

Suggested Indices of Teacher Quality for Arkansas: A Position Paper

Sandra Stotsky, Ed.D.
21st Century Chair in Teacher Quality
Department of Education Reform
University of Arkansas
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Executive Summary

The purpose of this paper is to suggest a variety of objective indices tailored to the distinctive characteristics of Arkansas that state legislators and other policy makers could use for determining whether the academic quality of the state's teaching force is increasing over time, with academic quality defined as prospective and practicing teachers' knowledge of the subject they teach. These measures are based on an examination of the information available on the Website of the Arkansas Department of Education and the web site of other departments of education, and on my work at the Massachusetts Department of Education from 1999 to 2003 in revising educator licensure regulations and both developing as well as revising teacher licensure tests for the Bay State. Most of these measures are very easy to develop. None would entail financial costs. Thus, this may be the opportune time for Arkansas to establish measures that can show increases in the academic quality of its teaching force, in reading and in mathematics especially.

Why should a state try to use measures of increases in prospective and practicing teachers' knowledge of the subject they teach as an index to improvement in teacher quality? According to the best research available, teachers' knowledge of the subject they teach is the chief *teacher* characteristic related to student achievement. That teachers' knowledge of mathematics makes a difference to student achievement in mathematics is one of the most important findings reported in *Foundations for Success*, the final report of the National Mathematics Advisory Panel (2008).

The Panel's report also noted that state licensure tests for those who teach mathematics as generalists (e.g., elementary teachers) or as specialists (full-time mathematics teachers) vary in the amount and level of the mathematics assessed, and in some cases assess no mathematics content at all. This observation suggests that one might examine the licensure tests Arkansas teachers take to find out if these tests adequately assess the mathematics knowledge these prospective teachers gained, or should have gained.

Indices that are easy to develop:

1. The number and percentage of prospective teachers in each licensure field passing their subject area test(s) on the first try and subsequent tries, broken down by traditional or alternative routes to licensure
2. The number and percentage of career-technical education teachers in each occupational area with a permit completing Arkansas Department of Education-sponsored pedagogical coursework for licensure on an annual basis.

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3. The number and percentage of middle school teachers with a subject area license for grades 7-12.
4. The number and percentage of grade 8 teachers passing the PRAXIS Middle School Mathematics test for an Algebra I endorsement, from test administration to test administration and from year to year.
5. The number of full-time elementary mathematics and science teachers as a percentage of all P-4 and 4-8 teachers.
6. The total number of academic and career-technical teachers teaching in each subject area or field on an annual basis, as well as the number holding a waiver.
7. The number and percentage of teachers annually who take or retake and pass an ABCTE subject area test or a NBPTS subject area test as part of a certificate program to attain master teacher status in a particular subject.

Indices that could be developed. These measures require changes in current licensure policies or an examination of the content of the reading methods and mathematics coursework that prospective teachers now take.

8. The number and percentage of elementary teachers who have taken appropriate mathematics courses and/or passed a licensure test that adequately assesses relevant mathematics knowledge.
9. The number and percentage of elementary teachers who have taken coursework on research-based reading instructional knowledge and/or passed a dedicated test of research-based reading instructional knowledge.
10. The number and percentage of test-takers achieving a passing score on relevant required subject area licensure test(s) after an increase in the passing score, announced two years in advance.

It is not at all clear that Arkansas is getting its money's worth from the middle school PRAXIS test it requires teachers in grades 4 -8 to take, no matter where the cut score is set. The state's teacher testing policy makers might consider several possibilities: (1) requiring a dedicated test of research-based reading instructional knowledge of all prospective elementary teachers as well as special education and/or early childhood teachers, such as is now used in California, Connecticut, Massachusetts, and Virginia, and (2) requiring a more extensive test of mathematics knowledge of these prospective teachers, as Massachusetts is now doing.

Arkansas should also consider eliminating some of the tests it now requires. In addition to a test of teachers' skills and a test of subject area knowledge, the state also requires one of the tests ETS offers in a PRAXIS series called Principles of Learning and Teaching. These tests may have serious limitations from a special education perspective in particular. To judge by sample items on the ETS Web site, these tests of "principles of learning and teaching" seem to promote a particular pedagogical philosophy and set of strategies that discredit teacher-directed instruction of academic concepts and skills. The Panel found no body of research evidence to support an emphasis on either a "student centered" or "teacher directed" approach for most students, although it did find consistent evidence on the usefulness of direct instruction for special education students and other struggling learners.

Information that could be made available on the ADE Web site. In addition, the Arkansas Department of Education should make the information listed below available to legislators, educational researchers, and the

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public at large on its Web site. This kind of information does not identify any individual teachers, schools, or institutions of higher education and is clearly public information.

1. Results for each test administration in all subject areas: number of test-takers, percentage passing, number taking each test for a second or more time, percentage passing.
2. Number of multiple choice questions and percentage of constructed response items required to be correct for a passing score on each licensure test required.
3. Number of academic and career-technical teachers receiving an initial license in each subject each year according to route taken (traditional or alternative certification).
4. Number of full-time elementary mathematics and science teachers employed each year.
5. Number of middle school teachers employed each year holding a grades 7-12 license.
6. Number of middle school teachers employed each year holding an Algebra 1 endorsement.
7. Total number of academic and career-technical teachers employed each year by subject area, and the total number of those on waiver by subject area.
8. Syllabi of required mathematics courses for prospective elementary, middle school, and special education teachers.
9. Syllabi of required reading instructional methods courses for prospective elementary, middle school, and special education teachers.
10. Copies of evaluation forms used by each teacher training institution for student teachers.
11. Criteria used for evaluating new teachers on the dimensions listed in PRAXIS II, as well as the criteria used for evaluating teachers for standard license on the dimensions listed in PRAXIS III.
12. Number of teachers annually who have tried to pass a NBPTS or ABCTE subject area test for master teacher status, and the number who have passed.

