Human Capital Research Collaborative[1]

University of Minnesota and the Federal Reserve Bank of Minneapolis

Summary Report

Assessing the Validity of Minnesota School Readiness Indicators

Prepared for

Early Learning Services

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Abstract

The State of Minnesota has established the goal that by the year 2020 all children entering kindergarten will be school-ready. In this report, we assessed the validity of the Minnesota Work Sampling System Kindergarten Entry Developmental Checklist (MWSS) in predicting third-grade school performance. Since 2002, the checklist of 32 items representing five domains of performance has been used by the Minnesota Department of Education to assess school readiness. Based on a 10% random sample of schools stratified by region, this performance-based assessment is completed annually by teachers in the fall of Kindergarten. We found that in the fall of 2009, 51% of the Kindergarten sample was proficient in language and literacy, 41% in language and literacy as well as mathematical thinking, and 31% were proficient in all five domains of performance. Using a new overall proficiency standard of attainment of 75% or more of the total points across all 32 items, 53% of Kindergartners demonstrated school-ready proficiency. This and other proficiency rates are unchanged since 2007.

Based on data from Kindergarten cohorts in 2003, 2004, and 2006 who had available achievement test scores in third grade or information on remedial education, we found that the MWSS checklist, including the 75% indicator, significantly and consistently predicted third-grade MCA reading and math tests scores and the need for school remedial services (special education or grade retention) above and beyond the influence of child and family background characteristics. The strength of prediction was consistent across a range of child and family characteristics (e.g., family income, gender, and race/ethnicity).

Eight recommendations were discussed: (1) establish an official definition of school-ready proficiency, (2) establish key indicators for measuring the rate of school-ready proficiency, primarily the 75% proficiency standard, (3) collect annually as part of the Kindergarten assessment information on prior early education and parenting, (4) collect MWSS data annually on all Minnesota Kindergartners, (5) consider use of the Kindergarten version of the WSS development checklist, (6) implement strategies as soon as possible to close the large gap between current rates of school readiness and the 2020 goal, (7) continue to track the currently analyzed cohorts to eighth grade and beyond, and (8) begin a longitudinal study in 2011 that tracks the Kindergarten assessment sample over time and through all available data systems.

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Overview

In 2008, the State of Minnesota established the goal that all children entering kindergarten will be school-ready by 2020. The Advisory Council on Early Care and Education (ECAC) is charged with making recommendations to the Governor and Legislature for policies and programs necessary for achieving this goal and developing a system of accountability for measuring progress. Defining school readiness is a fundamental part of this process. A high priority for the State is to establish a common definition of school readiness, identify key indicators of measuring school readiness, and identify benchmarks by which progress can be assessed.

The purpose of this report is to assess the content, reliability, and validity of the Minnesota Work Sampling System Kindergarten Entry Developmental Checklist (MWSS[2]). The MWSS measures children on 32 indicators of school readiness in 5 domains: Personal and Social Development (10 items), Language and Literacy (11 items), Mathematical Thinking (4 items), the Arts (4 items), and Physical Development and Health (3 items). The indicators are taken from the Preschool-4 Work Sampling System instrument and were chosen because they represent what children should be able to do as four-year-olds, prior to entering kindergarten. These indicators are aligned with the Minnesota Early Childhood Indicators of Progress and the K-12 Academic Standards. MWSS began in 2002 in Minnesota and is administered annually. The same 32 indicators have been used every year.

Kindergarten teachers are trained, either in-person (one full day of training) or on-line (approximately 3 hours), to assess children's proficiency using the MWSS. During the first eight weeks of school kindergarteners are observed by their teachers in the classroom environment. At the end of the eight weeks, teachers rate children as "Proficient", "In Process", or "Not Yet" on each indicator.

Although school readiness is defined and operationalized for benchmarking student progress, the main question we address in this report is how well scores on the MWSS predict school achievement in third grade. The report includes findings on three major questions:

1. What are children's levels of proficiency at kindergarten entry for different definitions of school readiness?

2. How well are children who are proficient on MWSS achieving in 3rd grade compared to those who are not proficient?

3. Is the predictive value of the MWSS similar across different groups of children (socioeconomic status, child and family characteristics, race and ethnicity)?

