Full Research Rationale

Standard 1: Selection Criteria

The program selects teacher candidates of strong academic caliber.

Standard applies to elementary, secondary and special education programs.

Why this standard?

To ensure that our children receive a world-class education, their teachers need to be world-class. Sixty years of research and the experience of nations whose students outperform our own have proven that we can only achieve this goal by raising the bar of admission to teacher preparation programs.

What is the focus of the standard?

The standard evaluates admissions requirements that help ensure that new elementary, secondary and special education teachers come from the top half of the college-going population. It signals that prospective teachers should have above-average SAT or ACT scores, or at least a 3.0 GPA. However, this standard only expects teacher candidates to be above-average – one does not need to be a genius to be an effective teacher. The standard is tailored to fit different practices at the undergraduate and graduate levels. "Strong design" (🏆) indicators address whether institutions maintain selectivity and diversity or if they are highly selective.

Rationale

Research base for this standard

"Strong research"[1] indicates that higher teacher selectivity as measured by factors such as SAT scores and, to a lesser degree, an IHE's general competitiveness is correlated with increased student achievement.[2] Although most strong research supports applying greater selectivity when admitting teacher candidates, one study found no correlation between teachers' higher college entrance exam scores (e.g., SAT, ACT) and student achievement[3] and another found no correlation between university selectivity and teacher effectiveness.[4]

[1] NCTQ has created "research inventories" that describe research conducted within the last decade or so that has *general* relevance to aspects of teacher preparation also addressed by one or more of its standards (with the exceptions of the Outcomes and Evidence of Effectiveness standards). These inventories categorize research along two dimensions: design methodology and use of student performance data. Research that satisfies our standards on both is designated as "strong research" and will be identified as such. That research is cited here if it is *directly* relevant to the standard; strong research is distinguished from other research that is not included in the inventory or is not designated as "strong" in the inventory. Refer to the introduction to the research inventories for more discussion of our approach to categorizing research. If a research inventory has been developed to describe research that generally relates to the same aspect of teacher prep as addressed by a standard, the inventory can be found in the back of this standard book.

[2] For research supporting greater selectivity for teacher preparation programs, see Boyd, D., et al. (2008, June). *The narrowing gap in New York City teacher qualifications and implications for student achievement in high poverty schools* (Working Paper No. 14021). Cambridge, MA: National Bureau of Economic Research.

[3] Harris, D. N., & Sass, T. R. (2011). Teacher training, teacher quality and student achievement. *Journal of Public Economics, 95,* 798-812. Note: This study relates to several NCTQ standards. Although it meets the criteria for strong research, the study's findings run contrary to the conclusions of most strong research in the field.

[4] Chingos, M. M., & Peterson, P. E. (2011). It's easier to pick a good teacher than to train one: Familiar and new results on the correlates of teacher effectiveness. *Economics of Education Review, 30*(3), 449-465. This study examined selectivity based on *U.S. News and World Report's* rankings and found no statistically significant correlation with teacher effectiveness, with the exception of a negative correlation with elementary math instruction. This study only examined selectivity at the university level, which may bear no relationship to the qualifications of teacher candidates themselves.

Additional research[5] spanning six decades[6] supports higher academic admissions standards for entry into teacher training programs, including studies showing: 1) a strong correlation between teacher "verbal ability" (frequently measured by SAT, ACT or other vocabulary tests) and student achievement;[7] and 2) a similarly strong correlation between the selectivity of the teacher's college and student achievement.[8] Education programs often use licensing tests (e.g., Praxis I) as admissions criteria for teachers, so the tests provide another useful measure of both teachers' expected teaching ability and education programs' selectivity.[9] Furthermore, a recent but limited study in Mississippi found that middle school students whose teachers earned higher ACT scores had higher levels of proficiency in math, reading, and writing on the state test.[10] Moreover, a recent study found that ELA teachers who attended more competitive IHEs produced longer-lasting learning benefits (as measured by the persistence of teachers' value-added effects on students) than teachers from less competitive IHEs.[11]

Other support for this standard

In countries whose students outperform our own, studies show a clear pattern of teacher preparation programs recruiting and admitting the most academically capable young adults into the profession. McKinsey's 2007 study of high-performing educational systems indicates that other countries set a high bar, with the least selective among their high-performing institutions still selecting teachers from only the top third of students.[12] By contrast, as the Teacher Prep Review shows, most U.S. teacher preparation programs are not ensuring that candidates are drawn from the top half of the college-going population. While there is evidence that the average academic aptitude of the applicant pool, particularly for secondary school, has risen recently, the United States still has a long way to go to ensure that it is drawing its future teachers from the top ranks of high school graduates going to college.

This standard also receives support from school district superintendents.

[5] "Additional research" is research that is not designated as "strong" because it is not as recent and/or does not meet the highest standards for design methodology and/or use of student performance data.

[6] Clotfelter, C. T., Ladd, H. F., & Vigdor, J. L. (2007). *How and why do teacher credentials matter for student achievement?* (Working Paper No. 12828). Cambridge, MA: National Bureau of Economic Research. Clotfelter, Ladd, and Vigdor found college selectivity to have a positive impact on student achievement in North Carolina.
For more research supporting greater selectivity for teacher preparation programs, see Gitomer, D. (2007). *Teacher quality in a changing policy landscape: Improvements in the teacher pool.* Retrieved February 6, 2013, from Educational Testing Service; http://www.ets.org/Media/Education_Topics/pdf/T; Goldhaber, D. D., et al. (2004). *NBPTS certification: Who applies and what factors are associated with success?* Seattle, WA: Center for Reinventing Public Education; Whitehurst, G. J. (2002). *Scientifically based research on teacher quality: Research on teacher preparation and professional development.* (Paper presented at the 2002 White House Conference on Preparing Tomorrow's Teachers); Kain, J., & Singleton, K. (1996, May-June). Equality of education revisited. *New England Economic Review,* (May), 87-114.; Ferguson, R., & Ladd, H. (1991). How and why money matters: An analysis of Alabama schools. In H. Ladd (Ed.), *Holding schools accountable.* Washington, DC: Brookings Institution; Greenwald, R., et al. (1996). The effect of school resources on student achievement. *Review of Educational Research, 66*(3)*, 361-396;* Ferguson, R. (1991). Paying for public education: New evidence on how and why money matters. *Harvard Journal on Legislation, 28*, 465-498; Strauss, R., & Sawyer, E. (1986). Some new evidence on teacher and student competencies. *Economics of Education Review, 5*(1), 41-48; McLaughlin, M., & Marsh, D. (1978). Staff development and school change. *Teachers College Record, 80*(1), 69-94; Summers, A., & Wolfe, B. (1977). Do schools make a difference? *American Economic Review, 67*(4), 639-652; Hanushek, E. (1971). Teacher characteristics and gains in student achievement: Estimation using micro-data. *American Economic Review, 61*(2), 280-288. Master, B., Loeb, S., & Wyckoff, J. (2014). *Learning that lasts: Unpacking variation in teachers' effects on students' long-term knowledge* (working paper). National Center for Analysis of Longitudinal Data in Education research.

[7] Numerous research studies have established the strong relationship between teachers' vocabulary (a proxy for being broadly educated) and student achievement. For example, see Whitehurst, G. J. (2002); Ehrenberg, R., & Brewer, D. (1995). Did teachers' verbal ability and race matter in the 1960s? Coleman Revisited. *Economics of Education Review, 14,* 1-21; Levin, H. M. (1970). A cost-effectiveness analysis of teacher selection. *Journal of Human Resources, 5*(1), 24-33.

[8] Ehrenberg, R., & Brewer, D. (1994). Do school and teacher characteristics matter? Evidence from high school and beyond. *Economics of Education Review, 13*(1), 1-17; Wayne, A., & Youngs, P. (2003). Teacher characteristics and student achievement gains: A review. *Review of Educational Research, 71*(1), 89-122; Winkler, D. (1975). Educational achievement and school peer composition. *Journal of Human Resources, 10,* 189-204.

[9] Clotfelter, C., Ladd, H., & Vigdor, J. (2007). A study of elementary teachers in North Carolina also found that teachers with test scores one standard deviation above the mean on the Elementary Education Test as well as a test of content was associated with increased student achievement of 0.011 to 0.015 standard deviations.

[10] Mississippi Life Tracks. (2013, February). *Teacher quality & student performance: A report on the impact of teachers' ACT scores on student proficiency on standardized tests.* Note: This study does not use randomized assignment of students to teachers, nor does it control for students' prior proficiency levels or use any other measures of student growth while in a teacher's class. Consequently, while these data may indicate that there is a causal relationship between teachers' ACT scores and student proficiency, an equally plausible explanation is that students with higher levels of proficiency are assigned to teachers with higher ACT scores.

[11] Master, B., Loeb, S., & Wyckoff, J. (2014).

[12] Barber, M., & Mourshed, M. (2007, September). How the world's best-performing school systems come out on top. *McKinsey & Co., 16.* For a discussion of teacher preparation program admissions policies in other countries, see McKenzie, P., Santiago, P., Sliwka, P., & Hiroyuki, H. (2005). Teachers matter: Attracting, developing and retaining effective teachers. *Organisation for Economic Co-operation and Development.*

Standard 2: Early Reading

The program trains teacher candidates to teach reading as prescribed by increasingly rigorous state standards.

Standard applies to elementary and special education programs.

Why this standard?

Teaching children how to read is "job one" for elementary and special education teachers because reading proficiency underpins all later learning. Unfortunately, some 30 percent of all children do not become capable readers. Using the knowledge gained from decades of research and articulated in increasingly rigorous state standards, effective reading instruction could cut this unacceptable rate of failure by two-thirds or even more.

What is the focus of the standard?

Lectures, assignments and textbooks of required reading courses are examined to determine whether the training that teachers receive is in line with the findings of the National Reading Panel, the most authoritative source on how children learn to read. Programs meeting the "strong design" (🏆) indicator are exemplary in every aspect of training in reading instruction that we examine.