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It is common knowledge that as a nation we need more academically qualified teachers than we now have in K-12. But there are two kinds of shortages. At the secondary level, we simply lack a sufficient supply of teachers of mathematics, science, history, and foreign languages--in part because our traditional training programs don't produce enough of them and in part because potential teachers with appropriate academic qualifications for teaching these subjects find more rewarding or remunerative careers elsewhere. The basic problems at the secondary level are recruitment and retention of teachers who, by virtue of their academic coursework, are academically qualified to teach their subject.

At the pre-high school level, however, the basic problem is the number of academically underqualified teachers who can legally teach two or more core subjects on a regular basis to elementary and middle school children. They are generally not licensed as subject area specialists but as elementary teachers, special education teachers, or middle school generalist teachers. Every year, education schools across the country graduate an oversupply of such teachers, for the elementary grades in particular--an oversupply that Arthur Levine (2006), among others, refers to as a "cash cow." Since teachers' knowledge of the subject they teach is the chief characteristic of effective teachers that research has so far identified (U.S. Department of Education, 2008), one might expect states to have developed a set of indicators that show the results of efforts to increase the academic knowledge of their teaching force, particularly since any increases are likely to occur only gradually, over time. Such indicators would serve as a counterpart of the measures the state now uses to note improvement over time in student achievement, although they would be very different in form in many respects. But no state has yet developed a set of indices for determining whether or not the academic quality of its teaching force is increasing over time, staying the same, or even declining.

The purpose of this paper is to suggest a variety of objective indices tailored to the distinctive characteristics of Arkansas that state legislators could use for determining if the academic quality of the state's teaching force is increasing over time and to what extent, with academic quality defined as prospective and practicing teachers' knowledge of the subject they teach. These measures are based on an examination of the information available on the Website of the Arkansas Department of Education and the web site of other departments of education, and on my work at the Massachusetts Department of Education from 1999 to 2003 in revising educator licensure regulations and developing as well as revising teacher licensure tests for the Bay State. Most of these measures are easy to develop. None would entail financial costs. Thus, this may be the opportune time for Arkansas to establish measures that can show increases in the academic quality of its teaching force, in reading and in mathematics especially.

Why We Have a Shortage of Academically Qualified Teachers in K-12

In most states, those who teach core subjects in the secondary grades have majored in the subjects they become licensed to teach, and they are therefore academically qualified for the grades and courses they teach. In order for our high schools to offer the kinds of academic courses we now want them to offer, in mathematics and science in particular, a larger number of academically qualified teachers need to be available. The problems are (1) how to encourage more undergraduates majoring in these subjects (or mid-career changers with the appropriate

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background knowledge) to become secondary teachers and (2) how to retain them if they do become teachers. Such programs as Teach for America and UTeach recruit academically able undergraduates to teach core subjects by altering the traditional training route that secondary teachers have been required to take. Teach for America provides a short summer preparation program for graduates of liberal arts colleges and places them in classrooms in the fall; UTeach is a program that provides students majoring in science or mathematics with sufficient education coursework over the course of their undergraduate years, as well as with student teaching experience, so that they can become secondary teachers after graduation, with a commitment to teach for a specified number of years. On the other hand, Math for America provides generous stipends and training for mid-career changers and college graduates who seek to become secondary mathematics teachers and are willing to make a five-year commitment. One attraction of some of these alternative routes to a teaching position for academically able undergraduates, according to some research, is the opportunity to avoid having to take many education courses they do not think they need. Thus, one solution to the shortage of academically qualified teachers at the secondary level is the reduction or alteration of licensure requirements for them. For others, a generous stipend and program support may be a solution.

The situation at the K-8 level is very different. Here the problem is the need to upgrade prospective teachers academically before they begin teaching. Prospective teachers for the elementary and middle grades often do not major in an academic discipline that is taught in K-8, such as English, history, mathematics, or a science, even when the state requires them to have a Bachelor of Arts degree and a major in the arts and sciences (instead of or in addition to an education major). And if they seek a teaching license by graduation, they often have to take many education courses instead of liberal arts electives as part of their undergraduate program of studies.

Unfortunately, neither Title II of the Higher Education Act nor the No Child Left Behind Act addressed or solved either of these problems. A provision in Title II in the 1998 reauthorization of HEA required states to report annually on pass/fail rates for each cohort of aspiring teachers in their state, leaving up to each state the decision on what licensure tests it would require, what it would assess on them, their passing scores, and when the tests could be taken. This provision could not and did not stimulate an increase in the number of potential core subject teachers at the secondary level with academic majors. Nor, more important, did it necessarily stimulate the strengthening of preparation programs in reading and mathematics for elementary teachers (see Steiner & Rozen, 2004; National Council on Teacher Quality, 2006; Greenberg & Walsh, 2008). Education faculty members were able to define "program completer" in a way that led to close to 100% pass rates for almost all programs. The most this provision may have accomplished is the weeding out of grossly incompetent candidates for admission to or exiting from a licensure preparation program. Certainly, the amount of content-oriented professional development that has been increasingly required of teachers in the past two decades strongly suggests that we are investing in remedial professional development, not professional enrichment. To put it another way, we have been backloading the academic knowledge teachers need for teaching, rather than frontloading it.

As for NCLB's injunctions about states ensuring that their teaching force consists of "highly qualified" teachers, once the states could show that their teachers were appropriately licensed, had passed a relevant subject matter test (no matter how dubious its academic quality), or had undertaken a specially tailored program for becoming qualified via professional development, they were off the hook. Either teachers were qualified or they were not, and the means for changing the status of underqualified teachers were clearly spelled out. There was no way to

show regular increases over time in the academic strength of a state's teaching force, as defined by teachers' knowledge of the subject(s) they taught or were preparing to teach.