Recommendations are provided for defining school readiness, improving the reliability and validity of the MWSS for tracking progress on children's school readiness over time, and increasing rates of proficiency to achieve the 2020 school readiness goal.

Defining School Readiness

The definition and measurement of school readiness has a long history in education and child development. Early definitions emphasized cognitive and language development in the format of standardized tests and were not comprehensive in the coverage of important skills, behaviors, and attitudes necessary for school success. Three categories of measures of school readiness can be distinguished. Direct assessments are

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[2] Developed by Dr. Samuel Meisels, the Work Sampling System is a nationally recognized form of child performance assessment (ages 3 to 11). Based on teacher observations, it is a curriculum-embedded assessment rather than an on-demand test. The three major elements are the developmental guidelines and checklist of progress indicators, child portfolios and work products, and summaries of child progress that integrate the first two elements. The original version of the developmental checklist includes 7 domains (Personal and social development; Language and literacy; Mathematical thinking; Scientific thinking; Social studies; The Arts; and Physical development).

standardized tests of performance at a single point in time (e.g., Peabody Picture Vocabulary, Woodcock-Johnson tests) and are not aligned to state learning standards. Screening instruments are relatively brief instruments measuring specific skills (e.g., Early Screening Inventory) for the purpose of determining need for additional services or for general descriptions of performance. Performance assessments such as the Work Sampling System or the Child Observation Record are curriculum-embedded assessments that are completed by teachers over a longer period of observation. They usually include work products (portfolios) and children are rated on developmental domains aligned to state learning standards. The MWSS is a performance assessment instrument completed by teachers within the context of the kindergarten classroom. The development of alternative types of assessments has been motivated by the accumulated research showing limited predictive validity of standardized tests for young children.[3]

Through implementation of the MWSS since 2002, the Minnesota Department of Education has provided a strong foundation for defining and establishing a comprehensive set of measures of school readiness.

Inherent in any definition of school readiness and being "school-ready" is an informed assessment of mastery or proficiency in key skills and behaviors that are predictive of later school performance and progress. These behaviors for a child demonstrating proficiency also would be observed on a regular basis rather than occasionally or sometimes.

We define school readiness as the consistent demonstration of mastery or proficiency in skills, behaviors, and attitudes that promote successful transition to kindergarten and are instrumental (predictive) of optimal learning and achievement. These skills and behaviors include the domains of language, literacy, math, socio-emotional development, the arts, and physical health. Proficiency in multiple domains is especially beneficial for smooth transitions to kindergarten. From the perspective of child development and educational measurement, no one indicator or measurement approach is fully representative of school readiness. Because skills and behaviors across domains are highly related in early childhood, an overall index is desirable. This increases coverage of important skills and the reliability of the score in repeated assessments.

How do other states measure school readiness?

Approximately 26 states collect school readiness data on children entering kindergarten. The data collected are used for a wide variety of purposes including informing classroom instruction, school improvement and accountability, and child screening and placement. The National Conference of State Legislatures recently completed a technical report entitled *State Approaches to School Readiness Assessment*[4] summarizing school readiness data collected by states.

Procedures

Many states (Alaska, Arkansas, Connecticut, Florida, Georgia, Hawaii, Louisiana, Maryland, Oregon, and Vermont) use instruments that are similar in content and rationale to the MWSS. Though the names of the domains vary, the essence of what they measure is very similar. Maryland uses portions of the WSS, similar to Minnesota. South Carolina also uses an adapted version of the WSS. The New York City Public Schools recently added the WSS as an approved assessment system for Kindergarten to Grade 3. Saint Paul Public schools has used the WSS in school readiness and community kindergarten programs since 2000. Table 1 provides an item-by-item comparison for select states that use school readiness items that are similar to the MWSS.

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[3] For a synthesis, see LaParo, K. M., & Pianta, R. C. (2000). Predicting young children's competence in the early school years: A meta-analytic review. *Review of Educational Research, 70*(4), 443-484.
[4] A brief report can be found at http://www.ncsl.org/?tabid=18496; the full report can be downloaded at http://www.ncsl.org/documents/Educ/KindergartenAssessment.pdf.