Rationale

Research base for this standard

A "strong research" study"[13] that assessed teachers' knowledge of the five components of effective reading instruction (phonemic awareness, phonics, fluency, vocabulary and reading comprehension, as identified by the National Reading Panel) found no relationship between teachers' level of knowledge and their level of education (e.g., masters degrees or permanent certification).[14] This study also found no relationship between teachers' knowledge of these components and their students' reading growth – with the notable exception of third-grade students. The authors suggest that these findings may be because programs did not train teachers in the use of appropriate strategies, or because their training did not align with their reading curricula or outcome measures.

Additional research[15] indicates that over the past 60 years, scientists from many fields have worked to determine how people learn to read and why some people struggle. In 2000, the National Reading Panel released an exhaustive review of this research, identifying five critical components of effective reading instruction (listed above). If teachers were to routinely integrate these findings into instruction, it is estimated that the current failure rate of 20 to 30 percent could be reduced to the range of 2 to 10 percent.[16] Preservice preparation that addresses the five essential components of effective reading instruction ensures that novice teachers will enter the classroom ready to teach reading well.

Despite this research on the five critical components of reading instruction, preparation in reading instruction appears to be inadequate. A recent study of a sample of 2,237 preservice teachers attending a nationally representative sample of 99 institutions that prepare teachers for initial certification found that, on average, the teacher candidates failed to have adequate knowledge of the five essential components of early reading instruction, correctly answering only 57 percent of items on a "knowledge assessment."[17]

[13] See note 1 above.

[14] Carlisle, J. F., Correnti, R., Phelps, G., & Zeng, J. (2009). Exploration of the contribution of teachers' knowledge about reading to their students' improvement in reading. *Reading and Writing: An Interdisciplinary Journal, 22*, 459-486.

[15] See note 5 above.

[16] Torgesen, J. K. (2005, November). *Preventing reading disabilities in young children: Requirements at the classroom and school level.* Presented at the Western North Carolina LD/ADD Symposium, Asheville, NC.

[17] Salinger, T., et al. (2010, September). *Study of teacher preparation in early reading instruction.* Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education. Retrieved February 7, 2013, from http://ies.ed.gov/ncee/pubs/20104036/pdf/20104036.pdf

Other support for this standard
If state licensing tests rigorously assessed teacher knowledge of reading instruction, the imperative of evaluating programs would be lessened. But only 17 states have developed strong, stand-alone assessments entirely focused on the science of reading. For example, Massachusetts (the highest performing state in the country) has developed a rigorous assessment for elementary teachers focused solely on reading. Other states rely on either pedagogy tests or content tests that include items on reading instruction. Because reading instruction is addressed only in one small part of most of these tests, it is often not necessary to know the science of reading to pass.[18]

This standard gains additional support from expert panels and school district superintendents, who agree that early reading is critical for elementary teachers. Finally, the Common Core State Standards for early elementary grades are explicitly aligned with the findings of the National Reading Panel.

Standard 3: English Language Learners

The program prepares elementary teacher candidates to teach reading to English language learners.

Standard applies to elementary programs.

Why this standard?
Elementary teachers often serve as the first teachers of English to the increasing numbers of students who come to school speaking other languages. It is imperative that these teachers are equipped to take on the challenge of teaching these students how to read.

What is the focus of the standard?
The standard evaluates whether reading courses for elementary teacher candidates present strategies to address the specific needs of English language learners.

Rationale
Research base for this standard
A "strong research"[19] study found that when teachers of English language learners were trained in a specific model of instructing English language learners, their students made greater gains than the comparison group whose teachers had not received instruction in this model.[20]

Other support for this standard
Recognizing the need for stronger teacher preparation in instructing English language learners, Massachusetts – a state whose students outperform students in all other states – has started to standardize teacher preparation training. The state seeks to ensure that all teachers are equipped to teach to a diverse group of students. After the state's education services for English language learners were found inadequate, Massachusetts developed a new three-credit course that will be a licensure requirement for all teachers by 2016. In the course's three sections, teachers will learn about: 1) their responsibility to educate English language learners; 2) how people learn language; and 3) what instructional strategies and techniques teachers can employ with their English language learner students.[21]

[18] For problems with existing reading tests, see 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, 2*(2) 1-37; Rigden, D. W. (2006). *Report on licensure alignment with the essential components of effective reading instruction.* Washington, DC: Reading First Teacher Education Network; http://www.tegr.org/Review/Articles/vol2/v2n2.pdf

[19] See note 1 above.

[20] The model teaches techniques including using visuals and demonstration, slowing speech, and employing targeted vocabulary development. Echevarria, J. (2006). School reform and standards-based education: A model for English language learners. *Journal of Education Research, 99*(4), 195-210.

[21] Maxwell, L. A. (2012, August). Mass. moves on ELL-training for regular teachers. *Education Week, 31*(37), 8-9. Retrieved February 5, 2013, from http://www.edweek.org/ew/articles/2012/08/08/37massell.h31.html?r=2140887769.

National trends in the K-12 student population demonstrate why preparation to teach reading to English language learners is critically important. In the years from the 2002-03 school year to 2009-10, the number of English language learner K-12 students increased by 4.7 million, or 7.1 percent.[22]

School district superintendents also support this standard.

Standard 4: Struggling Readers

The program prepares elementary teacher candidates to teach reading skills to students at risk of reading failure.

Standard applies to elementary programs.

Why this standard?

In most cases, the root cause of a diagnosis of a learning disability is significant trouble reading. So the best way to reduce the proportion of children in special education is to train teachers at the front line in the most effective strategies for preventing reading failure. In all but a few cases, early intervention by the classroom teacher can significantly improve the reading skills of students struggling to read.

What is the focus of the standard?

The standard evaluates whether reading courses for elementary teacher candidates present strategies to address struggling readers.

Rationale

Research base for this standard

"Strong research"[23] supports the efficacy of training teachers on specific methods to use with struggling readers. Recent strong research has found that increasing teacher candidates' knowledge of all five areas of reading instruction[24] and teaching teacher candidates to use strategies tailored to struggling readers[25] increase students' reading ability. Additionally, the research that supports the early reading standard applies to this standard as well; teaching the fundamental underpinnings of reading are as important for struggling readers as for any other beginning reader.

Other support for this standard

Other support for this standard comes from expert panels and school district superintendents, who agree that preparing teachers to work with struggling readers is essential.

[22] Lu, A. (2013, October 22). Who is an 'English-language learner'?. Stateline: The daily news service of The Pew Charitable Trusts. Retrieved from http://www.pewstates.org/projects/stateline/headlines/who-is-an-english-language-learner-85899514092. Education language learners: A growing – yet underserved – student population. *The Progress of Education Reform, 14*(6).

[23] See note 1 above.

[24] Spear-Swerling, L. (2009). A literacy tutoring experience for prospective special educators and struggling second graders. *Journal of Learning Disabilities, 42*(5), 431-443.

[25] Thames, D. G., et al. (2008). Reading comprehension: Effects of individualized, integrated language arts as a reading approach with struggling readers. *Reading Psychology, 29*(1), 86-115.

Standard 5: Elementary Mathematics

The program prepares teacher candidates to successfully teach to increasingly rigorous state standards for elementary math.

Standard applies to elementary and special education programs.

Why this standard?

After teaching reading, the most important job for elementary and special education teachers is to establish a strong foundation in mathematics. Not only will students with this foundation have a much better chance of succeeding in school, but we can increase the number of students with the skills necessary to consider all-important STEM (Science, Technology, Engineering and Math) careers.

What is the focus of the standard?

The standard evaluates the specialized coursework elementary and special education teachers should take in order to gain the deep conceptual understanding of elementary math topics required to teach to increasingly rigorous state standards. Programs meeting this standard in full not only require strong math content courses but also a math methods course in how to teach math. A program earning a "strong design" (🏆) designation does a particularly good job coordinating math content and methods coursework.

Rationale

Research base for this standard

"Strong research"[26] shows that, in general, students achieve more in math when taught by teachers with greater mathematics content knowledge.[27] A study of teacher preparation programs (both traditional and alternative) in New York City found that math courses correlated with increased math student achievement in the second year of teaching.[28] Another study found no correlation between teachers' math education credits and student achievement in math.[29]

Taken as a whole, the preponderance of additional available research studies[30] indicates that the mathematics content coursework needed by elementary teachers is neither pure mathematics nor pure methods but a combination of both. This mix of coursework imparts the foundational knowledge of elementary mathematics topics and is a bridge to instruction in the elementary classroom.[31]

Other studies have found that students performed better when their teachers had taken a mathematics course designed for teacher candidates, rather than a pure mathematics course,[32] and that higher-level mathematics courses (past calculus) had detrimental effects on student learning nearly as often as they had positive effects.[33]

[26] See note 1 above.

[27] Kukla-Acevedo, S. (2009). Do teacher characteristics matter? New results on the effects of teacher preparation on student achievement. *Economics of Education Review, 28,* 49-57; Hill, H., Rowan, B., & Ball, D. (2005). Effects of teachers' mathematical knowledge for teaching on student achievement. *American Educational Research Journal, 42*(2), 371-406.

[28] Boyd, D. J., Grossman, P. L., Lankford, H., Loeb, S., & Wyckoff, J. (2009). Teacher preparation and student achievement. *Educational Evaluation and Policy Analysis, 31*(4), 416-440. This study notes that its findings may differ from those in Harris & Sass (2011) because the Boyd study looked at "data on the characteristics of programs, courses, and field experiences," while the Harris study used course credit hours and hours of in-service training.

[29] Harris, D. N., & Sass, T. R. (2011). Note: This study relates to several NCTQ standards. Although it meets the criteria for strong research, the study's findings run contrary to the conclusions of most strong research in the field.

[30] See note 5 above.

[31] Greenberg, J., & Walsh, K. (2008). *No Common Denominator.* Washington, DC: National Council on Teacher Quality.

[32] Monk, D. (1994). Subject area preparation of secondary mathematics and science teachers and student achievement. *Economics of Education Review, 13*(2), 125-145.

