither supply and demand nor scoring data support such lowered expectations. Delving into the basis for lowered expectations of educators, Hypothesis III explored the credentials of three graduate groups, Elementary Education, Secondary, and Non-Education, as students of the groups matriculated into the University of Arkansas and completed their core coursework.

Graduate groups were compared on ACT composite, the ACT subscores, high school GPA, and core course GPA. On all variables, the Elementary Education graduates scored the lowest, on the average, and the Secondary graduates the highest with the Non-Education graduates

scoring, in most cases, only slightly below the Secondary group. Large effect sizes were detected between the Elementary and Secondary groups on the ACT variables and small on the GPAs.

These results supported Hypothesis III that the Elementary Education majors enter college with lower credentials than their peers in other fields of study. As conjectured, the content conscious, Secondary-bound group revealed the strongest average scores followed by the Non-Education group. Highly qualified status can be supported with results such as those revealed for the Secondary group but not for the Elementary Education group as their academic credentials before and during college were notably lower. Disappointing, the ACT subtest averages in mathematics and science for the Elementary Education group fell below the ACT benchmark scores utilized by ACT to predict achievement in a college algebra and biology class. By contrast, the ACT subtest averages for the Secondary and Non-Education groups surpassed the ACT benchmark scores on all four of the subtests. On the core course variable, the Elementary Education group averaged a "C" while the Secondary and Non-Education groups scored closer to a "B" level.

These early measures of content knowledge are an indication that the students entering the Elementary Education field at the U of A do have lower academic credentials. Disconcerting is that the foundation these teachers attained in content knowledge occurred in high school and during the first two years of college just as it did for the other two groups. But, Elementary Education graduates failed to measure up with equivalent levels of achievement. As a result, program inductees have the furthest to go in attaining the general content knowledge assumed of college graduates. And, exacerbating the problem, state passing scores on Elementary licensure exams are set at a minimal level masking actual student deficiencies. Most disquieting is that the

academic credentials and exams are the *only* safeguards in place to judge the content knowledge for this group.

Of concern also were the remediation rates. Based on ACT math and English subscores, remediation rates followed a similar pattern. Elementary Education and Non-Education graduates had similar remediation rates in mathematics and English while the Secondary group remediated less than half the proportions. Part of the disparity in remediation rates could be credited to the chosen majors of the Secondary group. With mathematics and English being two of the content areas sought and perhaps taught by this group, it would be understandable that ACT scores would reflect a higher level of achievement and thus produce reduced remediation rates.

Analysis and conclusions based on these U of A academic data can only be viewed as a pilot. Group comparisons using the academic variables are troubled by the identification of the Secondary group. With no Education degree program on the undergraduate level to pinpoint these students, an indirect method using Praxis II content area scores was used. The supposition was that a student with a degree outside of Education who took one of the Praxis II content knowledge exams was strongly considering Secondary education. Only 35 graduates across six fields of study were identified within the timeframe, and there were no assurances that the 35 would actually enter the teaching field. Though the Elementary Education and Non-Education groups were sampled with a sample size equivalent to that of the Secondary group, a more accurate design would identify a larger group of actual Secondary teachers on a more expansive timeframe and utilize their individual high school and college academic data. Then, the groups could be compared with or without sampling. Another advantage to larger numbers would be examining the profiles of teachers within content areas separately.

Also needing further refinement were core course GPAs which were affected by high school concurrent coursework, Advanced Placement credit, and credit through the College Level Examination Program (CLEP). Although all students have the opportunity to partake of these opportunities for early and less expensive college credit, it cannot be assumed necessarily that equivalent proportions of students within the groups took advantage of those opportunities. But, students whose aptitudes pointed toward a possible career in Secondary mathematics or English education, for example, would most likely be on the" fast track" in their favored subjects allowing them to take college coursework while in high school. It would not be expected that a prospective Secondary mathematics teacher would be registered for College Algebra at the U of A nor would an English major be taking the non-honors Composition I while on campus. Having completed subject area coursework before college would have, by default, left only grades from other core courses on college transcripts, those assumed to be outside of students' favored subjects. Even with entry level courses in their prospective fields not appearing on transcripts as core courses, the Secondary group still outscored the Elementary Education and Non-Education groups on the core course GPA.

A more definitive way to compare groups would have included core course grades from early credit as well as college credit. In addition, assessing group differences on English or mathematics courses alone as opposed to using varying numbers and types of core courses, would have supplied more credible information about group achievement.

Relative to Hypothesis III, the question was asked, "at what point did the lowered expectation of teachers begin?" In light of U of A performance comparable to the national pool on most licensure exams, it must be surmised that lowered expectations of educators started at the college level where applicants freely enter Education programs that require little selectivity. Further, will

it be sufficient for teachers to attain core content knowledge in college at only a "C" level? Raising program entry requirements on admittance credentials and core GPAs would promote a higher level of academic prowess from candidates, especially necessary in the Common Core era where content knowledge will be the key to educating students. Educators graduating from the COEHP's Early Childhood and Elementary Education programs will be particularly challenged as they will be teaching content reserved in the past for higher grades.

As was stated, Elementary education is not a critical shortage area in Arkansas. Program selectivity could be addressed to intake students with higher high school, core, and academic credentials. In Finland, ranked first in student reading and math scores internationally, only one in eight applicants to teaching programs is accepted. The smartest students desire to become teachers there and are offered the respect that Americans would bestow on physicians ("Finland is #1!," 2011). On the other hand, American students with plans to enter the teaching field were revealed as having among the lowest scores on college entrance examinations.

Part of the solution to insuring higher levels of content knowledge for educators would befall the state agency and school districts through professional development. The 60 hours of professional development presently required of teachers, annually, must include six technology hours, two parent involvement hours, and Arkansas History for certain grades. The other hours are decided by teachers with principal or district approval (T. Gibson, personal communication, November 10, 2011). Professional development hours could be reorganized to not only support pedagogy, data analysis, and professional learning communities but also to replenish and expand content knowledge. Presently it is only assumed (with little basis in fact) that new or experienced teachers have the level of content knowledge necessary to accomplish the college and career readiness goals. Less pedagogy and more teacher education in the content areas, as was stated by

Wenglinsky (2000), would support teacher efforts to redirect student achievement toward internationally competitive performance as this new era in education begins.