Why teacher quality can be defined as teachers' knowledge of the subject they teach

Why should a state try to use measures of increases in prospective and practicing teachers' knowledge of the subject they teach as an index to improvement in teacher quality? According to the best research available, teachers' knowledge of the subject they teach is the chief *teacher* characteristic related to student achievement. As a report by the Center on American Progress (Miller & Chait, 2008) notes in reference to science or mathematics teachers, "a generic master's degree, rather than a degree in mathematics or science, has scant value as an indicator of effective teaching."

Teachers' knowledge of the subject(s) they teach can be objectively measured in different ways, e.g., the number of grade 8 teachers in Arkansas holding an Algebra 1 endorsement, or the number of Arkansas teachers teaching middle school with a grades 7-12 license. Arkansas has seen much progress in student achievement in reading and mathematics in the past decade, to judge by the results of statewide assessments and National Assessment of Education Progress tests. It has also seen much progress in other ways, such as in the number of students taking Advanced Placement (AP) tests and passing with a score of 3 or higher. These are objective measures of change or improvement. Just as Arkansas now uses the percentage of student scores in the two highest performance categories at each grade level, or the number of students passing an AP course with a 3 or higher, as measures for gauging gains in student achievement from year to year, the state can also establish and use objective measures of prospective and practicing teachers' knowledge of the subject they teach for gauging gains over time in teacher quality.

That teachers' knowledge of mathematics makes a difference to student achievement in mathematics is one of the most important findings reported in *Foundations for Success*, the final report of the National Mathematics Advisory Panel (U.S. Department of Education, 2008). It found from its review of the best research available that substantial differences in student achievement are attributable to differences in their teachers, and that teachers' knowledge of mathematics is, so far, the only characteristic of effective mathematics teachers identified by research. As I have noted elsewhere (Stotsky, 2008), this does not necessarily mean that mathematical knowledge is the only characteristic of an effective teacher of mathematics; it means only that there is no basis in research for considering either the pedagogical coursework taken for certification or teaching experience as more important characteristics.

The National Mathematics Advisory Panel (henceforth referred to as Panel) also reviewed all the quality research on the relationship between teachers' professional development in mathematics and student achievement in mathematics. It found scant evidence attesting to the value of professional development for increasing student achievement in mathematics, and in those few studies showing a relationship, it was not at all clear what accounted for the results. Indeed, it is still not clear what effect the carefully defined professional development funded as part of Reading First has had on primary grade teachers' understanding of research-based reading instructional knowledge and, by extension, on student achievement in reading. Thus, the amount of professional development that teachers have taken is not at present a useful measure pointing to an increase in the academic quality of the state's teaching force.

However, the Panel's report did highlight several other findings that suggest useful indices of teacher quality as defined by teachers' knowledge of the subject they teach. The Panel found a relationship between the undergraduate mathematics coursework taken by high school mathematics teachers and high school students' mathematics achievement. Since most high school mathematics teachers are apt to have majored or minored in mathematics, this finding suggests that the number of mathematics courses they have taken may be a useful measure of their quality. However, the Panel found no relationship between the undergraduate mathematics coursework taken by elementary and middle school teachers and elementary and middle school students' mathematics achievement. This finding implies that these teachers may not have taken appropriate or enough mathematics coursework in their undergraduate programs. It further suggests that a measure of the mathematical knowledge prospective Arkansas teachers have gained from the mathematics courses they have taken, not just a measure of the number of such courses, may be useful.

The Panel's report also noted that state licensure tests for those who teach mathematics as generalists (e.g., early childhood, elementary, middle school, and special education teachers) or as specialists (full-time mathematics teachers) vary in the amount and level of the mathematics assessed, and in some cases assess no mathematics content at all. This observation suggests that one might examine the licensure tests prospective Arkansas teachers take to find out if these tests adequately assess the mathematics knowledge they gained, or should have gained.

Possible Indices for Arkansas in Mathematics and Reading Instructional Knowledge

In this section I propose some indices that Arkansas might be able to use to judge whether increases in the academic quality of its teaching force are taking place over time. These indices can identify trends as they emerge. I will list, first, possible indices that could be used almost immediately if the data on which they are based are made available. I will also explain why each might serve to inform policy makers about the academic quality of Arkansas's teaching force.

Indices that are easy to develop:

1. The number and percentage of prospective teachers in each licensure field passing their subject area test(s) on the first try, as well as the number and percentage of those retaking and passing their subject area test(s), from test administration to test administration and from year to year, broken down according to whether they have followed a traditional or alternative route to licensure

Policy makers should have clear information on how many prospective teachers are in the pipeline from year to year in each subject area, and from what routes. It is also useful to know how many prospective teachers did not pass their subject area test the first time. This information would not tell us why they did not pass the first time, which should be explored. But an increase in the number and percentage of those who pass the first time would be a signal of better preparedness. In addition, a link between any such increase and a particular licensure route would provide useful information for policy purposes.

2. The number and percentage of career-technical education teachers in each occupational area with a permit completing Arkansas Department of Education-sponsored pedagogical coursework for licensure on an annual basis.

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Policy makers should have clear information on how many career-technical education teachers complete the coursework for initial licensure in each occupational area from year to year. Far too many of the teachers hired for career-technical education in Arkansas have provisional licenses, and an increase in the number of those with initial licensure in occupational areas not covered by current undergraduate programs would be useful information to have as the state tries to upgrade and expand its workforce.