[33] Begle, E. G. (1970). *Critical variables in mathematics education: Findings from a survey of empirical literature.* Washington, DC: Mathematical Association of America and National Council of Teachers of Mathematics.

Research on mathematics methods, although limited, also indicates the value of mathematics methods courses.[34] Research generally supports the importance of teachers' knowledge of fundamental math concepts as well as their ability to apply mathematics content in teaching (learned in mathematics methods courses), rather than their just knowing the mathematics content.[35]

Other support for this standard

Detailed recent surveys of elementary teachers in 60 school districts in Michigan and Ohio[36] indicate that elementary teachers do not feel well prepared to teach the specific mathematics topics at the elementary level or slightly beyond:

- In at least three-quarters of the districts, less than half of first- through third-grade teachers considered themselves "very well-prepared" to teach more than 60 percent of the topics. A little more than half of teachers in all districts felt "very well prepared" to teach just three topics.
- In at least three-quarters of the districts, less than half of fourth- and fifth-grade teachers considered themselves "very well-prepared" to teach more than 50 percent of the topics. At least 55 percent of teachers in all districts only felt "very well prepared" to teach just three topics.

There is increasing consensus among mathematics education organizations that prospective elementary teachers would be more prepared to teach elementary math if they took college mathematics courses that were designed specifically for teachers and that imparted a deep understanding of elementary and middle school mathematics concepts.[37] These recommendations follow the prevailing research on teacher preparation in mathematics, as described in the research base for this standard. A calculus or statistics course is fine as an elective, but the National Council of Teachers of Mathematics (NCTM)[38] and the Conference Board of the Mathematical Sciences (CBMS)[39] recommend that aspiring elementary teachers also take 12 semester-credit hours in "elementary mathematics content." This content should cover four subject areas: numbers and operations, algebra, measurement and data, and geometry. These recommendations, as well as those of mathematicians who advised NCTQ in its national study of the mathematics preparation of elementary teachers, form the rationale for this standard with regard to content preparation.

As in early reading, the majority of state licensing tests for elementary candidates are insufficiently rigorous to determine if candidates have sufficiently mastered math to be effective elementary teachers, making an evaluation of preparation coursework necessary. However, states have made progress in the last few years. Now, 23 states have rigorous tests that either test mathematics as a standalone subject or provide a specific mathematics subscore. Other states rely on subject-matter tests that include some items (or even a whole section) on mathematics instruction. However, since subject-specific passing scores are not required, one could answer every mathematics question incorrectly and still pass. The content of these tests presents another issue: These tests should assess whether candidates have a sophisticated understanding of the content they will teach in elementary and middle grades, not whether they simply meet the state's expectations for *student* knowledge of math. Unfortunately, this level

[34] Promoting Rigorous Outcomes in Mathematics and Science Education (2006, December). *Knowing mathematics: What we can learn from teachers* (Research Report, Vol. 2). East Lansing, MI: Michigan State University.

[35] Ball, D., Lubienski, S., & Mewborn, D. (2001). Research on teaching mathematics: The unsolved problem of teachers' mathematical knowledge. In V. Richardson (Ed.), *Handbook on research on teaching* (4th ed.). Washington, DC: American Educational Research Association; Guyton, E., & Farokhi, E. (1987). Relationships among academic performance, basic skills, subject matter knowledge, and teaching skills of teacher education graduates. *Journal of Teacher Education, 38*, N5.

[36] Schmidt, W. H., & McKnight, C. (2002). *Inequality for all: The challenge of unequal opportunity in American schools*. New York: Teachers College Press, Columbia University.

[37] In this vein, a University of Virginia professor of psychology recently argued that elementary teachers need to be trained to understand and teach the "conceptual side of math," or else they cannot build a strong math foundation for their young students. Willingham, D. (2013). What the *NY Times* doesn't know about math instruction. Retrieved March 12, 2014 from www.DanielWillingham.com

[38] National Council of Teachers of Mathematics. (2005, July). *Highly qualified teachers: A position of the National Council of Teachers of Mathematics* (Position Paper). Retrieved January, 2011, from http://www.nctm.org/about/content.aspx?id=6364

[39] American Mathematical Society in Cooperation with the Mathematical Association of America. (2012). *The Mathematical Education of Teachers II, 17*. Retrieved February, 2013, from http://cbmsweb.org/MET2/index.htm

of difficulty is not present in the tests most states currently use.

Teacher preparation programs in high-achieving nations frequently ensure that teachers not only know the content but also can communicate it. Mathematics-specific pedagogy is part of the preparation of mathematics teachers around the world, including in countries such as Singapore, Korea and Taiwan, whose students outperform our own.[40] An analysis of courses taken by elementary teachers across 17 countries found five commonly required mathematics courses and another seven common mathematics electives addressing both content and pedagogy.[41]

The methodology includes assessing the content and quality of mathematics textbooks as part of the rating process for this standard. This application of textbook ratings is supported by a recent study by the National Center for Education Statistics, which evaluated the rigor of mathematics textbooks as a proxy for evaluating the rigor of individual mathematics courses.[42] This study proffers that textbooks can indicate the intended course curriculum, the skills and topics taught in a course, and the level of rigor of that course. NCTQ relies on this same understanding of the role of textbooks in its methodology for this standard.

This standard also draws support from school district superintendents.

Standard 6: Elementary Content

The program ensures that teacher candidates have the broad content preparation necessary to successfully teach to increasingly rigorous state standards.

Standard applies to elementary programs.

Why this standard?

Elementary teachers usually teach across multiple subjects, meaning that candidates must be themselves broadly educated to meet the needs of today's increasingly rigorous classrooms. The importance of broad subject matter knowledge (literature and composition, history and geography, science and fine arts) has gained even more urgency with the advent of increasingly rigorous state English Language Arts standards, which will demand that teachers cover a wide variety of nonfiction topics.

What is the focus of the standard?

At the undergraduate level, required coursework is examined to ascertain the breadth and depth of the subject matter instruction candidates receive. At the graduate level, the transcript review process is examined to check that the program identifies and addresses any content gaps that incoming candidates might have. Programs meeting the "strong design" (🏆) indicator ensure that candidates are grounded in the fine arts as well as all other requisite subjects.

[40] Communications with Mdm. Low Khah Gek, Deputy Director, Sciences, Curriculum Planning and Development Division, Ministry of Education, Singapore, March 2008.

[41] Schmidt, W., Burroughs, N., Cogan, L. (2013). World class standards for preparing teachers of mathematics (Working Paper). East Lansing, MI: Michigan State University Center for the Study of Curriculum and The Education Policy Center.

[42] Brown, J., Schiller, K., Roey, S., Perkins, R., Schmidt, W., & Houang, R. (2013). *Algebra I and Geometry Curricula* (NCES 2013-451). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office. Retrieved March 18, 2013, from http://nces.ed.gov/nationsreportcard/pdf/studies/2013451.pdf

Rationale

Research base for this standard

"Strong research"[43] on teacher preparation programs (both traditional and alternative) in New York City found that the amount of English Language Arts (ELA) coursework completed by teacher candidates correlated with increased ELA student achievement in the second year of teaching.[44] Although a different study found no correlation between teachers' content courses and students' achievement, this study only made use of data from an ELA assessment that did not expect students to have a broad base of content knowledge to be effective readers.[45] By contrast, Common Core State Standards explicitly and rightly link overall content knowledge with success in reading and ELA more generally.

Other support for this standard

Teachers need to be able to adequately convey content to students because students' content understanding improves their reading comprehension, an area in which American students languish.[46] Although little conclusive research links a teacher's liberal arts coursework with student achievement, the more a person knows about many different subject areas, the stronger are his or her levels of literacy as measured by vocabulary and scores on tests of reading comprehension.[47] A body of robust research spanning many decades connects a teacher's level of literacy or verbal ability and the achievement of that teacher's students.[48] In sum: The more broadly educated a teacher is, the stronger that teacher's vocabulary, and teachers with strong vocabularies are more likely to be effective in the classroom. In addition, with the implementation of increasingly rigorous state standards, teachers will face even higher expectations for their ability to teach content.[49]

With regard to an area of expertise, while there is no research evidence that such expertise in a single academic field makes a teacher more effective, it has been posited that a strong grounding in the "disciplinary ways of knowing"[50] will make for greater teacher effectiveness,[51] and that it is reasonable to assume that a concentration in an elementary content area (which can help one develop these disciplinary ways of knowing) is likely to help when teaching that content.

Moreover, the practical implications of a teacher candidate taking only pedagogy courses could be severe. Unless a teacher candidate has a major or has fulfilled a substantial part of the requirements for a major in a content area, the

[43] See note 1 above.

[44] Boyd, D. J., Grossman, P. L., Lankford, H., Loeb, S., & Wyckoff, J. (2009).

[45] Harris, D. N., & Sass, T. R. (2011). Note: This study relates to several NCTQ standards. Although it meets the criteria for strong research, the study's findings run contrary to the conclusions of most strong research in the field.

[46] Willingham, D. T. (2006). How knowledge helps: It speeds and strengthens comprehension, learning—and thinking. *American Educator, 30*(1), 30-37.

[47] Numerous research studies have established the strong relationship between teachers' vocabulary (a proxy for being broadly educated) and student achievement. For example, see Whitehurst, G. J. (2002); Ehrenberg, R., & Brewer, D. (1995).

[48] Ferguson, R., & Ladd, H. (1991); Hanushek, E. (1971); McLaughlin, M., & Marsh, D. (1978); Strauss, R., & Sawyer, E., (1986); Wayne, A., & Youngs, P. (2003); Winkler, D. (1975).