Model for Effective Teachers

As a final piece of the puzzle exploring teacher quality in the No Child Left Behind era, student achievement and teacher data from a local district were utilized in models focusing on effective teaching. Goldhaber (2007) found support for a relationship between teacher licensure scores and student achievement though was tentative in his interpretation. Darling-Hammond (2010) reported that differences of one point on a four-point scale on a state-developed teacher licensure test translated to gains of 40% or more in student reading achievement. Alternately, she disclosed that Praxis scores were not significantly related to student gains.

A multiple regression model was developed to predict student achievement gains contingent on Praxis II content knowledge scores and years of teaching experience of relatively new teachers. Student achievement on Benchmark exams from one year to the next was measured by a method developed for the ADE's Improvement Gain Index. The calculation included student gains in both mathematics and literacy. The teacher effectiveness model utilized data on the classroom level rather than the school level.

Converse to that which was hypothesized, the model predicting the student gains using proficiency sub-categories did not prove significant and predictors accounted for only a minimal amount of the variability. In an attempt to refine the teacher effectiveness model, actual student gains over two years were made part of analysis rather than movement over the proficiency sub-categories. Again, no significant predictors were discovered. Other attempts at comparing student achievement based on teacher scores or experience also proved unsuccessful. Both input variables, teacher content knowledge and experience, though valued through literature review as

being paramount in student achievement, in these cases did not contribute significantly. The lack of a relationship in the present model may indicate that the Praxis scores do not effectively translate into levels of content knowledge as Darling-Hammond (2010) related.

The studied models can only be viewed as a pilot. The paucity of new teachers in this local district minimally fulfilled data requirements for using such methodology. Other factors suspected as detriments to a stronger association (should one have existed) were the diversity of Praxis II examinations attempted and subject areas taught.

Providing an impetus for future studies, when classroom gains were explored individually, the gains were mostly in the preferred direction, positive, indicating some measure of value added by the teachers. Future studies might discover important relationships by utilizing only teachers of Middle school or Elementary thus eliminating factors inherent in child development or factors surrounding the teaching of a single subject. Using a greater number of educators, perhaps from several districts, and analyzing them separately by field might reveal a relationship, if one exists.

This thorough exploration of student gains based on teacher scores and experience did not demystify student achievement as conjectured in Hypothesis IV though positive classroom gains were a welcome finding. If content knowledge as measured by Praxis II exams and years of teaching experience are not necessarily related to student gains then other factors might prove more fitting as indicators of effectiveness. Though outside of the scope of this study, the academic credentials utilized when comparing graduate groups might prove fruitful as predictors of student gains. Another factor might be quality of teacher mentoring, a state provided service to new teachers. Collaborative support available to these new teachers by content area or grade level is no doubt critical in their professional development and might play a significant role in

student achievement. In the local district of the identified teachers, both of the aforementioned supports are exercised continuously.

Final Conclusions

The subject of student achievement and the teacher attributes that facilitate it has been continuously researched, legislated, and discussed. Since the intensive push for science and mathematics teachers in the 1950s to competing globally with recently instituted Common Core State Standards, pressure has been applied to the teaching profession to attain levels of student achievement not heretofore observed. No Child Left Behind, the overarching education legislation of the first decade of the 21st century, mandated a level of highly qualified teacher that had not been exacted before this time. Demonstrable knowledge of content was explicitly required of teachers. Though veteran teachers, for the most part, received their highly qualified designation through SEA channels giving credit for experience and college coursework in the fields taught, new teachers were required to pass "rigorous" content knowledge examinations in their assigned and/or chosen fields.

In actuality, the highly qualified teacher provisions were set by SEAs at minimal levels making the designation of HQT a misnomer. More specifically, HQT became concomitant with minimal cut scores on licensure exams instead of criteria that when met demonstrated that someone was highly qualified. It is clear, that when provided an opportunity to establish their own criteria for HQT, SEAs succumbed to the perverse incentive of using low cut scores to elevate passing rates and the ability to claim that essentially all teachers were HQT.

The specific use of licensure exams was to establish criteria demonstrating HQT, but these exams and the distribution of all student scores, clearly suggest cut scores were set artificially low to facilitate high pass rates. Issues with lowered expectations for performance were

exacerbated by the fact that required passing scores were well below national norms of performance for college of education majors.

SEAs were directed to institute definitions of HQT in accordance with the framework issued by the USDOE. Worse, the establishing of minimal scores for passage were the rule rather than the exception. It can be easily argued that high passing rates were the goal and intended consequence.

SEAs having been afforded the opportunity to establish standards representative of HQT, it is suggested that further modifications or attempts to define "Highly Effective Teachers" (HET) be completed by an independent board of professionals in education. It is clear, that when afforded the opportunity to set performance standards, SEAs will capitalize on the opportunity to "inflate" the results if and when these results are linked to Federal guidelines. As our country embarks on a course of rigor and college readiness through demands on teacher effectiveness, an independent board could facilitate the transition by developing explicit standards for effectiveness and thus eliminating the opportunity of SEAs to set artificially low guidelines.

The low passing scores required by Arkansas and other SEAs on the teacher licensure exams of the present study were judged as ineffective in identifying highly qualified teachers. These low expectations are paradoxical considering that student, and thus teacher, expectations have increased through the decade. Discovered to reside mostly in the lowest quartile of national scoring distributions, Arkansas's minimal cut scores have resulted in artificially inflated pass rates.

At no educational level is it more important to raise standards as far as rigor and relevance on licensing exams than on the Elementary level. Foundational and of prime importance will be the content knowledge of Elementary teachers in the Common Core era where half of reading

material will be informational text. Passing scores and academic standards for admittance into Colleges of Education will necessarily need to be raised to produce candidates not only highly qualified but effective as well.

Colleges of Education, and more specifically the U of A College of Education and Health Professions, could rectify the perpetuation of these minimal standards by issuing program standards for passing licensure tests at a level beyond those mandated by the Arkansas Department of Education. The completion of a degree from the U of A does not have to be based on the minimal expectations of the state, but can be transformed into a meaningful academic goal for all aspiring teachers to demonstrate they are "highly qualified." Raised expectations would enunciate the value and marketability of a degree from the Education program at the U of A. The fear of reporting passing rates at an unsatisfactory level according to Title II reporting has prohibited institutions from taking that step away from minimal qualifications toward highly qualified. The 100% passing has been too seductive in its gravitational pull on passing scores. The COEHP with their M.A.T. program could set aside the gamesmanship and be more selective about the licensure scores of program entrants. Just assuming that teachers have the content knowledge necessary for the classroom will not fulfill the raised expectations of the Common Core.