Of those states that collect school readiness data on students as they enter kindergarten (25 states) Minnesota is the only state that collects data on a sample of students rather than collecting data universally (or nearly universally) on all incoming kindergarteners.

Proficiency Rates

The criteria for a child to be identified as proficient on a given domain vary by state. Eleven states collect data on between five and nine domains, 10 states collect data only on reading, two collect data on math and reading only, and two do not specify the domains assessed by schools. Of those states that assess multiple domains, very few assign an overall school readiness score with the exception of Maryland. Maryland uses a child's total score to create a composite rating. In reporting readiness data, most states simply report percentages of children who scored at each proficiency level for each of the domains.

Similar to many other states, Minnesota currently calculates the MWSS proficiency rates by domain. The domain proficiency rating is solely based on the points in a domain adjusted for the number of indicators rated. In order to rate a child as proficient in a specific domain, the majority of the items within the domain must be rated as proficient.

Research on the Validity of WSS and Teacher Ratings

States use of school readiness assessments is relatively new and data on validity are in the early stages. The WSS has had more extensive research than most other assessments and is widely used. Meisels and colleagues have found that WSS checklist ratings are reliable and have moderate to high correlations with the Woodcock-Johnson scores in reading and math.[5] They also have been found to significantly predict school achievement above and beyond child background characteristics and standardized test scores. More generally, a substantial literature has confirmed the predictive validity of teacher ratings in kindergarten and the early grades on school achievement and educational attainment.[6] For example, studies have found that classroom adjustment in early schooling as rated by teachers is significantly associated with high school completion and college attendance. Teacher ratings of social adaptation (aggressive behavior) in first grade were found to be significantly associated with high school graduation. Engagement behaviors, including teachers' ratings of children's classroom deportment in terms of externalizing behaviors and adaptability at first grade, was found to be significantly associated with high school dropout. In addition, teacher ratings of school performance in first grade were found to be significantly associated with lower rates of high dropout. Studies also reveal that teacher ratings of school adjustment and performance can be as good or better predictors of school achievement and attainment

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[5] See Meisels et al. (2001). Trusting teachers' judgments: A validity study of curriculum-embedded performance assessment in Kindergarten-Grade 3. *American Educational Research Journal, 38*(1), 73-85. Meisels, S. J., Xue, Y., & Shamblott, M. (in press). Assessing language, literacy, and mathematics skills with Work Sampling for Head Start. *Early Education and Development*. Meisels, Liaw, F-R., Dorfman, A., & Nelson, R. (1995). The Work Sampling System: Reliability and validity of a performance assessment for young children. *Early Childhood Research Quarterly, 10*(3), 277-296.

[6] See the following studies: Alexander, K. L., Entwisle, D. R., & Horsey, C. S. (1997). From first grade forward: Early foundations of high school dropout. *Sociology of Education, 70*(2), 87-107. Ensminger, M. E., & Slusarcick, A. L. (1992). Paths to High-School Graduation or Dropout - a Longitudinal-Study of a 1st-Grade Cohort. *Sociology of Education, 65*(2), 95-113. Garnier, H. E., Stein, J. A. & Jacobs, J. K. (1997). The process of dropping out of high school: A 19-year perspective. *American Educational Research Journal, 34*(2), 395-419.Ou, S., Mersky, J. P., Reynolds, A. J., & Kohler, K. M. (2007). Alterable predictors of educational attainment, income, and crime: Findings from an inner-city cohort. *Social Service Review, 81*(1), 85-128. Ou, S., & Reynolds, A. J. (2008). Predictors of educational attainment in the Chicago Longitudinal Study. *School Psychology Quarterly, 23*(2), 199-229.

than test scores. Table 2 provides information on the effects of state funded Pre-K programs on school readiness measures for selected states.