3. The number and percentage of middle school teachers with a subject area license for grades 7-12.

Grade 7 or 8 teachers with middle school generalist licenses requiring 48-60 hours of academic work across the four major subjects they can legally teach (English, mathematics, science, and social studies) may not be of the same academic quality as grade 7 or 8 teachers with a single subject license for grades 7-12 based usually on a single major and minor. There is a possible lack of equity for students in these grades across schools. An index of teacher quality that noted whether there were increases in the number and percentage of subject area specialists in middle schools would help to send a message to rural principals. While they need some flexibility in re-assigning their staff from year to year to fill vacancies caused by departing teachers or slight school population shifts, they must also be encouraged to work out schedules that allow for the use of subject area specialists in grades 7 and 8.

4. The number and percentage of grade 8 teachers passing the PRAXIS Middle School Mathematics test for an Algebra I endorsement, from test administration to test administration and from year to year.

The Arkansas Department of Education commendably sought to ensure that an authentic Algebra 1 course could be taught in grade 8 by a mathematically stronger teacher than the typical grade 8 teacher with a generalist middle school license. In 2008 it began providing an Algebra 1 endorsement to grade 8 teachers who pass the PRAXIS Middle School Mathematics test. Policy makers should be able to find out how many teachers take the test, pass it the first time, and pass it after retaking it, from year to year. Not only will they want to note the trends in taking and passing this test in relation to student achievement in Algebra 1 in grade 8, they will also want to find out what those who initially failed the test needed to do in order to pass the test at a later date, or if they chose not to retake the test.

5. The number of full-time elementary mathematics and science teachers as a percentage of all P-4 and 4-8 teachers.

The National Mathematics Advisory Panel recommended in its report that elementary schools should pilot the use of full-time mathematics teachers. These would be teachers with a strong knowledge of mathematics who have specialized in elementary mathematics teaching. What is required for the use of full-time teachers of mathematics and science (and history/geography and reading) in the elementary school, especially in grades 4-6, is a restructuring of the school schedule. Their use does not involve additional teachers, simply a deployment of the current number of teachers in a different way. Their use would also entail lower costs for professional development in mathematics. Fewer teachers would need it, in contrast to the present situation in which all elementary teachers need professional development in mathematics all the time.

6. The total number of academic and career-technical teachers teaching in each subject area or field on an annual basis, as well as the number holding a waiver.

The public needs to know how the state is meeting the needs of its schools in each area on an annual basis.

7. The number and percentage of teachers annually who take and pass an ABCTE subject area test or a NBPTS subject area test as part of a certificate program to attain master teacher status in a particular subject, as well as the number and percentage of those who retake and then pass the test during that year.

Both organizations provide tests of subject area knowledge for teachers seeking master teacher status that are likely more difficult than the subject area tests the teachers took for initial licensure. Whether or not these teachers complete the certificate program, the fact that they have passed a more demanding test contributes to a useful measure of academic quality for experienced teachers. Further research could determine whether the academic achievement of the students of these teachers in subsequent years also increases.

Indices that could be developed. These measures require changes in current licensure policies or an examination of the content of the reading methods and mathematics coursework that prospective teachers now take.

8. The number and percentage of elementary teachers who have taken appropriate mathematics courses and/or passed a licensure test that adequately assesses relevant mathematics knowledge.

At present, there are no licensure tests available that adequately assess aspiring early childhood or elementary teachers' mathematical knowledge (Stotsky, 2009). But that fact will change in March 2009. In 2007, because of concern that 25% of a general elementary curriculum test was not adequate for assessing prospective elementary teachers' knowledge of relevant mathematical concepts and skills, and because there was no clear information on the level of difficulty of this 25%, the Massachusetts Board of Elementary and Secondary Education approved the construction of a new 40-item mathematics section that, beginning in March 2009, will count for 50% of the general curriculum test *and* have its own cut score.¹ The Board of Elementary and Secondary Education also approved a set of guidelines for the contents of the test to help the state's elementary (and special education) licensure programs to develop appropriate mathematics coursework (Massachusetts Department of Elementary and Secondary Education, 2007). In coming years, it will track the number and percentage of test-takers passing the test at each test administration, while the Board of Higher Education will examine the content of required coursework in mathematics in all licensure programs for these prospective teachers, in order to evaluate test results. Department staff will also try to relate elementary students' mathematics scores on state tests to whether their teachers have passed the new test. All state boards of education or teacher licensing agencies should establish such a measure of elementary teacher quality and examine its correlation with student achievement in mathematics (Stotsky, 2007a; Stotsky, 2007b).

9. The number and percentage of elementary teachers who have taken coursework on research-based reading instructional knowledge and/or passed a dedicated test of research-based reading instructional knowledge.

There are two reasons why such a measure would be useful. Arkansas, like most states, does not require a dedicated test of research-based reading instructional knowledge (as spelled out in the 2000 report of the National

¹ Pearson Evaluation Systems has made available a practice test at http://www.mtel.nesinc.com/PDFs/MA_FLD003_SubtestII_PRACTICE_TEST.pdf

Reading Panel), and the licensure tests it does use for prospective early childhood teachers (and prospective special education teachers) do not assess this knowledge adequately. In fact, most states do not use tests that assess research-based reading instructional knowledge adequately (Rigden, 2006; Stotsky, 2006). Moreover, two studies that examined syllabi for reading methods courses since 2000 (Steiner & Rozen, 2004; National Council on Teacher Quality, 2006) found that few schools of education expect an understanding of this body of knowledge in their reading methods courses. To drive changes in their teacher preparation programs in order to remedy this situation, a handful of states (e.g., California, Connecticut, Massachusetts, and Virginia) now require prospective elementary teachers (and special education and/or early childhood teachers as well) to take a dedicated test of research-based reading instructional knowledge to ensure that new teachers come into the classroom knowing how to teach reading in ways that are supported by the evidence from a large body of credible research.

10. The number and percentage of test-takers achieving a passing score on relevant required subject area licensure test(s) after an increase in the passing score, announced two years in advance.