The model, piloted with an admittedly small number of teachers, did not reveal significant relationships between student gains and teacher scores on content exams. Those results might indicate issues with licensure exam rigor and validity rather than research design flaws. But, the licensing exams are deeply entrenched as the most common means of fulfilling the highly qualified goal. The future of assessing educators will necessarily change with the reauthorization and the Common Core of State Standards. Licensure examinations may be part of the

amalgamation that emerges. Raising standards through passing scores and teacher academic credentials will ease the transition.

The highly qualified teacher provision has been an important step in the evolution of teacher expectations. HQT has been the forerunner of efforts to ensure that all students have qualified instructors and has motivated the next generation of proposals to improve teacher effectiveness in the reauthorization of ESEA. Teacher quality and effectiveness will always be interrelated with teachers both needing demonstrated content and pedagogical expertise. But, additionally, they will need the ability to transition these skills to effective student outcomes or teacher effectiveness.

VI. FOOTNOTES

[1] 48.1% of public school teachers had master's degree or higher according to the NCES Schools and Staffing Survey 2003-04 ("Characteristics," 2006).

[2] As background, students, including freshmen, already admitted to the U of A, are eligible for admission to the COEHP's programs of study. To be admitted to the U of A automatically, a prospective student must have taken a high school preparatory curriculum, have a 3.00 GPA, and an ACT composite of 20 or at least 930 on the SAT ("Welcome," 2007). Credentials are individually inspected for students not meeting all of the standards of admission. Students transferring to the COEHP within the University must have complete 62 hours, attained a 2.7 GPA on program prerequisites, and have achieved grades of "C" or better in certain courses ("College of Education," 2011).

VII. REFERENCES

2005 assessment results. (2007) Retrieved March 13, 2009 from http://nces.ed.gov/quicktables/result.asp?SrchKeyword=&topic=Assessments&Year=2005

2006 ACT national data tables. (2007). Retrieved July 9, 2007 from http://www.act.org/news/data/06/data.html

2006 ACT national score report news release. (2006). Retrieved June 7, 2007 from http://www.act.org/news/releases/2006/ndr.html

2008 ACT national profile report. (2008). Retrieved February 11, 2009 from http://act.org/news/data/08/data.html

2010 Arkansas school performance report. (2010). A publication of the Arkansas Department of Education.

2010 college-bound seniors total group profile report. (2010). Retrieved December 30, 2010 from http://professionals.collegeboard.com/profdownload/2010-total-group-profile-report-cbs.pdf

50-State HOUSSE Report (Elementary). (2006). Retrieved November 2, 2006 from http://mb2.ecs.org/reports/Report.aspx?id=1053

A blueprint for reform. (2011). Retrieved November 8, 2011 from http://www2.ed.gov/policy/elsec/leg/blueprint/publication_pg3.html

A summary of highly qualified teacher data for school year 2008-09. (2010). Retrieved December 27, 2010 from http://www2.ed.gov/programs/teacherqual/brief0809.doc

About the NYSTCE. (2006). Retrieved April 27, 2006 from http://www.nystce.nesinc.com

About the standards. (2011). Retrieved October 31, 2011 from http://www.corestandards.org/about-the-standards

Achievement gaps. (2010). Retrieved December 22, 2010 from http://nces.ed.gov/nationsreportcard/studeies/gaps/

ACT high school profile report. (2003). Retrieved 1/22/07 from http://www.act.org/news/data/03/pdf/data/pdf

ACT high school profile report. (2006). Retrieved 5/24/07 from http://www.act.org/news/data/06/pdf/one.pdf

Akiba, M., LeTendre, G. K., & Scribner, J. P. (2007). Teacher quality, opportunity gap, and national achievement in 46 countries. *Educational Researcher 36*(7), 369-387.

American Board for Certification of Teacher Excellence. (2007). Student achievement and passport to teaching certification in mathematics. Retrieved April 23, 2010 from http://www.abcte.org/files/math_2007_validity.pdf

Anderson, N. (2010, March 14). Obama: Revise No Child Left Behind law. *The Washington Post*, pp. 1-2. Retrieved from http://www.washingtonpost.com

Arkansas highly qualified status. (2010). Retrieved April 5, 2010 from http://www.ets.org/praxis/ar/

Arkansas state report card 2006. (2011). Retrieved December 27, 2011 from http://normessasweb.uark.edu/schoolperformance/Archives/State/SRC_06.php

Arkansas state report card 2009. (2010). Retrieved December 27, 2010 from http://normessasweb.uark.edu/schoolperformance/State/SRCy3.php

Arkansas state report card 2010. (2011) Retrieved December 27, 2011 from http://normessasweb.uark.edu/schoolperformance/State/SRCy3.php

Azordegan, J. (2004). Initial findings and major questions about HOUSSE. Retrieved March 13, 2009 from http://www.ecs.org/clearinghouse/49/68/4968.htm

Carey, K., Barth, P., Hall, D., Garcia, A., Licon, S., Wiener, R., & Yi, Y. (2003). Telling the whole truth (or not) about highly qualified teachers. Retrieved from http://www.edtrust.org/

Childhood education. (2011). Retrieved November 1, 2011 from http://catalogofstudies.uark.edu/2008/3108.php

Clotfelter, C. T., Ladd, H. F., & Vigdor, J. L. (2007). *How and why do teacher credentials matter for student achievement.* Retrieved September 3, 2011 from http://www.caldercenter.org/pdf/1001058_Teacher_credentials.pdf

College of Education and Health Professions 2010-2011 annual report. (2011). Retrieved November 4, 2011 from http://coehp.uark.edu/2010-2011_COEHP_Annual_Report.pdf

College readiness benchmark attainment by state. (2011). Retrieved November 6, 2011 from http://www.act.org/newsroom/data/2010/benchmarks.html

Constantine, J., Player, D., Silva, T., Hallgren, K., Grider, M., & Deke, J. (2009). An evaluation of teachers trained through different routes to certification. Retrieved March 12, 2009 from http://www.mathematica-mpr.com/publications/PDFs/Education/teacherstrained09.pdf

Critical academic licensure shortage areas 2011-2012 school year. (2011). Retrieved November 1, 2011 from http://arkansased.org/educators/index.html

Croninger, R. G., Rice, J. K., Rathbun, A, & Nishio, M. (2007). Teacher qualifications and early learning: Effects of certification, degree, and experience on first-grade student achievement. *Economics of Education Review 26*(3), 312-324.