[49] In response to thousands of teachers' reports that they felt ill-prepared to teach the content needed to meet increasingly rigorous state standards, the Core Knowledge Foundation developed a college-level curriculum for elementary teacher candidates. This curriculum consists of 18 courses, each accompanied by a detailed course guide (available at http://www.coreknowledge.org/mimik/mimik_live_data/view.php?id=1833&record_id=326). The *Teacher Prep Review's* elementary content standard is largely based on this work and its detailed analysis of what critical features must be included in content courses for teacher candidates. The Core Knowledge Foundation. (2002). *What elementary teachers need to know: College course outlines for teacher preparation.* Charlottesville, VA: The Core Knowledge Foundation. Retrieved April 8, 2014 from http://www.coreknowledge.org/mimik/mimik_uploads/documents/482/What%20Elem%20Teachers%20Need%20to%20Know-College%20Course%20Outlines.pdf

[50] Langer, J. A., Confer, C., & Sawyer, M. (1993). *Teaching disciplinary thinking in academic coursework*. Albany, NY: National Research Center on Literature Teaching and Learning, University at Albany, State University of New York. Retrieved February 7, 2013, from http://www.albany.edu/cela/reports/langer/langerteachingdiscipthink.pdf
This paper argues that understanding an academic discipline requires two components: (a) content knowledge and (b) "ways of knowing and reasoning that are accepted as appropriate and necessary for learning and understanding within the particular field." These ways of knowing could include the types of evidence that are acceptable, the ways arguments are produced and the ways information is shared in a specific field.

[51] Grossman, P., & Schoenfeld, A. (2005). Teaching subject matter. In L. D. Hammond, & J. Bransford (Eds.), *Preparing teachers for a changing world* (p. 230). San Francisco: Jossey-Bass; Slekar, T. D., & Haefner, L. A. (2010). Syntactic knowledge in history and science education: Teacher education and neglect in the academy. *Journal of Thought, 45*(1-2), 7-16; < http://www.journalofthought.com/Issues/2010vol45issue12pdf/07slekarhaefner.pdf>

ramifications of failing student teaching are great, namely, the loss or serious delay of a college degree.[52] This absence of a fall-back plan creates a strong disincentive for the education program to fail candidates who cannot demonstrate an acceptable level of performance in the classroom, which may result in teachers entering the classroom even though they have demonstrated that they are not prepared to do so.

Furthermore, school district superintendents support this standard.

Standard 7: Middle School Content

The program ensures that teacher candidates have the content preparation necessary to successfully teach to increasingly rigorous state standards.

Standard applies to secondary programs.

Why this standard?

Research generally shows that teachers' deep content knowledge will support their students' academic success. Middle school teacher candidates must develop sufficient expertise in their subjects to teach them effectively, particularly in increasingly rigorous classrooms.

What is the focus of the standard?

If a state does not have regulations that require that all middle school teacher candidates pass adequate subject-matter licensing tests, the program's subject preparation requirements are examined. At the undergraduate level, candidates should work toward an academic major if they are going to teach one subject (e.g., math) or two minors if they are going to teach unrelated subjects (e.g., math and science). At the graduate level, the transcript review process is examined to check that programs are verifying that their incoming candidates have sufficient content knowledge in the area or areas they wish to teach.

Rationale

Research base for this standard

Little "strong research"[53] exists on this topic.[54] However, one study found no correlation between teachers' content courses and students' achievement, but the study only looked at math and reading achievement and therefore would not have captured an effect of content courses on achievement in other areas, such as science or social studies.[55]

Additional research[56] indicates that strong subject-matter expertise makes for better teaching. However, while support for this principle is strong at the high school level, the evidence supporting how much expertise is enough is less clear

[52] When a California education school attempted to fail a student-teaching candidate in the mid-1990s, the case was litigated for three years, and the education school's attorney indicated that in the entire history of teacher preparation in California to date there was no record of a credential candidate actually failing student teaching. In all other cases, candidates were "counseled" out of the program and free to apply to another program. The education school prevailed in the litigation with evidence from nursing programs that do fail nurse candidates in their clinicals.

[53] See note 1 above.

[54] For related strong research on the importance of subject-matter knowledge, see Dee, T., & Cohodes, S. (2008). Out-of-field teaching and student achievement: Evidence from matched-pairs comparisons. *Public Finance Review, 36*(1), 7-32. This study found a positive relationship between teachers' state-certification in a subject and students' academic achievement in that subject; this is suggestive (though not conclusive) of the importance of teachers' content knowledge.

[55] Harris, D. N., & Sass, T. R. (2011). Note: This study relates to several NCTQ standards. Although it meets the criteria for strong research, the study's findings run contrary to the conclusions of most strong research in the field.

[56] See note 5 above.

at the middle school level.[57] There are few studies examining the effectiveness of a middle school teacher with a major versus one with just a minor. One study points to a potential ceiling effect at six mathematics courses for middle school mathematics teachers, roughly equivalent to a minor, meaning that additional coursework would not yield additional benefits to the teacher.[58]

A study of middle school physical science teachers found that when teachers could identify both the correct answer and a popular misconception on a science test, their students had greater learning gains. Furthermore, the study found little transfer of teacher knowledge between science concepts. These findings support the importance of building teacher candidates' content and pedagogical knowledge in the specific subjects they will teach.[59]

Other support for this standard

Middle school teaching requires more advanced subject knowledge than elementary school teaching; consequently, those seeking middle school endorsement must have adequate subject preparation, defined as a full academic major. In fact, the federal No Child Left Behind (NCLB) statute defines a "highly qualified" middle or high school teacher as one who either majors in the subject she or he teaches or passes a rigorous test in that subject.

NCTQ has long endorsed requiring an academic major for all secondary teachers, which NCLB established as the minimum credential that secondary teachers should have. For middle school teachers, NCTQ has endorsed an academic major for teachers of a single subject. However, requiring that middle school teachers who intend to teach two related subjects receive two minors rather than two majors may be more realistic.

From a pragmatic perspective, unless a teacher candidate has fulfilled a substantial part of the requirements for a college major outside of education or teacher-specific subjects such as social studies, if that teacher candidate fails student teaching, he or she may not earn a college degree. This consequence provides a strong disincentive for the education program to fail candidates even in the face of poor performance.

Several studies comparing the teacher preparation practices of different countries further supports this standard. One study found that in countries whose middle school students scored the highest on international math exams, middle school teacher candidates tended to devote half of their teacher preparation courses to formal mathematics. In the United States (where middle school students generally score around average on international math exams), middle school teacher candidates devoted only 40 percent of coursework to math and shifted the balance of their coursework to general pedagogy.[60] Another report on international practices found that high-performing countries generally required their middle school mathematics teacher candidates to take nine courses on mathematics content and methods, with a heavier focus on content. This study noted that in the United States, only a third (31 percent) of teacher candidates reached this benchmark.[61]

This standard also meets with support from school district superintendents.

[57] Chaney, B. (1995). *Student outcomes and the professional preparation of eighth grade teachers in science and mathematics. NSF/NELS: 88 Teacher transcript analysis.* Rockville, MD: Westat; Goldhaber, D. D., & Brewer, D. J. (1997). Why don't schools and teachers seem to matter? Assessing the impact of unobservables on educational productivity. *Journal of Human Resources, 32*(3), 505-523; Goldhaber, D. D., & Brewer, D. J. (1998, October). When should we reward degrees for teachers? *Phi Delta Kappan, 80*(2),134-138; Goldhaber, D. D., & Brewer, D. J. (2000). Does teacher certification matter? High school teacher certification status and student achievement. *Educational Evaluation and Policy Analysis, 22*(2), 129-145; Monk, D. (1994). Rothman, A. (1969). Teacher characteristics and student learning. *Journal of Research in Science Teaching, 6*(4), 340-348; Rowan, B., Chiang, F., & Miller, R. J. (1997, October). Using research on employees' performance to study the effects of teachers on students' achievement. *Sociology of Education, 70*, 256-284; Wenglinsky, H. (2000). *How teaching matters: Bringing the classroom back into discussions of teacher quality.* Princeton, NJ: Educational Testing Service; www.ets.org/Media/Research/pdf/PICTEAMAT.pdf

[58] Monk, D. (1994).

[59] Sadler, P. M., Sonnert, G., Coyle, H.P., Cook-Smith, N., Miller, J. L., (2013). The influence of teachers' knowledge on student learning in middle school physical science classrooms. *American Educational Research Journal, 50*(5), 1020-1049.

[60] Center for Research in Mathematics and Science Education. (2010). *Breaking the cycle: An international comparison of U.S. mathematics teacher preparation.* East Lansing, MI: Michigan State University.

[61] Schmidt, W., Burroughs, N., Cogan, L. (2013).

Standard 8: High School Content

The program ensures that teacher candidates have the content preparation necessary to successfully teach to increasingly rigorous state standards.

Standard applies to secondary programs.

Why this standard?

High school teacher candidates must develop a sophisticated level of knowledge in the subjects they wish to teach if they are to help their students succeed in increasingly rigorous classrooms and graduate from high school ready for college and a career.

What is the focus of the standard?

If a state does not have regulations that require that all high school teacher candidates pass adequate subject-matter licensing tests, the program's subject preparation requirements are examined. At the undergraduate level, candidates should earn an academic major if they are going to teach one subject, or two minors in related disciplines if they are going to teach under a composite certification (i.e., general science or general social science). At the graduate level, the transcript review process is examined to check that programs are verifying that their incoming candidates have sufficient content knowledge in the area they wish to teach.

Rationale

Research base for this standard

"Strong research"[62] conducted in the United States found that students of teachers with a bachelor's or master's degree in mathematics achieved greater results in mathematics than did students of teachers with other majors (although the same did not hold true for science).[63] In Germany, researchers found that while content knowledge in a subject was not sufficient for a teacher to effectively teach a subject, having that content knowledge enables the development of pedagogical content knowledge (e.g., specific methods to communicate content or identify students' misunderstandings), which was critical for effective teaching.[64] However, one study found no correlation between teachers' content courses and students' achievement; this study only looked at math and reading achievement and therefore would not have captured an effect of content courses on achievement in other areas such as science or social studies.[65]

Additional research studies[66] have demonstrated the positive impact of teacher content knowledge on student achievement. Teacher content preparation in math and science had a positive effect on how much math and science high school students learn.[67] One study found that high school teachers' content coursework had a higher payoff for less experienced teachers,[68] and another found that when hiring novice teachers, selecting those who excelled academically can make up for their lack of teaching experience.[69]

Several studies have found that while teachers' pedagogical knowledge may play a larger role in students' success than content knowledge, content knowledge is still essential. In addition to Baumert et al.'s findings, cited above,

[62] See note 1 above.