This kind of measure implies a regular upgrading of all the subject area licensure tests Arkansas now requires. In theory, there is no reason why the state could not reset the cut score for its subject area tests upwards on a regular basis (for example, every five years, with advance notice to institutions of higher education before each resetting) in order to motivate licensure programs and future teachers to pay more attention to the academic coursework they need for passing the test at a more demanding level. The reason why this seemingly drastic measure should be considered relates to the current set of tests that the state now requires of its prospective teachers.

Why Arkansas might benefit from raising cut scores on its licensure tests or adding new tests

Arkansas is a rural state and a geographically large state. As the state's legislators know, this means a relatively small number of students per school district, despite recent consolidation of some school districts. Less well known to the state's legislators is the academically weak nature of many of the licensure tests its teachers are required to take, especially the middle school generalist licensure test that teachers in middle or K-8 schools throughout the state have taken.

The fact that principals in rural areas with small numbers of teachers and students want teachers who are licensed to teach all of the major subjects in the curriculum: English, mathematics, science, and social studies (which includes history, geography, economics, and civic education) does not mean that the state must use an academically weak licensure test for them. It is understandable that rural principals need flexibility in re-assigning their staff from year to year, given the qualifications for a "highly qualified teacher" embedded in the No Child Left Behind Act. And, according to the state's own regulations, they cannot assign teachers without the appropriate academic background and license to teach a required subject, not even for 20% of their time (allowable out-of-field teaching in many other states). The development of a middle school generalist license took place nationally several decades ago, not to address the problems of rural schools but to staff the middle schools that were being created out of academically downgraded junior high schools (with grade 9 siphoned off to the high school level). Nevertheless, the middle school generalist license (for grades 4-8) has come to serve almost completely the purpose intended by the old K-8 license, which allowed an elementary teacher to teach almost all subjects in all grades from K to 8. Arkansas is to be commended for requiring for its middle school generalist license 48 to 60

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academic hours in the four major subjects, or 4 to 5 three-credit courses per subject. But it is not at all clear that Arkansas is getting its money's worth from the middle school PRAXIS test it requires teachers in grades 4 -8 to take, no matter where the cut score is set.

For example, the level of difficulty of the passages in the literature or reading sections of these tests may not be worthy of a college graduate. To judge from the sample passage given on the Educational Testing Service (ETS) Web site for the Middle School Content Knowledge test, the level of reading ability expected of the grade 7 or 8 English teacher is less than one would expect of many students in those grades. The Web site explains that the sample questions are not "representative of the entire scope of the test in either content or difficulty," but, nevertheless, the passage below is the only passage by which one may judge the level of academic expectations that ETS test developers hold of middle school English teachers, and it is clearly not high. The sample passage is an excerpt from *Thousand Pieces of Gold*, by Ruthanne Lum McCunn.

"Polly laid her forehead against the cold pane of glass. Outside a meadowlark sang, its haunting melody reminding her of the three robins she had saved after Mr. Grostein's cat had killed the birds' mother.

At first, they were content to fly around her room, but soon they began pecking at the window, demanding to be let out. So Charlie built a cage for them, and Polly hung the cage on a tree outside. But their cries tore at her, and finally she opened the door, letting them fly where they pleased. Then one day Mr. Benson, the butcher, came to the saloon and handed her a cigar box with three stiff bodies crusted with blood.

He was sorry, he said. He knew how much the birds meant to her, and he had reprimanded his clerk severely. But the way they hovered, demanding scraps, had been annoying, and if she had kept them in the cage Charlie had made for them, his clerk would not have killed them.

Charlie had told her the same thing, and she had tried to explain why, even though she mourned the birds' deaths, she did not regret leaving them uncaged. But he had not understood. Then how could she make him understand her own need to escape the cage that held her."

Moreover, compensatory scoring is used on all licensure tests. In other words, the total score a test-taker gets is the sum of all the points accumulated on the test. Thus, a test-taker could get most of the items in one section (or more) wrong and still pass the test. As the chart below shows, each section of the test accounts for only 25% each of the whole test. Much depends on exactly where the cut score is set, of course.

On the other hand, a prospective teacher who obtains a license to teach mathematics or English for grades 7-12 takes a subject area test that assesses mathematics or English for 100%, not 25%, of the test. Thus, a single subject test, with many more test items on it, *may* reflect broader and deeper academic expectations of prospective teachers for that license. However, much depends on exactly what is being assessed on such a test. Commendably, the state introduced in 2008 an Algebra 1 endorsement to enable current grade 8 teachers with only a generalist middle school license to teach an authentic Algebra 1 course. But this 40 multiple-choice question test (with 3 more short answer questions addressing problem solving, worth 11% each) is an additional test, not part of the middle school content knowledge test. And, it contains only 12 multiple-choice test questions in a category labeled "Arithmetic and Basic Algebra" (worth 20% of the test). It is not clear how many of the 12

multiple-choice questions in this category address "basic algebra," nor how many of the three "constructed response" questions address algebra. Nor is it clear from an *Education Week* article on the state's new requirement (Cavanagh, 2008) how many, if any, of the state's mathematics professors examined the contents of this on-the-shelf ETS test to offer an informed judgment on how well it covers the knowledge base needed for teaching an authentic Algebra 1 course. Finally, what is not at all clear is its cut score. Nevertheless, students might benefit academically if all prospective middle school generalist teachers were required to take an academically stronger test than they now do, or if the cut scores on the current tests were set higher.

Middle school students might benefit even more if prospective elementary teachers were also required to take an academically stronger licensure test than they now do. The chart below also shows the percentage of test content ostensibly devoted to language/literacy/literature and mathematics in the tests required of those who seek to teach elementary school children in Arkansas, grades P-4. I say "ostensibly" because a large number of test questions on PRAXIS 0022 are "framed in the context of children's learning," according to the description of this test. In other words, they assess the teaching of reading and mathematics, rather than mathematics knowledge per se. At best, as can be seen, the prospective elementary school teacher in Arkansas takes a licensure test only 25% of which addresses mathematics or mathematics pedagogy, and only 31% of which addresses all the areas in the English language arts: language, literature, composition, and grammar, as well as the knowledge base needed for teaching reading itself.