Current NAEP contractors. (2010). Retrieved April 8, 2010 from http://nces.ed.gov/nationsreportcard/contracts/history.asp

Darling-Hammond, L. (2010). Evaluating teacher effectiveness. Retrieved March 4, 2011 from http://www.americanprogress.org/issues/2010/10/pdf/teacher_effectiveness.pdf

Darling-Hammond, L., Holtzman, S. J., Gatlin, S. J., & Heilig, J. V. (2005). Does teacher preparation matter? Evidence about teacher certification, Teach For America, and teacher effectiveness. Retrieved March 13, 2009 from http://www.stanford.edu/~ldh/publications.html

Darling-Hammond, L. & Sykes, G. (September, 2003). Wanted: A national teacher supply policy for education: The right way to meet the "Highly Qualified Teacher" challenge. *Education Policy Analysis Archives, 11*(33). Retrieved from http://eric.ed.gov/

Dillon, S. (2007, December 12). Report finds better scores in new crop of teachers. *New York Times*, p. O20.

Duncan, A. (2009). The Secretary's sixth annual report on teacher quality. Retrieved December 27, 2010 from https://title2.ed.gov/secReport09.asp

Early childhood: content knowledge. (2007). Retrieved February 22, 2007 from http://www.ets.org/Media/tests/Praxis/pdg/0022.pdf

Elementary education: Content knowledge. (2010). Retrieved December 19, 2010 from http://www.ets.org/s/praxis/pdf/5014.pdf

Elementary education: Curriculum, instruction, and assessment. (2010). Retrieved December 19, 2010 from http://www.ets.org/s/praxis/pdf/5011.pdf

Education in states and nations. (1991). Retrieved March 13, 2009 from http://nces.ed.gov

Elementary and Secondary Education Act. (2010). Retrieve December 22, 2010 from http://edlabor.house.gov/education/esea/

Elementary & secondary education ESEA reauthorization: A blueprint for reform. (2011). Retrieved March 4, 2011 from http://www2.ed.gov/policy/elsec/leg/blueprint/index.html

EnCorps. (2010). Retrieved May 24, 2010 from http://www.encorpsteachers.org/index.cfm/page/Press

Fact sheet: The No Child Left Behind Act: Five years of results for America's children. (2007). Retrieved March 13, 2009 from http://georgewbush-whitehouse.archives.gov/news/releases/2007/01/20070108-6.html

Feistritzer, C. E. (2007). Alternative teacher certification: A state by state analysis. Retrieved July 18, 2007 from http://www.teach-now.org/intro.cfm

Finland is #1!. (2011). Retrieved November 6, 2011 from www.scholastic.com/browse/article.jsp?id=3749880

Future teachers and SAT scores. (2004). Retrieved January 22, 2007 from http://www.reformk12.com/archives/000094.nclk

Gimbert, B., Cristol, D. S., & Sene, A. (2007). The impact of teacher preparation on student achievement in algebra in a "hard-to-staff" urban pre K – 12 – university partnership. [Electronic version]. *School Effectiveness and School Improvement 18*(3), 245-272.

Gitomer, D. H. (2007). Teacher quality in a changing policy landscape: Improvements in the teacher pool. Retrieved 1/21/08 from http://www.ets.org/teacherqualityreport

Goldhaber, D. D. (2007). Everyone's doing it, but what does teacher testing tell us about teacher effectiveness? Retrieved April 26, 2010 from http://www.caldercenter.org/PDF/1001072_everyones_doing.PDF

Goldhaber, D. D., & Brewer, D. J. (2000). Does Teacher Certification matter? High school teacher certification status and student achievement. [Electronic version]. *Educational Evaluation and Policy Analysis 22*(2), 129-145.

Gonzales, P. Williams, T., Jocelyn, L., Roey, S., Kastberg, D., & Brenwald, S. (2008). Highlights from TIMSS 2007: Mathematics and Science achievement of U.S. fourth- and eighth-grade students in an international context. Retrieved March 31, 2009 from http://nces.ed.gov/pubsearch/pubsinfo.asp?pubsinfo.asp?pubid=2009001

Gordon, R., Kane, T. J., &Staiger, Do. O. (2006).*Identifying effective teachers using performance on the job.* Retrieved September 3, 2011 from http://www.brookings.edu/~/media/Files/rc/papers/2006/04education_gordon/200604hamilton_1.pdf

Greenwald., R., Hedges, L. V., Laine, R. D. (1996). The effects of school resources on student achievement. [Electronic version]. *Review of Educational Research 66*(3), 361-396.

Grimes-Crump, R. H. (2001). Virginia teacher licensure examination policy: Intended and unintended effects on teacher availability and minority representation. (Doctoral dissertation, Virginia Tech University, 2001). *Dissertation Abstracts International, 62*(10), 3362.

Heck, R. H. (2007). Examining the relationship between teacher quality as an organizational property of schools and students' achievement and growth rates. [Electronic version]. *Educational Administration Quarterly 43*(4), 399-432.

Hickok, E. W., & Poliakoff, M. B. (1999). Raising the bar for Pennsylvania's teachers. Retrieved March 13, 2009 from http://eric.ed.gov/ERICDocs/data/ericdocs2sql/content_storage_01/0000019b/80/15/df/f6.pdf

Highlights from TIMSS: Overview and key findings across grade levels. (1999). Retrieved April 18, 2006 from http://nces.ed.gov

The history of NAEP partners. (2006). Retrieved June 7, 2007 from http://nces.ed.gov/nationsreportcard/contracts/history.asp

Honawar, V. (2007). Reports renew debate over alternative preparation. [Electronic version]. *Education Week, 27*(16), 11.

Honawar, V. (2008). Aspiring teachers take up residence. *Education Week, 28*(8), 28-31.

How to read your CEOE score report. (2006). Retrieved April 27, 2006 from http://www.ceoe.nesinc.com

How the test is scored. (2009). Retrieved April 21, 2009 from http://www.collegeboard.com/student/testing/sat/scores/understanding/howscored.html

Howell, C. (2006, December 16). Plan to better state's schools wins approval. *Arkansas Democrat Gazette*, p. B1.

HQT data. (2008). Retrieved April 1, 2009 from http://www.ed.gov/programs/teacherqual/hqt-data-2006-07.xls

HQT revised state plans. (2008). Retrieved July 9, 2008 from http://www.ed.gov/programs/teacherqual/hqtplans/index.html

Huang, S., Yi, Y., & Haycock, K. (2002). Interpret with caution: The first state Title II reports on the quality of teacher preparation. Retrieved February 13, 2007 from http://www2.edtrust.org/NR/rdonlyres/305751B5-7635-4F5E-9BBE-068CF0849150/0/titleII.pdf

In the states. (2011). Retrieved October 30, 2011 from http://www.corestandards.org.