[63] Goldhaber, D. D., & Brewer, D. J. (2000).

[64] Baumert, J. (2010). Teachers' mathematical knowledge, cognitive activation in the classroom, and student progress. *American Educational Research Journal, 47*(1), 133-180.

[65] Harris, D. N., & Sass, T. R. (2011). Note: This study relates to several NCTQ standards. Although it meets the criteria for strong research, the study's findings run contrary to the conclusions of most strong research in the field.

[66] See note 5 above.

[67] Monk, D. (1994); Goldhaber, D. D., & Brewer, D. J. (1997).

[68] Monk, D. (1994).

[69] White, B. R., Presly, J. B., & DeAngelis, K. J. (2008). Leveling up: Narrowing the teacher academic capital gap in Illinois. *Illinois Education Research Council*,1-44.

another study reiterated the importance of both content and pedagogy, indicating that the former was necessary but not sufficient.[70]

Other support for this standard

For decades, teacher preparation and higher education reformers attempted to improve the rigor of undergraduate teacher preparation programs by promoting the requirement of full academic majors for prospective teachers. For example, the Holmes Group of the mid-1980s, a group of education school deans, advocated for programs in which teachers complete a traditional bachelor program with a content-area major and then devote an additional year to teacher preparation, such as through a postbaccalaureate program. While this type of program has not always been executed effectively, the concept shows the ongoing emphasis on teachers' content knowledge.

In general, most other research indicates that strong subject-matter expertise makes for better teaching, especially at the high school level and especially for teachers of mathematics and science.[71]

The structure of the standard acknowledges that most states offer certification in the sciences and social sciences such that teachers with specialization in any one subject area may also teach other subject areas.[72] Based on their high school science licensure requirements, many states seem to presume that a teacher with a background in one science area is equally capable of teaching anatomy, photochemical reactions and Newtonian physics. Most states allow teachers to obtain general science or combination licenses across multiple science disciplines, and, in most cases, these teachers need only pass a general knowledge science exam that does not ensure subject-specific content knowledge. This means that a teacher with a background in biology could be fully certified to teach chemistry or physics having passed only a general science test—and perhaps answering most of the chemistry or physics questions incorrectly.

In contrast to most of the field, California State University, Long Beach requires its secondary sciences candidates to earn two relevant minors, in keeping with our standard.

Districts undoubtedly appreciate the flexibility that these broad field licenses offer, especially given the very real shortage of teachers in many science disciplines. But the all-purpose science teacher not only masks but also perpetuates the shortage of STEM teachers with strong STEM backgrounds, which leads to fewer students with a strong foundation in STEM who can pursue STEM professions. This cycle of inadequate preparation merely prolongs the STEM crisis.

Just as with an umbrella science certification, most states offer a general social studies license at the secondary level. For this certification, teachers can have a background in a wide variety of fields, ranging from history and political science to anthropology and psychology. Under such a license, a teacher who majored in psychology could be licensed to teach secondary history having passed only a general knowledge test and answering most—and perhaps all—history questions incorrectly.

Given the prevalence of these pathways into high school teaching, requiring a major (30 semester hours) in each of the subjects in which a teacher is certified (e.g., biology and chemistry for a teacher with a general science certification) would be unrealistic. On the other hand, requiring anything less than at least two minors (15 semester hours each) for general social studies and general science certifications would clearly be inadequate.

This standard garners support from school district superintendents.

[70] Monk, D. (1994).

[71] Chaney, B. (1995); Goldhaber, D., & Brewer, D. J. (1997); Goldhaber, D. D., & Brewer, D. J. (1998, October); Goldhaber, D. D., & Brewer, D. J. (2000); Monk, D. (1994); Rothman, A. (1969); Rowan, B., Chiang, F., & Miller, R. J. (1997, October); Wenglinsky, H. (2000); Carlisle, J. F., Correnti, R., Phelps, G., & Zeng, J. (2009). Includes evidence specifically related to the importance of secondary social studies knowledge.

[72] National Council on Teacher Quality. (2010). *The all-purpose science teacher: An analysis of loopholes in state requirements for high school science teachers;* http://www.nctq.org/p/publications/docs/NCTQ_All_Purpose_Science_Teacher.pdf

Standard 9: Content for Special Education

The program ensures that teacher candidates' content preparation aligns with increasingly rigorous state standards in the grades they are certified to teach.

Standard applies to special education programs.

Why this standard?

Students with special needs must be able to access the K-12 curriculum. It is not sufficient for special education teachers to have training in special education pedagogy; they must also have content knowledge sufficient to teach their assigned grade levels.

What is the focus of the standard?

State regulation in this area is particularly germane. Because states certify special education teachers for elementary grades, secondary grades or a combination of the two, the analysis for this standard is first conditioned on the state context and then examines program requirements at the undergraduate and graduate levels. If special education teachers are certified to teach in elementary grades only, we determine whether teacher candidates will have a sufficient breadth of subject knowledge (Standard 6). If special education teachers are certified to teach at the secondary level, we look to see if teacher candidates will have a sufficiently focused content preparation, preparation similar to that appropriate for general secondary certification (Standard 8). And if special education teachers are certified to teach the full span of grades, PK-12, we assess whether content preparation matches what elementary and general certification secondary teachers need (Standards 6 and 8).

Rationale

Research base for this standard

Little "strong research"[73] currently exists to demonstrate the importance of adequate content preparation for special education teachers. However, given the support of some strong research for general education teachers' content preparation[74] and the requirement that special education students learn the same content as their general education peers, it seems logical that special education teacher candidates would similarly benefit from developing content knowledge in the courses they will teach.

Other support for this standard

Both state and federal requirements expect special education students to meet the same high standards as other students; therefore, special education teachers must have adequate content preparation for the core subjects they will teach.[75] While special educators should be valued for their critical role in working with students with disabilities and special needs, the state identifies them not as "special education assistants" but as "special education teachers," because their primary role is to provide instruction.

Too many states make no distinction between elementary and secondary special education teachers, certifying all such teachers under a generic K-12 special education license. While this broad umbrella may be appropriate for teachers of low-incidence special education students, such as those with severe cognitive disabilities, it is deeply problematic for teachers of high-incidence special education students, such as those with learning disabilities, who are expected to learn grade-level content. And because the overwhelming majority of special education students are in the high-incidence category, the result is a mismatch between students' academic needs and teachers' ability to meet those needs. The current model does little to protect some of our most vulnerable students.[76]

[73] See note 1 above.

[74] Boyd, D. J., Grossman, P. L., Lankford, H., Loeb, S., & Wyckoff, J. (2009); Willingham, D. T. (2006).

[75] For an analysis of the importance of special educator content knowledge, see Levenson, N. (2011). Something has got to change: Rethinking special education. *American Enterprise Institute* (Working paper 2011-01, 1-20).

[76] Inclusion models, where special education students receive instruction from a general education teacher paired with a special education teacher to provide instructional support, do not mitigate the need for special education teachers to know content.

It is virtually impossible and certainly impractical for states to ensure that a PK-12 teacher knows all the subject matter across 13+ grades, and the same problem exists for pedagogical knowledge. Attaining this depth of knowledge becomes even more imperative for teachers with the advent of the Common Core State Standards, which expect all students, including those classified as special education, to meet the standards (with appropriate modifications). To resolve this inadequacy, teacher preparation and licensure for special education teachers must distinguish between elementary and secondary levels, as they do for general education.

School district superintendents also show support for this standard.

Standard 10: Classroom Management

The program ensures that teacher candidates practice specific techniques for managing the classroom.

Standard applies to elementary, secondary and special education programs.

Why this standard?

New teachers often cite classroom management as their most pressing challenge. Given that students learn best in an orderly classroom environment, teacher candidates should be trained in a coherent management approach focusing on maximizing the potential for learning and the strategies to handle both minimally disruptive behavior as well as more serious misbehavior.

What is the focus of the standard?

The standard looks at how student teachers are evaluated by their supervisors on the use of classroom management strategies.[77]

This standard has undergone substantial revisions since the *Teacher Prep Review 2013*. While all previous indicators for this standard remain, we have made several additions based on a review of the research (described below) and discussions with experts in the field.

Most notably, we now evaluate programs on their feedback to student teachers about their use of praise and positive reinforcement. Proper use of praise can encourage and maintain appropriate behavior, thus reducing the need for more disruptive methods of addressing misbehavior. Furthermore, we also evaluate feedback provided on the physical classroom environment, which recognizes that a thoughtfully arranged classroom in which teachers can see and quickly move to be near all students helps maintain a productive learning environment.

Another substantive change is to apply this standard to special education programs. Several experts in preparing special education teachers confirmed that our standard and indicators were fully applicable to evaluations of special education student teachers.

To further test our revised standard, we conducted a field test with over 140 programs, including 26 special education programs. This field test verified that language satisfying these indicators does appear in student teacher evaluation instruments, it can be reliably measured, and it is applicable to special education programs.

[77] NCTQ's report on classroom management finds an inconsistent connection between the classroom management topics teacher candidates learn in coursework and the feedback they receive in student teaching. Given this inconsistency, NCTQ's evaluation of the student teaching evaluation/observation instruments rather than course syllabi focuses analysis on the classroom management techniques the IHE considers most critical to the classroom performance of its graduates, as is evident from their inclusion in the culminating student teaching feedback instruments.