In my judgment, the licensure tests that Arkansas uses for assessing prospective elementary and special education teachers' knowledge of the two critical subjects they must teach and their capacity to address the state's content standards in its state assessments are not sufficiently demanding, no matter where the cut score has been set. The state's teacher testing policy makers might consider several possibilities: (1) requiring a dedicated test of research-based reading instructional knowledge of all prospective elementary teachers as well as special education and/or early childhood teachers, such as is now used in California, Connecticut, Massachusetts, and Virginia, and (2) requiring a specific and more extensive test of mathematics knowledge of these prospective teachers, as Massachusetts is now doing.

There is one more possibility that could address the concerns of some principals in rural areas who want teachers who are licensed to teach more than one major subject in the curriculum. The state does not need to use as the only options either a test that assesses all four major subjects in the middle school curriculum or a test for a single subject area. The state could offer, in addition, a test covering just two subjects: a test of English and history, or a test of mathematics and science. It could then encourage rural school principals to hire teachers for its middle schools who are licensed to teach only two subjects at most (and who have therefore majored in one and minored in the other) in order to strengthen the academic preparation of middle school students for more authentic high school work.

Table 1: Licensure Tests Required in Arkansas for Prospective Early Childhood and Middle School Teachers

Licensure Tests Required in Arkansas for Prospective Early Childhood and Middle School Teachers	Number of Questions	Percentage of Test on Literacy Knowledge	Percentage of Test on Mathematics Knowledge
Subject Test For Prospective P-4 Teachers			
PRAXIS 0022 (<i>Early Childhood: Content Knowledge</i>)	120	31%	25%
Subject Test for Prospective Middle School Teachers			
PRAXIS 0146 (<i>Middle School: Content Knowledge</i>)	120	25%	25%
Subject Test for Prospective P-4 Special Education Teachers			
PRAXIS 0351 (<i>Special Education: Knowledge-Based Core Principles</i>)	60	0%	0%
Tests of Pedagogical Knowledge for Beginning Teachers and for Educational Examiners at Different Grade Levels			
PRAXIS 0521 (<i>Principles of Learning and Teaching: Early Childhood</i>)	24 MC 12 short answers	0%	0%
PRAXIS 0522 (<i>Principles of Learning and Teaching: Grades K-6</i>)	Same	0%	0%
PRAXIS 0523 (<i>Principles of Learning and Teaching: Grades 5-9</i>)	Same	0%	0%
PRAXIS 0524 (<i>Principles of Learning and Teaching: Grades 7-12</i>)	Same	0%	0%

Why Arkansas should eliminate some of the tests it now requires

In addition to a test of teachers' skills and a test of subject area knowledge, the state also requires one of the tests ETS offers in a PRAXIS series called Principles of Learning and Teaching. This set of tests is designed to assess “what a beginning teacher should know about teaching and learning.” As the chart shows, there are four tests in this set of tests, one for early childhood (0521), one for grades K-6 (0522), one for grades 5-9 (0523), and one for

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grades 7-12 (0524). These particular PRAXIS tests assess new or prospective teachers' knowledge of the educational theories or principles that guide classroom practice and instructional programs in every subject area. Each of the four tests in this set of tests consists of 24 multiple-choice questions and four "case histories" that are each followed by three short-answer questions scored on a scale of 0 to 2. Test content is organized in four categories:

1. Students as Learners (33%, 22% of which is based on short-answer questions)
2. Instruction and Assessment (33%, 22% of which is based on short-answer questions)
3. Teacher Professionalism (22%, 11% of which is based on short-answer questions)
4. Communication Techniques (11%, based solely on short-answer questions).

Arkansas, like other states, wants prospective teachers to know how to teach, as well as to have an adequate knowledge base for the subjects they teach. But state policy makers need to be aware of the bias in these pedagogical tests. They appear to have serious limitations from a special education perspective in particular. The National Mathematics Advisory Panel found that "explicit instruction with students who have mathematical difficulties has shown consistently positive effects on performance with word problems and computation. Results are consistent for students with learning disabilities, as well as other students who perform in the lowest third of a typical class" (p. xxiii). Indeed, the research base for both reading and mathematics instruction supports explicit and systematic instruction for struggling students. Yet, to judge by sample items on the ETS Web site, these tests of "principles of learning and teaching" seem to promote a particular pedagogical philosophy and set of strategies that discredit teacher-directed instruction of academic concepts and skills. Indeed, these tests, which Arkansas requires of its educational examiners as well as of all prospective teachers, not only promote student-directed learning but also demean teacher-directed instruction, even though the Panel found no body of research evidence to support an emphasis on either a "student centered" or "teacher directed" approach.

Two examples will show how sample test questions and answers serve to promote a pedagogy favoring student-directed learning and/or to discredit teacher-directed instruction. The following question and choices follow the description of PRAXIS 0522:

- Which of the following kinds of instruction is frequently cited as the opposite of discovery learning?
- (A) Simulation games
 - (B) Expository teaching
 - (C) Mastery learning
 - (D) Schema training

As ETS does on all its Answer pages for all its sample test questions for all its tests, the Answer page for this example carefully explains why the best answer is B. "The method of teaching most often seen as the opposite of discovery teaching is expository teaching. Discovery learning allows students to explore material on their own and arrive at conclusions. In expository teaching, students are presented with subject matter organized by the teacher." Not only is this an odd definition of an uncommon phrase ("expository teaching"), it is an indirect slap

at direct instruction and leaves anyone familiar with mastery learning in the dark about why it didn't qualify as the best answer.