Ingersoll, R. M. (2006). A comparative study of teacher preparation and qualifications in six nations. Retrieved March 13, 2009 from http://www.cpre.org/index.php?option=com_content&task=view&id=217&Itemid=77

Jacobson, L. (2007). California could tap industry for teachers. *Education Week 26*(42), 26-28.

James, T. K. (2006). Arkansas' CSPR revised plan meeting the highly qualified teacher goals. Retrieved November 1, 2006 from http://www.ed.gov/programs/teacherqual/hqtplans/index.html.

Kane, T. J., Rockoff, J. E., & Staiger, D. O. (2007). Photo finish: Certification doesn't guarantee a winner. *Education Next, 2007*(1), 60-67.

Keller, B. (2005, October 24). U.S. education department gives states reprieve in meeting 'highly qualified' teacher requirement. *Education Week.* Retrieved March 13, 2009 http://www.edweek.org

Keller, B. (2006). Ed. Dept. won't force HOUSSE closure now. [Electronic version]. *Education Week, 26*(4), 28-30.

Keller, B. (2007). Tiered licensing systems being used by states to help teacher quality. *Education Week, 27*(16), 6-7. Retrieved from http://www.edweek.org/

Kissel, H. L., Meyer, J. P., & Liu, X. (2006). Successful retention of new and minority teachers: Results from the SASS and TFS. Paper presented at the AERA annual meeting, April 9, 2006, San Francisco, CA.

Klein, A. (2009). Aspen take two: The commission on No child Left Behind is back in business. Retrieved April 8, 2010 from http://blogs.edweek.org/edweek/campaign-k-12/2009/08/aspen_take_two_the_commission.html

Klein, A. (2011). Teacher evaluation scaled back in revised ESEA draft. Retrieved October 18, 2011 from http://www.edweek.org/ew/articles/2011/10/18/08esea.h31.html

Kober, N., Chudowsky, N., & Chudowsky, V. (2010. Rising scores on state tests and NAEP. Retrieved December 22, 2010 from http://www.cep-dc.org/index.cfm?DocumentSubTopicID=21

LEA plan for highly qualified teachers. (2006). Retrieved June 7, 2007from http://www.arkansased.org/nclb/word/LEA_Plan_for_HQT_120406.doc

Legler, R. (2002). Alternative certification: A review of theory and research. Retrieved May 30, 2007 from http://www.ncrel.org/policy/pubs/html/altcert/charact.htm

Lips, D. (2007). Education notebook: Do American schools really need NCLB 2.0? Retrieved June 7, 2007 from http://www.heritage.org/Research/Education/ednoteArchive.cfm

Master of Arts in Teaching (M. A. T. in Secondary Education. (2011). Retrieved November 1, 2011 from http://catalogofstudies.uark.edu/4102.php

Mathematics: Content knowledge. (2011). Retrieved November 1, 2011 from http://www.ets.org/Media/Tests/PRAXIS/pdf/0061.pdf

Mathematics literacy performance of 15-year-olds. (2010). Retrieved December 27, 2010 from http://nces.ed.gov/surveys/pisa/pisa2009highlights_3.asp

Miners, Z. (2009). Aspiring teachers flunk math test. Retrieved April 23, 2010 from http://www.usnews.com/blogs/on-education/2009/05/22/aspiring-teachers-flunk-math-test.html

Minutes state board of education. (2001, April 9). Retrieved February 2, 2007 from http://www.arkansased.org/sbe/pdf/board_minutesapril2001.pdf

Minutes state board of education. (2001, November 19). Retrieved February 2, 2007 from http://www.arkansased.org/sbe/pdf/board_minutesnovember2001.pdf

Mitchell, R. & Barth, P. (1999, Spring). Not good enough: A content analysis of teacher licensing. *Thinking K-16,* 3(1), 274-294.

Moritz, R. (2008, December 15). Study: Teacher equity rises. *The Morning News*, pp. A1-2.

Nagy, C., & Wang, N. (2006). The alternative route teacher's transition to the classroom: Preparation, support, and retention. Paper presented at the AERA annual meeting April 9, 2006, San Francisco, CA.

National level norms composite report. (2011). Retrieved January 9, 2012 from http://www.act.org/research/services/pdf/ClassProfileNormReport.pdf

The nation's report card. (2010). Retrieved December 22, 2010 from http://nationsreportcard.gov/

New No Child Left Behind flexibility: Highly qualified teachers. (2004). Retrieved May 15, 2007 from http://www.ed.gov/nclb/methods/teachers/hqtflexibility.html

No child left behind: A toolkit for teachers. (2006). Retrieved November 6, 2006 from http://www.ed.gov.teachers/nclbguide/toolkittoc.html

No child left behind's 5th anniversary keeping promises and achieving results. (2007). Retrieved June 7, 2007 from http://www.ed.gov/nclb/overview/importance/nclb5anniversary.html

Number of core academic classes, highly qualified teachers and non highly qualified teachers teaching core academic classes – 2006-07. (2007). Retrieved January 2, 2011 from http://www.arkansased.org/nclb/pdf/school_HQT_06-07_Upd011007.pdf

Nunnery, J., Kaplan, L., Owings, W. A., & Pribesh, S. (2009). The effects of Troops to Teachers on student achievement: One state's study. *NASSP Bulletin, 93*(4), 249-272. Retrieved from http://bul.sagepub.com/

Nwazota, K. (2005). The federal role in education before No Child Left Behind. Retrieved May 22, 2007 from http://www/pbs.org/newshour/bb/education/nclb/beforenclb.html

Overview of the Nation's Report Card. (2007). Retrieved June 7, 2007 from http://nces.ed.gov/nationsreportcard/about/

Overview of the Praxis III tests. (2010). Retrieved April 5, 2010 from http://www.ets.org/praxis/ar/

Paige, R. (2004). Key policy letters signed by the education secretary or deputy secretary. Retrieved November 6, 2006 from http://www.ed.gov/policy/elsec/guid/secletter/040331.html

Palmaffy, T. (1999). Measuring the teacher quality problem. Retrieved February 15, 2007 from http://www.edexcellencemedia.net/publications/1999/199907_betterteachersbetterschools/btrtchrs.pdf