Rationale

Research base for this standard

Little "strong research"[78] exists on teacher preparation in classroom management. However, additional research[79] has found that without a positive, orderly classroom environment, learning is difficult, if not impossible. A newly published study of growth in literacy found that students who have trouble inhibiting impulses distract other students, and reduce class average scores on literacy assessments.[80]

The benefits of a well-managed classroom are confirmed by a meta-analysis of research which confirms that teachers' classroom management techniques can reduce students' behavioral problems.[81]

Two research summaries echo Oliver's findings and provide support for specific classroom management techniques.[82] These studies provide especially strong support for the use of praise and positive reinforcement to encourage students to continue appropriate behavior. Other effective classroom management techniques backed by these studies include establishing and teaching rules and routines; maintaining the flow of the lesson through effective management of time, materials, and the physical classroom to maintain student engagement; and addressing misbehavior. A number of studies also address strategies to identify burgeoning disruptions and to quickly redirect students before their behavior develops into misbehavior. To a lesser extent, studies also support other techniques including teaching students to self-monitor their behavior, involving families in behavior issues, and using school-wide behavior plans. However, since these latter techniques appear less often in the research and because they extend beyond what student teachers could reasonably demonstrate in a classroom observation, they are not included in this standard. However, the availability of these other strategies reinforces the point that the techniques included in NCTQ's classroom management standard are necessary underpinnings for effective classroom management, but do not exhaustively address every strategy that could be employed.

Other support for this standard

Having a well-managed classroom correlates with students' ability to learn,[83] yet classroom management continues to be one of the biggest obstacles to teaching, especially for new teachers. New teachers (and their supervisors) often cite classroom management as their most pressing challenge.[84] Fifteen years ago a poll revealed that 58 percent of K-12 teachers said that behavior that disrupted instruction occurred "most of the time or fairly often."[85] Almost 10 years ago a survey of teachers found that nearly half indicated that "quite a large number" of the new teachers need a lot more training on effective ways to handle students who are discipline problems.[86] More recently, school staff indicated that over 40 percent of new teachers were either not at all prepared or only somewhat prepared to handle

[78] See note 1 above.

[79] See note 5 above.

[80] Skibbe, L. E., Phillips, B. M., Day, S. L., Brophy-Herb, H. E., & Connor, C. M. (2012). Children's early literacy growth in relation to classmates' self-regulation. *Journal of Educational Psychology, 104,* 541-553.

[81] The studies included in this meta-analysis did not yield enough statistical power to identify the specific techniques that produced the greatest benefit. Oliver, R. M., Wehby, J. H., & Reschly, D. J. (2011). Teacher Classroom Management Practices: Effects on Disruptive or Aggressive Student Behavior. *Society for Research on Educational Effectiveness.*

[82] While the research cited in these summaries is generally of high quality, the studies may not be included in NCTQ's Classroom Management research inventory because of the publication date or because of the use of single case studies, which do not meet the current criteria for inclusion in the inventories. Atkins, M., Cullinan, D., Kutash, K., Weaver, K., & Woodbridge, M. (2008). *Reducing behavior problems in the elementary school classroom.* Institute of Educational Sciences and National Center for Education Evaluation and Regional Assistance; Simonsen, B., Fairbanks, S., Briesch, A., Myers, D., & Sugai, G. (2008). Evidence-based practices in classroom management: Considerations for research to practice. *Education and Treatment of Children, 31*(3), 351-380.

[83] See Pianta, R. C., La Paro, K. M., & Hamre, B. K. (2008). *Classroom assessment scoring system manual: Pre-K.* Baltimore: Paul H. Brookes Publishing Co.

[84] Jones, V. (2005). How do teachers learn to be effective classroom managers? In C. Evertson, & C. Weinstein (Eds.), *Handbook of classroom management: Research, practice and contemporary issues* (pp. 888-889). Mahwah, NJ: Lawrence Erlbaum Associates.

[85] Langdon, C. A. (1997, November). The fourth Phi Delta Kappa poll of teachers' attitudes towards the public schools. *Phi Delta Kappan, 79*(3), 212-220.

[86] Farkas, S., Johnson, J., & Duffett, A. (2003). *Stand by me: What teachers really think about unions, merit pay and other professional matters* (Report from Public Agenda). Retrieved February 7, 2013, from http://www.publicagenda.org/specials/standbyme/standbyme.htm

a range of classroom management or discipline situations.[87] For a variety of reasons, including the fact that students with disabilities related to behavior are participating in general education classes, there is every reason to believe that the number and intensity of behavior problems presented by students have not decreased recently and continue to be a challenge.

Teacher candidates will be better able to establish a classroom environment that makes learning possible if they are taught and practice a coherent management approach that focuses on maximizing the potential for learning and the means to handle minimally disruptive behavior.[88] And for incidents of more serious misbehavior, teacher candidates need to learn, and practice, specific techniques so that the techniques become habits that teachers apply consistently.[89]

This standard garners support from school district superintendents.

Standard 11: Lesson Planning

The program trains teacher candidates how to plan lessons.

Standard applies to elementary and secondary programs.

Why this standard?

Planning how to adjust and enhance instruction to meet students' diverse needs lies at the heart of effective teaching. Teacher candidates should be able to demonstrate this skill in the assignments representing the culmination of their training. Good lesson plans address the needs of all students in a class, including those who are English language learners, have special needs or have already advanced beyond proficiency in a lesson objective. Teacher candidates should also learn to integrate technology to facilitate learning.

What is the focus of the standard?

Requirements for all culminating assignments, such as those pertaining to the content of lesson plans used in student teaching, are examined to ensure that elementary and secondary teacher candidates must demonstrate that they know how to adjust their lesson planning to accommodate the needs of diverse students and employ technology effectively.

Rationale

Research base for this standard

No "strong research"[90] exists on the importance of training teachers in lesson planning techniques.

Other support for this standard

This standard is grounded in common sense. One of the fundamental duties of teachers is to plan lessons for their classes, and so it follows that teacher candidates should learn to produce lesson plans while in their preparation

[87] Coggshall, J. G., Bivona, L., & Reschly, D. J. (2012, August). *Evaluating the effectiveness of teacher preparation programs for support and accountability.* Washington, DC: National Comprehensive Center for Teacher Quality. This study analyzed data from the 2007-2008 Schools and Staffing Survey gathered by the National Center for Education Statistics.

[88] Stuhlman, M. W., Hamre, B. K., Downer, J. T., & Pianta, R. C. (n.d.). *What should classroom observation measure?* Charlottesville, VA: University of Virginia. Strong empirical evidence at the primary grade level suggests that behavior management should focus on both "proactive intervention and efficient, positive misdirection of minor misbehaviors." Retrieved January, 2011, from http://curry.virginia.edu/uploads/resourceLibrary/CASTL_practioner_Part2_single.pdf

[89] Stough, L. M. (2006). The place of classroom management and standards in teacher education. In C. M. Evertson, & C. S. Weinstein (Eds.), *Handbook of classroom management: Research, practice, and contemporary issues.* pp. 909-923. These self-evident facts do not find the expression one might expect in standards related to teacher preparation or teaching. "The extent to which knowledge and skills of classroom management is included in [accreditation, certification, and licensing] standards appears exceedingly minimal."

[90] See note 1 above.

programs. Because most classes include a range of students with diverse needs, it is both a legal requirement and a modern reality that teachers must adapt lessons to a variety of students. The education community has reached a consensus that teachers should be able to plan lessons for their students.

Despite this consensus, a recent survey of school staff found that just over one-third of new teachers (35 percent) were either not prepared or only somewhat prepared to select and adapt curriculum and instructional materials.[91]

While teacher preparation programs almost universally encourage teacher candidates to tailor instruction to students' "learning styles," methodologically sound research does not support the efficacy of attempts to do so.[92] In fact, Howard Gardner, who developed the theory of "mulitiple intelligences" (with which learning styles are often confused) asserts that learning styles are neither coherent nor supported by persuasive evidence.[93]

School district superintendents also support this standard.

Standard 12: Assessment and Data

The program trains teacher candidates how to assess learning and use student performance data to inform instruction.

Standard applies to elementary and secondary programs.

Why this standard?

Great teachers know what concepts and skills their students have mastered and what they still have trouble understanding. Not surprisingly, there is increasing evidence that the better a teacher becomes at pinpointing what students need to learn, the better the students *do* learn. The development of assessments (e.g., quizzes), as well as the capacity to analyze and interpret assessment results to improve instruction, are explicit skills teacher candidates should have an opportunity to practice.

What is the focus of the standard?

Coursework and assignments representing the culmination of a candidate's preparation are examined to check that elementary and secondary teacher candidates have an opportunity to practice developing their own assessments, analyzing student assessment results, and applying their analysis to lesson planning. We also check to see that candidates have an opportunity to practice analyzing student data in teams because schools are increasingly fostering a collaborative approach to teaching. The "strong design" (🏆) indicator evaluates the structure of coursework in which preparation related to assessment is provided, examining whether a core assessment course is complemented by coverage of subject-specific assessment topics in methods courses.

Rationale

Research base for this standard

No "strong research"[94] exists with regard to assessment and efficacy of using data for teacher preparation.

[91] Coggshall, J. G., Bivona, L., & Reschly, D. J. (2012, August).

[92] Pashler, H., McDaniel, M., Rohrer, D., & Bjork, R. (2009). Learning styles: Concepts and evidence. *Psychological Science in the Public Interest, 9*(3), 105-119. Retrieved March 3, 2013, from http://www.psychologicalscience.org/journals/pspi/PSPI_9_3.pdf

[93] Strauss, V., & Gardner, H. (2013, October 16). Howard Gardner: 'Mulitple intelligences' are not 'learning styles.' *The Washington Post*. Retrieved from www.washingtonpost.com.

[94] See note 1 above.

However, the application of assessments and data can be beneficial within K-12 education. Some additional research[95] has found that taking an assessment can be beneficial to students as it enhances learning through strengthened memory representation.[96] One study found that frequent quizzes during a lecture decreased students' mind wandering, increased note-taking, increased performance or a cummulative test, and reduced anxiety about that final test.[97]

Other support for this standard

Emerging evidence from highly effective schools suggests that making instruction more "data-driven" (i.e., using assessment data to adjust what teachers do) can play a significant role in teacher effectiveness.[98] A recent survey of school staff found that over one-quarter (29 percent) of new teachers were not at all prepared or only somewhat prepared to assess students.[99]

On the basis of emerging research findings, the Institute of Education Sciences provides five recommendations for how educators should use data. These recommendations specify that teachers should use assessment information in a cyclical manner whereby they collect data about student learning, interpret those data to determine how to improve students' learning, modify instruction based on their determination and collect new data.[100] To successfully implement this cycle, teachers must be able to implement both formative and summative strategies to assess their students' learning, to analyze assessment outcome data and to adjust instruction based on those data.