The following sample test item accompanies all four test descriptions. It subtly discredits any approach to instruction other than an approach favoring student-directed learning in the answers to the questions that follow two paragraphs, which are presented as being taken from a debate about the advantages and disadvantages of a constructivist approach. Here are the two passages and the two questions following them:

Why constructivist approaches are effective

The point of constructivist instruction is to have students reflect on their questions about new concepts in order to uncover their misconceptions. If a student cannot reason out the answer, this indicates a conceptual problem that the teacher needs to address. It takes more than content-related professional expertise to be a "guide on the side" in this process. Constructivist teaching focuses not on what the teacher knows, but on what and how the student learns. Expertise is focused on teaching students how to derive answers, not on giving them the answers. This means that a constructivist approach to teaching must respond to multiple different learning methods and use multiple approaches to content. It is a myth that a constructivist teacher never requires students to memorize, to drill, to listen to a teacher explain, or to watch a teacher model problem-solving of various kinds. What constructivist approaches take advantage of is a basic truth about human cognition: we all make sense of new information in terms of what we already know or think we know. And each of us must process new information in our own context and experience to make it part of what we really know.

Why constructivist approaches are misguided

The theory of constructivism is appealing for a variety of reasons—especially for its emphasis on direct student engagement in learning. However, as they are implemented, constructivist approaches to teaching often treat memorization, direct instruction, or even open expression of teacher expertise as forbidden. This demotion of the teacher to some sort of friendly facilitator is dangerous, especially in an era in which there is an unprecedented number of teachers teaching out of their fields of expertise. The focus of attention needs to be on how much teachers know about the content being taught. Students need someone to lead them through the quagmire of propaganda and misinformation that they confront daily. Students need a teacher who loves the subject and has enough knowledge to act as an intellectual authority when a little direction is needed. Students need a teacher who does not settle for minimal effort but encourages original thinking and provides substantive intellectual challenge.

Question One: The first passage suggests that reflection on which of the following after a lesson is an essential element in constructivist teaching? (The correct answer is C.)

- (A) The extent to which the teacher's knowledge of the content of the lesson was adequate to meet students' curiosity about the topic.
- (B) The differences between what actually took place and what the teacher planned.
- (C) The variety of misconceptions and barriers to understanding revealed by students' responses to the lesson.
- (D) The range of cognitive processes activated by the activities included in the lesson design and implementation.

Question Two: The author of the second passage would regard which of the following teacher behaviors as essential for supporting student learning?

- (A) Avoiding lecture and memorization
- (B) Allowing students to figure out complex problems without the teacher's intervention

- (C) Emphasizing process rather than content knowledge
- (D) Directly guiding students' thinking on particular topics

There are several problems with this sample test item and its answer options. First, one must note the way in which the passages are titled—"Why constructivist approaches are effective" and "Why constructivist approaches are misguided"—implying that there is a research base supporting constructivist approaches (even if critics think they are misguided) and pre-empting any challenge to this assertion. However, as noted above, one key finding of the Panel report is that high-quality research does not support the exclusive use of either a "student centered" or "teacher directed" approach; i.e., there is no body of evidence to favor the wholesale promotion of either approach (p. xxii).

Second, assertions in each passage are made to appear as a contrast to each other, implying that student achievement is the concern of the constructivists, not their critics. What teacher would fail to see constructivism as the clear winner in this debate, based on these two paragraphs? Needless to say, the ETS Web site provides no reference for this debate, if it actually took place.

Third, the supposedly correct answer to the second question, D, is in fact not an answer to the question posed but will likely convince prospective test-takers studying these sample questions (as well as school supervisors and those making the decision to require these tests for any level of licensure in the state) that non-constructivist teaching is undesirable on ethical and civic grounds. Nowhere does the second passage say or imply that critics of constructivism want teachers to directly guide "student thinking on particular topics." If anything, it implies the exact opposite in its final sentence. But the Answers page explains why D is the best answer. "The best answer is D. The second author maintains that students require teacher guidance and a direct expression of the teacher's expert content knowledge in order to learn most effectively. Choices A, B, and C are not consistent with this approach to teaching. Direct guidance of student's thinking is consistent with the second author's approach." In other words, critics of constructivism support indoctrination.

There are probably several reasons for the way D has been worded: first, to make sure that anyone reading the second passage wouldn't be carried away by the last sentence in the passage and come down on the side of the critics; and second, to make the test-taker recoil from any desire to be on the side of the critics. (After all, D could have been worded to reflect what the critic of constructivism *does* say in the last sentence.) No normal American teacher would want to be seen as an indoctrinator if that is how a teacher will be described who thinks students should be taught how to read carefully in order to understand what an author has written, rather than as someone who inculcates democratic values by letting students decide for themselves the meaning of what an author has written.

Concluding Remarks

In summary, two educational policies seem to be undermining the state's laudable effort to ensure that principals of small middle schools or K-8 schools have licensed teachers for the middle grades with sufficient academic knowledge in the subjects they teach, as well as staffing flexibility. One is the use of academically weak licensure tests to assess the academic knowledge of prospective middle school (and elementary) teachers, regardless of where the cut score is set. The second is the use of the PRAXIS II series of pedagogical tests for initial licensure (and for licensing the educational examiners themselves). An examination of the state's framework for its teacher licensure tests leaves one with the impression that educational policy makers are overly concerned about how teachers teach and not sufficiently concerned about whether teachers know enough about a subject to teach it. Arkansas should consider raising the cut scores on the subject area tests it now requires and adding academically stronger tests in several key areas or, at the least, eliminating the pedagogical tests it now requires. For the sake

of racial equity, prospective elementary teachers should be required to have more mathematics knowledge than they now have, and should be assessed by more demanding mathematics licensure tests (Kenschaft, 2005).