Pearce, R. A. (2011, October, 31). Teacher training discussed. Retrieved October 31, 2011 from http://www.nwaonline.com

Posted replies. (2006). Retrieved March 23, 2006 from http://www.ets.org

Praxis I details. (2006). Retrieved April 27, 2006 from http://www.ets.org

Praxis II overview. (2006). Retrieved February 22, 20007 from http://www.ets.org

The Praxis series passing scores by test and state. (2010). Retrieved May 21, 2010 from http://www.ets.org/Media/Tests/PRAXIS/pdf/09706passingscores.pdf

Praxis series testing. (2010). Retrieved December 27, 2010 from http://www.arkansased.org/educators/pdf/licensure/praxis_series_testing_073010.pdf

Praxis technical manual. (2010). Retrieved April 22, 2011 from http://www.ets.org/Media/Tests/PRAXIS/pdf/PraxisTechnicalManual.pdf

Principles of learning and teaching: Early Childhood. (2010). Retrieved December 19, 2010 from http://www.ets.org/Media/Tests/PRAXIS/taag/0521/about.htm

Programs (majors). (2010). Retrieved December 20, 2010 from http://cied.uark.edu/5210.php

Proper use of the Praxis Series and related assessments. (2006). Retrieved July 19, 2007 from http://www.ets.org/Media/Tests/PRAXIS/pdf/guidelines.pdf

Quality counts 2008: Tapping into teaching. (2008). Retrieved July 11, 2008 from http://www.edweek.org

Reading literacy performance of 15-year-olds. (2010). Retrieved December 27, 2010 from http://nces.ed.gov/surveys/pisa/pisa2009highlights_2.asp

Readout of President Obama's meeting on the reauthorization of ESEA. (2011). Retrieved March 4, 2011 from http://www.whitehouse.gov/the-press-office/2011/02/17/readout-president-obama-s-meeting-reauthorization-esea

Rotherham, A. J. & Mead, S. (2003, November). Rethinking teacher pay. *Leadership Insider.* Retrieved March 18, 2009 from http://www.nsba.org/SecondaryMenu/COSA/Search/AllCOSAdocuments/LeadershipInsiderNovember2003.aspx

Scavongelli, S. (2003, July 11). States struggle to define highly qualified teachers. Retrieved March 18, 2009 from http://www.stateline.org/live/ViewPage.action?siteNodeId=136&languageId=1&contentId=15314

Schedule for the state and National Assessment of Educational Progress (NAEP) for 2007-2017. (2007). Retrieved June 7, 2007 from http://nces.ed.gov/nationsreportcard/about/assessmentsched.asp

Schmidt, W. H., Babcock, J., Babcock, P., Buhler, J., Cady, J., Cogan, L., Houang, R., Neelam, K., Patrick, J., Rosolova, K., and Wight, K. (2010). Breaking the cycle: An international comparison of U.S. mathematics teacher preparation. Retrieved May 19, 2010 from http://www.educ.msu.edu/content/sites/usteds/documents/Breaking-the-cycle.pdf

Schmidt, W. H., Tatto, M. T., Bankov, K., Blomeke, S., Cedillo, T., Cogan, L., Schwille, J. (2007). The preparation gap: Teacher education for middle school mathematics in six countries. Retrieved January 21, 2008 from http://usteds.msu.edu/MT21Report.pdf

School report cards. (2006). Retrieved May 29, 2007 from http://normessasweb.uark.edu/reportcards/select.php

Science literacy performance of 15-year-olds. (2010). Retrieved December 27, 2010 from http://nces.ed.gov/surveys/pisa/pisa2009highlights_3.asp

Spelling, M. (2005). The Secretary's fourth annual report on teacher quality. Retrieved November 5, 2006 from http:// title2.ed.gov

Spelling, M. (2006, September 5). Key policy letters signed by the education secretary or deputy secretary. Retrieved March 13, 2009 from http://www.ed.gov/policy/elsec/guid/secletter/060905.html

Spelling, M. (2006). The Secretary's fifth annual report on teacher quality. Retrieved February 12, 2007 from http:// title2.ed.gov

State requirements. (2010). Retrieved December 1, 2010 from http://www.ets.org

States opt out of NCLB. (2008). Retrieved April 8, 2010 from http://www.aepweb.org/industryinfo/newsletter/legarchives/NCLB3-2-04.htm

Stotsky, S. (2007). Teacher licensure tests: Their relationship to mathematics teachers' academic competence and student achievement in mathematics. Retrieved April 23, 2010 from http://www.uark.edu/ua/der/EWPA/Research/Teacher_Quality/1798 /teacher_licensure_pdf.pdf

Stotsky, S. (2008). Suggested indices of teacher quality for Arkansas: A position paper. Paper presented at a conference on Preparing Highly Qualified Teachers for Arkansas sponsored by the Office for Education Policy at the University of Arkansas.

Strengthen teacher quality, No Child Left Behind: A toolkit for teachers. (2007). Retrieved January 22, 2007 from http://www.ed.gov/teachers/nclbguide/toolkit_pg10.html#requirements

Supporting teachers. (2010). Retrieved December 28, 2010 from http://www2.ed.gov/policy/elsec/leg/blueprint/faq/supporting-teachers.pdf

Tannenbaum, R. J. (2011). Setting standards on The Praxis Series tests: A multistate approach. Retrieved November 4, 2011 from http://www.ets.org/Media/Research/pdf/RD_Connections17.pdf

Teacher and principal quality headlines. (2006). Retrieved November 13, 2006 from http://www.all4ed.org/teacher_principal /headlines.html

Teacher attrition and mobility. (2009). Retrieved January 2, 2011 from http://nces.ed.gov/pubs2010/2010353.pdf

Teachers non-traditional licensure program. (2006). Retrieved May 30, 2007 from http://www.arkansased.org/teachers/nontraditional.html

Teachers Praxis Series. (2006). Retrieved May 30, 2007 from http://www.arkansased.org/teachers/praxis.html

Teacher shortage areas. (2011). Retrieved November 4, 2011 from http://www2.ed.gov/about/offices/list/ope/pol/tsa.html

Testing prospective teachers. (2004). Retrieved May 15, 2007 from http://www1.lakeland.edu/hayssen/backup/Praxis%20tests.htm

Testing requirements for University of Arkansas students. (2007). Retrieved March 19, 2010 from http://coehp.uark.edu/5574.htm