This standard also receives support from school district superintendents.

Standard 13: Equity

The program ensures that teacher candidates experience schools that are successful in serving students who have been traditionally underserved.

Standard applies to elementary programs.

Why this standard?

Placement in schools whose staffs are successfully teaching students living in poverty can help teacher candidates maintain high expectations for disadvantaged students and learn effective instructional methods.

What is the focus of the standard?

This standard examines the proportion of a program's student teaching placements that are in high-performing, high-poverty schools, ensuring that programs are taking full advantage of strong placement options.

[95] See note 5 above.

[96] Chang, C. Y., Yeh, T. K., & Barufaldi, J. P. (2010). The positive and negative effects of science concept tests on student conceptual understanding. *International Journal of Science Education, 32*(2), 265-282; Karpicke, J. D., & Blunt, J. R. (2011). Retrieval practice produces more learning than elaborative studying with concept mapping. *Science, 331*, 772-775; McDaniel, M. A., Agarwal, P. K., Huelser, B. J., McDermott, K. B., & Roediger III, H. L. (2011). Test-enhanced learning in a middle school science classroom: The effects of quiz frequency and placement. *Journal of Educational Psychology, 103*(2), 399-414; Rohrer, D., & Pashler, H. (2010). Recent research on human learning challenges conventional instructional strategies. *Education Researcher, 39*(5), 406-412; Rohrer, D., Taylor, K., & Sholar, B. (2010). Tests enhance the transfer of learning. *Journal of Experimental Psychology, Learning, Memory, and Cognition, 36*(1), 233-239; Greenberg, J., & Walsh, K. (2012). *What teacher preparation programs teach about K-12 assessment: A review.* Retrieved February 12, 2013, from http://www.nctq.org/p/publications/docs/assessment_report.pdf

[97] Szpunar, K. K., Khan, N. Y., & Schacter, D. L. (2013). Interpolated memory tests reduce mind wandering and improve learning of online lectures. *Proceedings of the National Academy of Sciences, 110*(16), 6313-6317. While this study focuses on college students in an online class, the results may still be generalizable to K-12 students in a classroom setting.

[98] Bambrick-Santoyo, P. (2010). *Driven by data: A practical guide to improve instruction.* San Francisco: Jossey-Bass.

[99] Coggshall, J. G., Bivona, L., & Reschly, D. J. (2012, August).

[100] Hamilton, L., Halverson, R., Jackson, S., Mandinach, E., Supovitz, J., & Wayman, J. (2009). Using student achievement data to support instructional decision making (NCEE 2009-4067). Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education. Retrieved February 11, 2013, from http://ies.ed.gov/ncee/wwc/publications/practiceguides/

Note: *Methodological challenges in using the data provided by institutions prevent rating programs on this standard, although we are able to report on this standard. We will revisit this standard in future editions.*

Rationale

Research base for this standard

"Strong research"[101] shows that entering teachers learn crucial methods of instruction and management through observation of and supervised practice in schools where staff are successfully teaching students living in poverty.[102] Such a training model can also prevent teacher candidates from developing misguided notions that lower their expectations of what disadvantaged students can achieve.

Other support for this standard

This standard garners support from school district superintendents.

Standard 14: Student Teaching

The program ensures that teacher candidates have a strong student teaching experience.

Standard applies to elementary, secondary and special education programs.

Why this standard?

Teachers make an estimated 1,200 instructional decisions each day, which helps explain why an apprenticeship is essential to success as a novice teacher. Student teaching, which is generally a semester-long apprenticeship in a PK-12 school, allows candidates to build on their coursework by learning from a "pro" how to effectively deliver instruction.

What is the focus of the standard?

This standard examines programs' criteria for the selection of cooperating teachers, the programs' role in that process, and the number and frequency of observations by programs' supervisors.

Rationale

Research base for this standard

Student teaching presents critical opportunities to learn "from a pro." "Strong research"[103] shows how teacher preparation programs can ensure that teacher candidates fully reap the benefits of practice teaching with a cooperating teacher.

- Student teachers need frequent observations and feedback. Scheduling five supervisor observations during the semester (lasting typically between 14 and 16 weeks) ensures that the student teacher receives adequate guidance at sufficient intervals. A study of the impact of teacher preparation elements on teacher effectiveness found that student achievement improved for first-year teachers who graduated from teacher preparation programs that provided oversight of their student teaching experience. One component of this oversight is that the institutions required a minimum of five supervisor observations during student teaching.[104] These observations should be spaced throughout the semester so that the student teacher can make use of the feedback the observations provide.

[101] See note 1 above.

[102] Ronfeldt, M. (2012). Where should student teachers learn to teach? Effects of field placement school characteristics on teacher retention and effectiveness. *Educational Evaluation and Policy Analysis, 34*(1), 3-26. A recent study supports the use of high-functioning schools (as indicated by low staff turnover rates) for student teaching placements.

[103] See note 1 above.

[104] Boyd, D. J., Grossman, P. L., Lankford, H., Loeb, S., & Wyckoff, J. (2009).

- Finding the best possible teacher to serve as the "cooperating teacher" is critical. A second aspect of student teaching oversight shown to have a positive impact on student achievement is selection of the cooperating teacher by the preparation program rather than by the student teacher or school district staff.[105] The cooperating classroom teacher should be carefully screened to ensure that he or she has demonstrated the capacity both to increase student learning above the average and to mentor an adult.

Additional research[106] affirms the above strong research findings. The importance of multiple supervisor observations is supported by a meta-analysis of 49 studies on the effects of preservice and in-service training on practical classroom teaching behaviors and skills that found stronger effects for classroom practice with performance feedback.[107]

Other support for this standard

Practices in other nations support the standard that institutions should ensure the quality of cooperating teachers. In Finland, whose students outperform students in the United States, all teacher candidates' clinical work occurs in preselected schools staffed exclusively by highly effective teachers.

This standard also receives support from school district superintendents.

Standard 15: Secondary Methods

The program requires teacher candidates to practice instructional techniques specific to their content area.

Standard applies to secondary programs.

Why this standard?

It is one thing to know a subject and quite another to teach it. Beyond knowing content, candidates should have skills related to how to introduce content to students. Best practices differ among content areas, so methods courses should be tailored to a candidate's chosen subject area.

What is the focus of the standard?

We evaluate whether secondary teacher candidates receive instruction on pedagogy related to their content area and have the opportunity to practice these skills in a classroom.

Rationale

Research base for this standard

Little "strong research"[108] exists on this topic. However, a strong study in Germany looking at the relative effects of different components of teacher education, including pedagogical content knowledge (PCK) (e.g., methods to effectively teach math), found that "it is PCK that has greater predictive power [than content knowledge] for student progress and is decisive for the quality of instruction."[109]

[105] Ibid.

[106] See note 5 above.

[107] Rose, D. J., & Church, J. R. (1998). Learning to teach: The acquisition and maintenance of teaching skills. *Journal of Behavioral Education, 8*(1) 5-35.

[108] See note 1 above.

[109] Baumert, J., et al. (2010).

An additional research study[110] of high school math and science teachers found that teachers' pedagogical coursework positively correlated with students' achievement, and in some cases this pedagogical background yielded greater effects than their content knowledge.[111] Another study found that students had larger learning gains when their teacher had both content knowledge and the ability to identify common misconceptions about the content.[112] These studies demonstrate that teachers must have a firm basis in content knowledge and pedagogical techniques specific to that content to teach a subject effectively.

Other support for this standard

Teacher preparation programs in high-achieving nations frequently ensure that teachers not only know the content but also can communicate it. Mathematics-specific pedagogy is part of the preparation of mathematics teachers around the world, including in countries such as Singapore, Korea and Taiwan, whose students outperform our own.[113] Like teaching lesson planning, teaching pedagogical skills is one of the central tasks of a teacher preparation program. While some components of teaching may be universal across all subjects, many techniques and strategies are specific to a content area. Therefore it is essential that teacher preparation programs teach these skills to teacher candidates, who are expected to practice them through assignments and eventually implement them in the field.

School district superintendents also support this standard.

Standard 16: Instructional Design for Special Education

The program trains teacher candidates to design instruction for teaching students with special needs.

Standard applies to special education programs.

Why this standard?

In designing instruction, exceptional special education teachers modify and enhance the core curriculum in order to give their students full access to it. Explicit coursework provides the training and practice special education teacher candidates need to develop expertise in this area.

What is the focus of the standard?

This standard examines coursework offered by special education experts to ascertain if special education teacher candidates have sufficient practice designing instruction for students with the more common learning disabilities.

Rationale

Research base for this standard

While no "strong research"[114] on this topic exists, a recent additional study[115] found that teachers with more preservice coursework in special education (and those who received special education certification through preservice training) are more effective when teaching special education students reading. The study found a similar (although weaker) correlation between special education coursework and math instruction.[116]

[110] See note 5 above.

[111] Monk, D. (1994).

[112] Sadler, P. M., Sonnert, G., Coyle H. P., Cook-Smith N., & Miller, I. L. (2013).

[113] Communications with Mdm. Low Khah Gek. (2008, March).

[114] See note 1 above.

[115] See note 5 above.

[116] Feng, L., & Sass, T. R. (2010). What makes special-education teachers special? *Teacher training and achievement of students with disabilities* (Working Paper 49). Washington, DC: National Center for Analysis of Longitudinal Data in Education Research (CALDER), American Institutes for Research.