Data Used in Analyses

For analyses reported herein, data were obtained from the Early Learning Services division of the Minnesota Department of Education. Data are reported only for those children who do not have any missing MWSS ratings, with the exception of the 2006 longitudinal matched sample, where there was a large number of missing data, specifically in the art domain. For children missing less than 50% of the items in a given domain in 2006, proficiency rates were calculated based on their available items using the same proficiency criteria. The number of children included in the MWSS sample for each year is as follows: 2003 = 2,933; 2004 = 3,247; 2006 = 2,990; 2007 = 6,372; 2008 = 3,497; and 2009 = 6,280. Across the cohort samples the percent proficient varies suggesting that the cohorts may be distinct. This was especially true for 2006 where a higher percentage of students were proficient than in other years. It was, therefore, deemed important to analyze cohorts separately.

Each spring third grade children in Minnesota participate in the Minnesota Comprehensive assessment system (MCA)[7]. This criterion-referenced test measures each child's progress on state standards in reading and math. Based on children's raw scores on these exams, children are assigned an overall scale score for reading and an overall scale score for math. The overall scale score is a three or four digit number that begins with the grade level and is followed by the student's scaled score on that exam. For third grade, these scores range from 301 to 399. Students are also assigned an achievement level based on their overall scale score for both reading and math. There are four achievement levels of the MCA tests as follows:

- Exceeds Standards (Proficient): reading scores of 365-399; math scores of 364-399. These scores correspond to minimum percentile ranks of 52 and 62, respectively.

- Meets Standards (Proficient): reading scores of 350-361; math scores of 350-362. These correspond to percentile ranks of 25-47 and 20-57, respectively.

- Partially Meets Standards (Not Proficient); reading scores of 340-348; math scores of 340-349. These scores correspond to percentile ranks of 14-23 and 6-18, respectively.

- Does Not Meet Standards (Not Proficient); reading scores of 301-339; math scores of 301-339. These scores correspond to percentile ranks of 1-13 and 1-5, respectively.

Follow-up data for MCA Reading and Math Scores in third grade as well as any special education and retention by third grade was provided by MDE. The 2003, 2004, and 2006 samples were matched by MDE based on MARSS[8] numbers. Not all children who had MWSS scores were available in the matched samples. All three

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[7] There is reason to believe that early achievement is related to later educational success. While we are not aware of any study examining results on MCA to later achievement, there are studies of similar standardized tests predicting to college attendance. In 2007, the National Center for Education Statistics at the U.S. Department of Education produced a report on the relationship between NAEP math scores and post-secondary attendance. Any post-secondary attendance was significantly lower among students "below basic" on math portion of the 12th grade NAEP exam compared to students at the "basic", "proficient" or "advanced" levels (rates = 54%, 82%, 95% and 98%, respectively) . Similarly, rates of post-secondary degree earned were different by level of 12th grade math scores. Of students whose score was "advanced", 91% of them went on to earn at least a bachelor's degree. This differs significantly for students whose score was "proficient" (79%), "basic" (50%), and "below basic" (18%). About three in five students who were below basic did not earn any post-secondary degree or training certificate. (Chapter 3, table 5 and table 6). Scott, L.A., and Ingels, S.J. (2007). *Interpreting 12th-Graders' NAEP-Scaled Mathematics Performance Using High School Predictors and Postsecondary Outcomes From the National Education Longitudinal Study of 1988 (NELS:88)* (NCES 2007-328). National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education. Retrieved from: http://eric.ed.gov/PDFS/ED498359.pdf.

[8] Minnesota Automated Reporting Student System: "MARSS is the means by which the Department collects demographic, enrollment and selected program data on all public school students, and some private school students who receive specific

cohorts had some MARSS numbers that did not match initially; in addition, there was some attrition from Kindergarten to third grade. The number of children included in the matched longitudinal samples is as follows: 2003 = 1,469; 2004 = 2,846; and 2006 = 2,342.

Representativeness

An important issue when collecting data on only a portion of the larger student population is obtaining a representative sample. For most years, attempts were made by Minnesota to obtain a representative sample by randomly sampling schools within six strata differentiated by school size and location. MWSS data are collected on approximately 5-10% of the Kindergarten population. Table 3 (see Appendix) provides information about Kindergarteners' demographics for 2006 at the state level, the MWSS sample, and the longitudinal sample. Table 3.1 (see Appendix) provides additional information regarding the school strata for each year where data are available.