Texas Center for Educational Research. (2000). The cost of teacher turnover. Retrieved May 28, 2007 from http://www.tcer.org/research/index.aspx

TIMSS 2003 international reports. (2003). Retrieved May 28, 2007 from http://isc.bc.edu/timss2003i/intl_reports.html

Title II –State Reports 2009. (2009). Retrieved December 20, 2010 from http://title2.ed.gov/title2dr/ChooseState.asp?Type=Map&Year=2009

To teach or not to teach? (2007). Retrieved January 5, 2012 from http://nces.ed.gov/pubs2007/2007163.pdf

Tolson, R. (2011, September 7). Re: Masters of Arts in teaching mentoring and licensure [Electronic Commissioner's Memos]. Retrieved from http://adesharepoint2.arkansas.gov/memos/default.aspx

Total group profile report. (2006). Retrieved January 22, 2007 from http://www.collegeboard.com/prod_downloads/about/news_info/cbsenior/yr2006/national-report.pdf

U.S. Secretary of Education Margaret Spellings announces final regulations to strengthen No Child Left Behind. (2008). Retrieved April 8, 2010 from http://www2.ed.gov/news/pressreleases/2008/10/10282008.html

Understanding your Praxis scores. (2011). Retrieved October 31, 2011from http://www.ets.org/s/praxis/pdf/uyps_1112.pdf

Unfulfilled promise: Ensuring high quality teachers for our nation's students. (2004). A publication of the Southeast Center for Teaching Quality SECTQ. Retrieved February 21, 2006 from http://www.teachingquality.org

Walsh, K. & Snyder, E., (2004, December). How states are responding to the nation's goal of placing a highly qualified teacher in every classroom. Retrieved March 13, 2009 from http://www.teach-now.org/NCTQ2004HOUSSE.pdf

Wang, A. H., Ashaki, B. C., Coley, R. J., & Phelps, R. P. (2003). Preparing teachers around the world. Retrieved February 13, 2007 from http://www.ets.org

Waugh, R. & Slivka, J. (2005). Self-study toolkit: Highly qualified teachers (HQT). Retrieved June 6, 2007 from http://www.neglected-delinquent.org/nd/resources/spotlight/spotlight200507a.asp

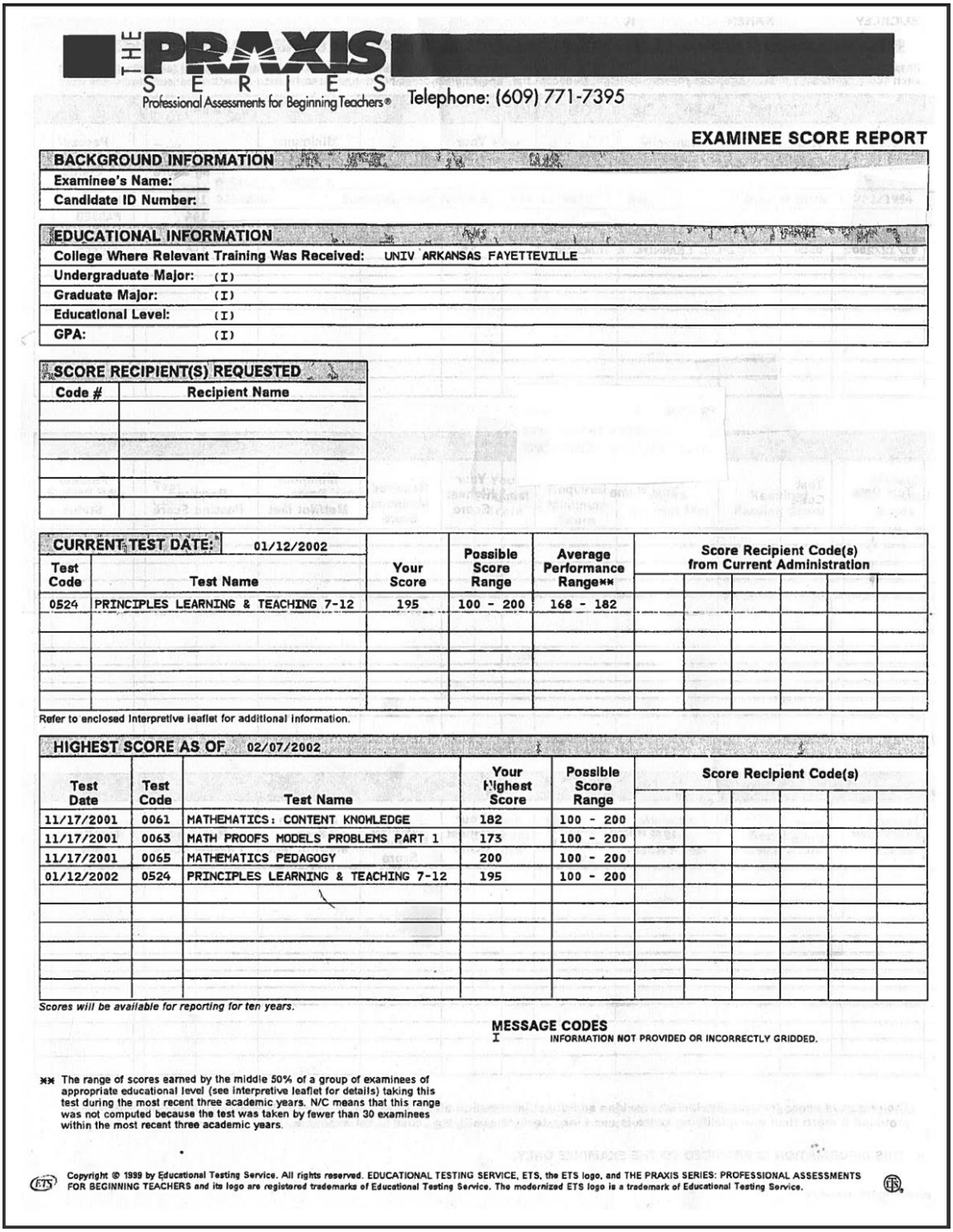
Welcome to the Office of Admissions. (2007). Retrieved June 29, 2007 from http://admissions.uark.edu/students/new/requirements.php

Wenglinsky, H. (2000). Teaching the teachers: Different settings, different results. Retrieved October 3, 2006 from http://www.ets.org

Williams, B. (2006). New issues. Retrieved November 2, 2006 from http://arkansased.org

VIII. APPENDIX A

Praxis Examinee Scoring Report



THE PRAXIS SERIES
Professional Assessments for Beginning Teachers®
Telephone: (609) 771-7395

EXAMINEE SCORE REPORT

BACKGROUND INFORMATION

Examinee's Name:
Candidate ID Number:

EDUCATIONAL INFORMATION

College Where Relevant Training Was Received:	UNIV ARKANSAS FAYETTEVILLE
Undergraduate Major:	(I)
Graduate Major:	(I)
Educational Level:	(I)
GPA:	(I)

SCORE RECIPIENT(S) REQUESTED

Code #	Recipient Name

CURRENT TEST DATE: 01/12/2002

Test Code	Test Name	Your Score	Possible Score Range	Average Performance Range**	Score Recipient Code(s) from Current Administration					
0524	PRINCIPLES LEARNING & TEACHING 7-12	195	100 - 200	168 - 182						

Refer to enclosed interpretive leaflet for additional information.