Other support for this standard
The fundamental concept of special education as defined by federal law (the Individuals with Disabilities Education Act [IDEA]) is "specially designed instruction." Coursework that prepares teacher candidates to design instruction for students with learning disabilities and to meet their legal obligation to their students is therefore central to the public mission of special education programs.

Furthermore, school district superintendents support this standard.

Standard 17: Outcomes

The program and institution collect and monitor data on their graduates.

Standard applies to elementary, secondary and special education programs.

Why this standard?
Just as teachers use information about their students' performance to improve their instruction, teacher preparation programs can use surveys and other information about the performance of their graduates to inspire and inform improvement.

What is the focus of the standard?
This standard examines how extensively and regularly institutions gather information from surveys of graduates and employers, data models, and performance assessments. We carefully consider the state policy context to determine what data are available and to determine where institutions do more than the state in which they're located requires. The standard's "strong design" (🏆) indicators address the use of outcomes information for program improvement.

Rationale
Research base for this standard
No "strong research"[117] exists to support this standard.

Other support for this standard
Mirroring a similar commitment now found in K-12 education, higher education institutions should embrace data-driven decision making and accountability by tracking the performance of their graduates. In states such as Louisiana, Tennessee and Florida, state education agencies are developing this capacity through their longitudinal data systems and have begun to provide teacher preparation programs with the results. With the advent of the Race to the Top grants, 10 more states will collect and report these data; several states will also use these data for accountability purposes.[118] The most sophisticated use of such data is to measure the performance of the students taught by an institution's graduates relative to the performance of students taught by the graduates of other institutions in the state.

This standard also garners support from school district superintendents.

[117] See note 1 above.

[118] Crowe, E. (2011). *Race to the top and teacher preparation: Analyzing state strategies for ensuring real accountability and fostering program innovation.* Washington, DC: Center for American Progress; www.americanprogress.org/wp-content/uploads/issues/2011/03/pdf/teacher_preparation.pdf

Standard 18: Evidence of Effectiveness

The program's graduates have a positive impact on student learning.

Standard applies to elementary and secondary programs in institutions in states with adequate data models.

Why this standard?

The ultimate purpose of teacher preparation programs is to train teachers to be successful in their own classrooms from day one. This standard examines whether the students of teacher preparation program graduates are achieving academically.

What is the focus of the standard?

This standard examines state reports, where available, on the effectiveness of graduates of individual teacher preparation programs. To be used for evaluation, report data must be specific to particular grade spans (i.e., elementary or secondary) and be available for at least two consecutive years.

Rationale

Research base for this standard

No "strong research"[119] exists on this topic.

Other support for this standard

The ultimate goal of teacher preparation programs should be to produce teachers who effectively educate their students. This standard evaluates programs by using direct evidence of effectiveness, rather than by inferring a connection between a program's practices and teacher candidates' future performance based on research findings.[120]

While this goal may have been hard to assess a few years ago, that is no longer the case. Across the country, states and school districts are increasingly measuring student learning as a way to evaluate the efficacy of teachers. In the past few years, 95 different states and school districts have received Teacher Incentive Fund (TIF) federal grants, which support their efforts to gather data on students' academic growth that can be attributed in part to teachers' efforts.[121] Concurrently, value-added measures of teachers' contributions to student learning are becoming more refined.

Given the wealth of information that is available on teacher efficacy, it seems reasonable to expect programs to first gather these data on the teachers they produce (as measured by Standard 17) and then use that information to fine-tune the program to ensure that it yields positive results. While people may disagree about the measures used to evaluate effectiveness, no one can dispute that teacher preparation programs should produce teachers who have a positive impact on student learning.

This standard also received support from school district superintendents.

119 See note 1 above.

120 Although this standard does not rely on research for its justification, the data on which the standard is based (data taken from state reports providing the results of value-added models for teacher preparation) apply research in the field of value-added models.

121 Center for Educator Compensation Reform. *List of TIF Grantees*. Retrieved February 5, 2013, from <http://www.cecr.ed.gov/TIFgrantees/list.cfm>

Standard 19: Rigor

The program holds teacher candidates to the same or a higher level of expectations regarding coursework and grading standards as that to which students in the rest of the institution are held.

Standard applies to undergraduate elementary, secondary and special education programs.

Why this standard?

Teaching is an immensely challenging profession that requires teachers to satisfy a long list of school and curricular demands, meet ever-rising expectations for student performance on state tests, consistently find the instructional sweet spot in a class of diverse students, and make the right choices time after time when faced with a barrage of situations requiring action. To be prepared for these challenges on day one, teachers need to have received a sufficiently rigorous course of study that mirrors the tough job of teaching.

This standard investigates whether teacher preparation programs provide candidates with training whose demands prepare them for the demands of the classroom. More specifically, the standard examines whether teacher candidates' grades are so high that they fail to realistically signal candidates' preparation for the classroom. The accompanying report, Training Our Future Teachers: Easy A's and What's Behind Them, provides additional background on whether teacher preparation grades are grounded in assignments designed to maximize the potential for feedback and to reduce teachers' reliance on trial and error in their first year of teaching. A forthcoming component of the standard will directly address this aspect of assignments.

What is the focus of the standard?

Our current evaluation of institutions on the first component of the standard measures the rigor of the preparation they provide as indicated by the grade point average (GPA) differential between teacher candidates and their campus peers.[122] A failing score on Standard 19 is a signal that teacher candidates earn disproportionately high grades, indicating that a program is not making the demands in training that prepare its graduates for the demands they will face in the classroom.

Rationale

Research base for this standard

Previous "strong research"[123] has provided evidence that teacher candidates earn higher grades than their campus peers.[124] Additional research[125] has commented on the nature of assignments in teacher preparation.[126] However, NCTQ's analysis, as described in our 2014 report Training Our Future Teachers: Easy A's and What's Behind Them, is the first to show a clear connection between teacher candidates' grades and their course assignments.

NCTQ analysis shows that grading patterns generally reflect coursework assignment patterns, which in turn generally connect to the potential for productive instructor feedback needed for training.[127] On this basis, the GPA differential can be used as a metric for rigor along two dimensions: first, in terms of accurately signaling teacher candidate performance, and second, in terms of providing assignments that are well designed for training purposes.

[122] As explained in the methodology for this standard, the GPA differential is computed as the difference between GPA-based honors of teacher candidates and honors of all graduating students on the same campus, as cited in brochures for spring undergraduate graduation ceremonies.

[123] See note 1 above.

[124] Koedel, C. (2011). Grading standards in education departments at universities. *Education Policy Analysis Archives, 19*(23).

[125] See note 5 above.

[126] Evertson, C. M., Hawley, W. D., and Zlotnik, M. (1985). Making a difference in educational quality through teacher education. *Journal of Teacher Education, 36*(3). Pages 2-12; Merseth, K. K. (1991). The early history of case-based instruction: Insights for teacher education today. *Journal of Teacher Education, 42*(4), 243-249.

[127] See *Training Our Future Teachers: Easy A's and What's Behind Them*, available at http://www.nctq.org/dmsStage/EasyAs

For purposes of this analysis, we divide assignments into two broad categories:

- "Criterion-deficient" assignments, in which assignments allow students' work products to vary so substantially that the criteria for evaluation can realistically only be tied to superficial characteristics, such as completion, and to a large extent cannot be tied to skills and knowledge.[128]
- "Criterion-referenced" assignments, in which assignments provide clearly circumscribed criteria so that work products focus on similar content and vary along dimensions that facilitate evaluation referenced to knowledge and skills.[129]

Our analysis shows that courses with higher proportions of grades based on criterion-deficient assignments have higher average grades. This relationship is consistent in both teacher preparation courses and other academic disciplines. We hypothesize that the relationship between criterion-deficient assignments and grades is related to the fact that in the absence of criteria for evaluation related to a discrete set of knowledge and skills that students must demonstrate they have mastered, it is difficult for instructors to distinguish between inadequate, adequate and excellent work. Without these criteria, instructors grade on more superficial characteristics (such as whether all parts of the assignment were completed), which can lead to a clustering of grades at the top of the scale. Moreover, these high grades become disconnected from teacher candidates' mastery of the content. On the other hand, assignments with clearly circumscribed content enable instructors to provide a high level of critical feedback, which maximizes the candidate's ability to master content so that they rely less on trial and error in their first year of teaching.

The nature of the sample we evaluated makes it impossible at this time to validate the Rigor Standard by drawing a direct connection between the proportion of criterion-deficient assignments in teacher preparation programs' coursework and the GPA differentials of those programs' graduating teacher candidates but we hope to be able to draw such a connection in the future when we provide evaluations on programs' assignments.[130]

For more information on why alternative explanations for the pattern of relatively higher grades in teacher preparation use — including the possibility that teacher preparation instructors are more effective teachers or that clinical practice influences grading practices — do not explain the widespread phenomenon of GPA disparities as well as does the nature of assignments, refer to our report laying the foundation for this standard.[131]

[128] For example, an instructor's rubric for evaluation of a lesson planning assignment may state that she will evaluate all instructional strategies. But if the assignment is open-ended regarding the lesson plan's topic and student audience, teacher candidates' work will generate 25 different lesson plans produced on 25 different learning objectives, each for a class with a different student composition. The instructor will be hard-pressed to consider the issue of teaching strategies in anything but the most cursory way. The potential for productive instructor feedback is minimal.

[129] For example, if the assignment described above is modified to specify that all lesson plans must be based on only one learning objective addressed to a class with a specified student composition, the potential is much increased that the instructor can evaluate whether knowledge and skills are correctly reflected in instructional strategies. The potential for productive instructor feedback is substantial.

[130] The sample of institutions for which we have coursework and grades is too small and does not encompass a wide-enough range of academic disciplines to make it fully comparable to the Rigor Standard, which compares teacher preparation programs with the entire institution. We are eager to fully validate this standard, and appeal to any institutions interested in this work to submit full sets of course syllabi and their average course grades for a range of academic disciplines, including teacher preparation.

[131] See *Training Our Future Teachers: Easy A's and What's Behind Them*, available at http://www.nctq.org/dmsStage/EasyAs