Longitudinal Sample Recovery Rates

Among the 2003 Kindergarten cohort, 34% were available at third grade for matching in the longitudinal sample. Most of the nonmatching cases were due to missing or incomplete MARSS numbers in Kindergarten. The percentage of children with matched records between Kindergarten and third grade in 2004 and 2006 were 72% and 78%, respectively.

Factor Analysis of the MWSS Checklist

To address the question—"Are the 32 items in the state assessment best represented by five domains of performance as conceptualized in the WSS?"—a factor analysis was conducted for the cohort years of 2003, 2004, 2006, and 2009. Findings were consistent that the checklist items were the most empirically represented by one overall school readiness dimension rather than five. Table 4 (see Appendix) provides correlations of the MWSS items with the overall factor from the principle components analysis for 2003, 2004, and 2006. This single dimension (factor) accounted for 55-61% of the total inter-item variance, which is considered relatively strong verification of a single factor model. A weak and inconsistent second factor related to personal and social development was not supported. The items most strongly associated with the one-factor model of overall proficiency (2009) were "comprehends and responds to stories read aloud" ($r = .84$), "beginning understanding of concepts about print" ($r = .83$), and "approaches tasks with flexibility and inventiveness" ($r = .83$). The items with lower correlations with the overall factor were "performs some self-care tasks independently" ($r = .72$), "follows class rules and routines" ($r = .73$), and "participates in creative movement, dance, and drama" ($r = .73$). The average inter-item correlation coefficients ranged from .54 to .60, which indicates a relatively high degree of response consistency. Notably, the internal consistency reliability of the overall scale and the five subscales were high. The overall scale demonstrating the highest reliability coefficient (rel. = .98). These findings support the creation of an overall proficiency index, which is described below.

1. What are children's levels of proficiency at kindergarten entry for different definitions of school readiness?

Table 5 (see Appendix) presents different ways to measure the MWSS proficiency rates. The percentage of Kindergarteners in the sample who met each proficiency rate and the number of children included in the sample

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public instructional services, for purposes of state aid calculations, accountability reports, and various ad hoc reports to the legislature, the public and the federal government." Minnesota Department of Education, 2006-07
http://education.state.mn.us/mdeprod/groups/Finance/documents/Publication/002618.pdf

are listed in the table. These data are provided for 2003, 2004, 2006, 2007, 2008, and 2009. The following proficiency rates are provided:

     a)   current MDE proficiency rates listed in each domain

     b)   a higher proficiency rate on specified domains

     c)   a total score of 75% or better (48 out of 64 points)

     d)   proficient in all 5 domains

     e)   proficient in Language and Literacy and Mathematical Thinking.

- Proficiency rates fluctuate across years, across domains, and across different ways of measuring proficiency.
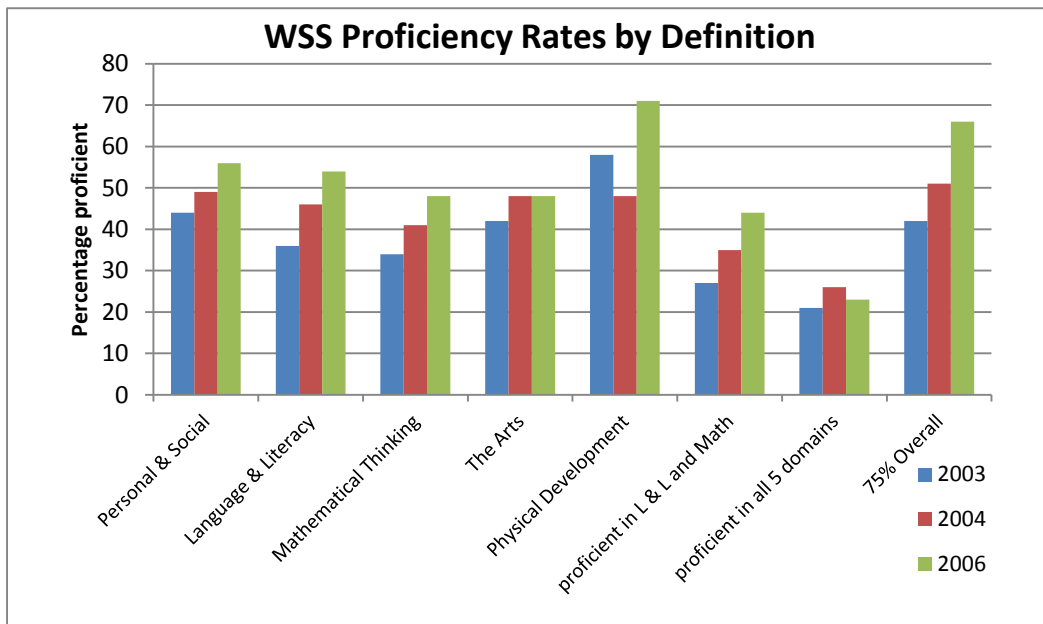
- The overall proficiency rate of 75% proficient (48 out of 64 points) ranges from 42% proficient in 2003 to 66% proficient in 2006; this is similar to the rates obtained for the MDE defined proficiency rate by domain.