HIGHEST SCORE AS OF 02/07/2002

Test Date	Test Code	Test Name	Your Highest Score	Possible Score Range	Score Recipient Code(s)					
11/17/2001	0061	MATHEMATICS: CONTENT KNOWLEDGE	182	100 - 200						
11/17/2001	0063	MATH PROOFS MODELS PROBLEMS PART 1	173	100 - 200						
11/17/2001	0065	MATHEMATICS PEDAGOGY	200	100 - 200						
01/12/2002	0524	PRINCIPLES LEARNING & TEACHING 7-12	195	100 - 200						

Scores will be available for reporting for ten years.

MESSAGE CODES
I INFORMATION NOT PROVIDED OR INCORRECTLY GRIDDED.

** The range of scores earned by the middle 50% of a group of examinees of appropriate educational level (see interpretive leaflet for details) taking this test during the most recent three academic years. N/C means that this range was not computed because the test was taken by fewer than 30 examinees within the most recent three academic years.

BUCKLEY KAREN K

PASSED/NOT PASSED INFORMATION BASED ON HIGHEST SCORES EARNED AS OF 02/07/2002

Passed/not passed status provided in this report is based on the passing score in effect on the test date or on the date reported (as indicated next to each score recipient's name). Agencies reserve the right to accept the reporting of scores but not necessarily the passed/not passed status.

ARKANSAS STATE DEPT EDUCATION — Based on Test Date

Test Date	Test Code	Test Name	Your Highest Score	Required Minimum Score	Minimum Score Met/Not Met	Required Passing Score	Passed/ Not Passed Status
11/17/2001	0061	MATHEMATICS: CONTENT KNOWLEDGE	182			116	PASSED
11/17/2001	0063	MATH PROOFS MODELS PROBLEMS PART 1	173			144	PASSED
11/17/2001	0065	MATHEMATICS PEDAGOGY	200			135	PASSED
01/12/2002	0524	PRINCIPLES LEARNING & TEACHING 7-12	195			164	PASSED

Test Date	Test Code	Test Name	Your Highest Score	Required Minimum Score	Minimum Score Met/Not Met	Required Passing Score	Passed/ Not Passed Status

Test Date	Test Code	Test Name	Your Highest Score	Required Minimum Score	Minimum Score Met/Not Met	Required Passing Score	Passed/ Not Passed Status

The enclosed score interpretive leaflet provides additional information about state requirements. Passed/not passed information not provided if more than one qualifying score is used for a test, or qualifying score is not available.

* THIS INFORMATION IS PROVIDED TO THE EXAMINEE ONLY.

DETAILED INFORMATION FOR 01/12/2002 TEST DATE

Test Category	Raw Points Earned†	Raw Points Available	Average Performance Range‡
PRINCIPLES OF LEARNING AND TEACHING: GRADES 7-12			
I. ORGANIZING CONTENT KNOWLEDGE FOR STUDENT LEARNING	12	14	7 - 10
II. CREATING AN ENVIRONMENT FOR STUDENT LEARNING	10	11	8 - 10
III. TEACHING FOR STUDENT LEARNING	14	14	9 - 12
IV. TEACHER PROFESSIONALISM	5	5	N /C
SHORT ANSWER	31	36	23 - 28

† For categories containing multiple-choice items, Raw Points Earned are the number of questions answered correctly. For categories containing constructed response items or essays, the Raw Points Earned are the sum of the weighted ratings awarded.

‡ The range of scores earned by the middle 50% of a group of examinees who took this form of the test at the most recent national administration or other comparable time period. N/C means that this range was not computed because fewer than 30 examinees took this form of the test or because there were fewer than 8 questions in the category or, for a constructed-response module, fewer than 8 points to be awarded by the raters. N/A indicates that this test section was not taken and, therefore, the information is not applicable.

51004-09031.PXESF1-09/25/98

IX. APPENDIX B

Cumulative binomial probability of successfully passing the Praxis II Mathematics: Content Knowledge examination through random guessing

The exam consists of 50 multiple choice items each with four responses. The exam is scored between 100 and 200 thus yielding the assumption that each item is valued at two points. The cut score of 125 in Arkansas means that a tester must answer 13 items correctly to pass. To facilitate calculations, instead of calculating the probability of success by answering 13 items correctly or 14 items on up to 50 items, the probability of failure is calculated. The binomial probability of getting 0 items correct, one item correct, two items correct, on up to 12 items correct are summed, the result being the probability of failing by random guessing. Then, that cumulative probability is subtracted from 1.0 to attain the probability of passing by random guessing.

The formula for calculating the probability for a discrete variable is:

$$P(X=k) = \binom{n}{k} p^k (1-p)^{n-k}$$

Where P = probability of success
n = number of trials
k = number of successes
$\binom{n}{k} = \frac{n!}{k!(n-k)!}$

$$P(X=0) = \frac{50!}{0!(50-0)!} . 25^0 . 75^{50} = 0.000000566$$
$$P(X=1) = \frac{50!}{1!(50-1)!} . 25^1 . 75^{49} = 0.00000944$$

$P(X=2)=$ 0.0000771
$P(X=3)=$ 0.000411
$P(X=4)=$ 0.00161
$P(X=5)=$ 0.00494
$P(X=6)=$ 0.0123
$P(X=7)=$ 0.0259
$P(X=8)=$ 0.0463
$P(X=9)=$ 0.0721
$P(X=10)=$ 0.0985
$P(X=11)=$ 0.119
$P(X=12)=$ 0.129

$$1 - \sum_{k=0}^{12} P(X=k) = 1 - 0.51 = 0.49$$