If the state's policy makers are unwilling to require additional licensure tests, raise cut scores, eliminate seemingly counterproductive pedagogical tests, or develop academically stronger tests altogether for every subject area, they can still establish a number of measures by which to gauge increases, decreases, or plateaus in teacher quality as defined by teachers' knowledge of the subjects they teach. And whether or not they decide to establish and use such measures, the information listed below should be made available to legislators, educational researchers, and the public at large on the Arkansas Department of Education web site. This kind of information does not identify any individual teachers, schools, or institutions of higher education and is clearly public information.

Information that could be made available on the ADE Web site:

1. Results for each test administration in all subject areas: number of test-takers, percentage passing, number taking each test for a second or more time, percentage passing.
2. Number of multiple choice questions and percentage of constructed response items required to be correct for a passing score on each licensure test required.
3. Number of academic and career-technical teachers receiving an initial license in each subject each year according to route taken (traditional or alternative certification).
4. Number of full-time elementary mathematics and science teachers employed each year.
5. Number of middle school teachers employed each year holding a grades 7-12 license.
6. Number of middle school teachers employed each year holding an Algebra 1 endorsement.
7. Total number of academic and career-technical teachers employed each year by subject area, and the total number of those on waiver by subject area.
8. Syllabi of required mathematics courses for prospective elementary, middle school, and special education teachers.
9. Syllabi of required reading instructional methods courses for prospective elementary, middle school, and special education teachers.
10. Copies of evaluation forms used by each teacher training institution for student teachers.
11. Criteria used for evaluating new teachers on the dimensions listed in PRAXIS II, as well as the criteria used for evaluating teachers for standard license on the dimensions listed in PRAXIS III.
12. Number of teachers annually who have tried to pass a NBPTS or ABCTE subject area test for master teacher status, and the number who have passed.

Many other policies could be pursued by a state department of education to improve teacher quality in a state (Stotsky, 2004), but the suggestions listed above would constitute a useful beginning.

References

Paper presented at a conference on Preparing Highly Qualified Teachers for Arkansas
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- Greenberg, J., & Walsh, K. (2008). *No common denominator: The preparation of elementary teachers in mathematics by America's education schools*. Washington, DC: National Council on Teacher Quality.
- Cavanagh, S. (2008). 8th Grade Algebra Teachers in Arkansas to Need State Nod. *Education Week*. October 21.
- Kenschaft, P.C. (2005). Racial Equity Requires Teaching elementary School teachers More Mathematics. *Notices of the American Mathematical Society*, Vol. 52 (2), 208-212.
- Levine, A. (2006). *Educating school teachers*. Washington, DC: The Education Schools Project.
- Massachusetts Department of Education. (2007). *Guidelines for the mathematical preparation of elementary teachers*. Author. <http://www.doe.mass.edu/mtel/MathGuidance.pdf>
- Miller, R., & Chait, R. (December 2008). *Teacher Turnover, Tenure Policies, and the Distribution of Teacher Quality: Can High-Poverty Schools Catch a Break?* Washington, D.C.: Center for American Progress.
- Mitchell, R., & Barth, P. (Spring 1999). How Teacher Licensing Tests Fall Short. *Thinking K-16. Education Trust*, 3.
- National Council on Teacher Quality. (2006). *What teacher preparation programs aren't teaching about reading--and what elementary teachers aren't learning*. Washington, DC: National Council on Teacher Quality.
- Rigden, D. (2006). Report on Licensure Alignment with the Essential Components of Effective Reading Instruction. Retrieved May 24, 2007, from http://www.rften.org/content/Rigden_Report_9_7_06.pdf.
- Steiner, D., & Rozen, S. (2004). Preparing tomorrow's teachers: An analysis of syllabi from a sample of America's schools of education. In F.M. Hess, A.J. Rotherham, & K. Walsh (Eds.). *A qualified teacher in every classroom? Appraising old answers and new ideas*, (pp. 119-148). Cambridge, MA: Harvard Education Press.
- Stotsky, S., & Haverty, L. (2004). Can a state department of education increase teacher quality? Lessons learned in Massachusetts. In D. Ravitch (Ed.), *Brookings papers on education policy*, (pp. 131-180). Washington, DC: Brookings Institution.
- Stotsky, S. (2006). Why American students do not learn to read very well: The unintended consequences of Title II and teacher testing. *Third Education Group® Review / Articles*, 2.1 Retrieved on October 21, 2007 from <http://www.thirddeducationgroup.org/Review/Articles/v2n1.htm>
- Stotsky, S. (2007a). How state boards of education can upgrade math teaching in the elementary school. National Association of State Boards of Education. *Commentaries*, 13. http://www.nasbe.org/new_resources_section/commentary/Comm_Upgrade_Math_Teaching_Elementary_Schools_02.07.pdf
- Stotsky, S. (2007b). Teacher licensure tests: Their relationship to mathematics teachers' academic competence and student achievement in mathematics. *Education Working Paper Archive*, Department of Education Reform, University of Arkansas. Retrieved October 21, 2007 from http://www.uark.edu/ua/der/EWPA/Research/Teacher_Quality/1798.html

Paper presented at a conference on Preparing Highly Qualified Teachers for Arkansas
Sponsored by the Office for Education Policy at the University of Arkansas
April 2009

Stotsky, S. (2008). *How to strengthen K-12 mathematics education in Massachusetts: Implications of the National Mathematics Advisory Panel's report*. Center for School Reform. Policy Brief. Boston: Pioneer Institute.

Stotsky, S. (2009). Licensure tests for special education teachers: How well they assess knowledge of reading instruction and mathematics. To appear in the *Journal of Learning Disabilities*, 2009.

U.S. Department of Education. (2008). *Foundations for success: Final report of the National Mathematics Advisory Panel*. U.S. Department of Education.