- The percentage proficient ranges from 21% in 2003 to 31% in 2007 and 2009 when a more stringent definition of proficiency is used where children need to be proficient in all five domains.

- Requiring proficiency in at least Language and Literacy and Mathematical Thinking results in proficiency rates between the 75% overall proficiency and requiring proficiency in all domains.

     Comparisons of all Kindergarteners in the sample and various subgroups of Kindergarteners on the MWSS proficiency rates, by domain and overall using a cut-off of 75% proficient on all items were analyzed for 2008 and 2009. Gender, IEP status, and school strata were collected in both 2008 and 2009. Additional information was available in 2008 (Table 6 in Appendix) on race/ethnicity, family income, and parental education.

The percentage of white children who were proficient was highest for all of the proficiency rates, and the percentage of American Indian children and Hispanic children who were proficient was lowest.

Proficiency Rates by Ethnicity 2008
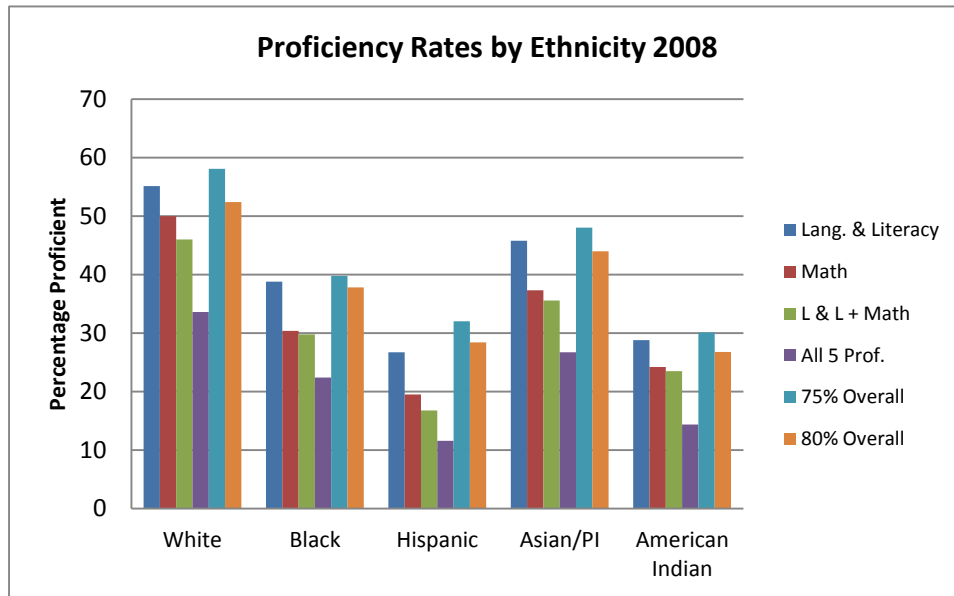
Parental education also differentiated children who were proficient from those who were not. The percentage of kindergarteners proficient whose parents had less than a high school education was consistently lower than the percentage of children proficient whose parents had a bachelor's degree or higher.

Proficiency Rates by Parent Education 2008
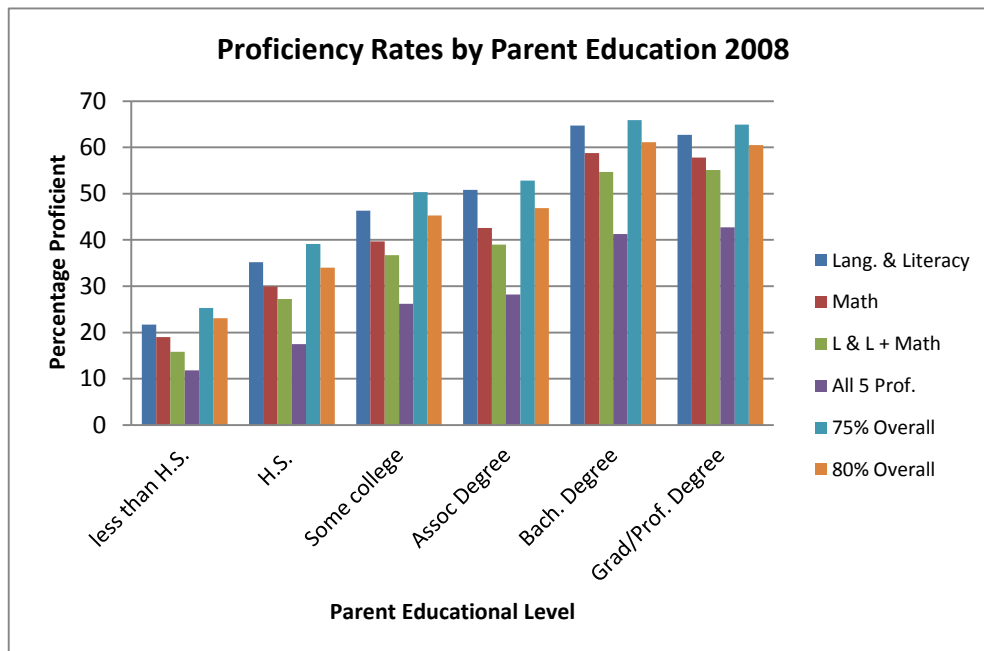
A lower percentage of Kindergarteners whose families earned 250% or less of the Federal Poverty Level were proficient by all standards compared to those children whose families earned more than 250% of the Federal Poverty Level.

Proficiency Rates by Family Income 2008
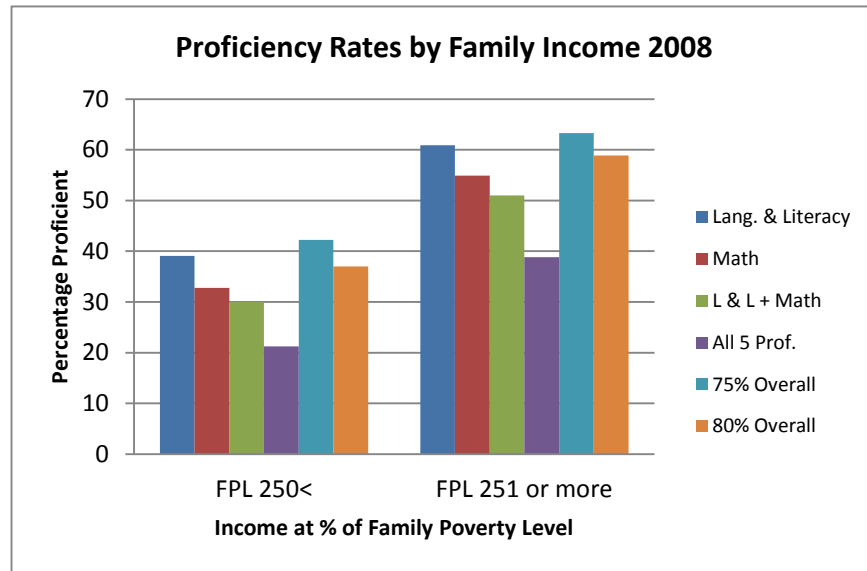
2. How well are children who are proficient on MWSS achieving in third grade compared to those who are not proficient?

This question was examined in a number of ways. In order to examine this question, the MWSS proficiency rates were measured in a number of different ways, including:

    a) the MWSS domain of Language and Literacy,

    b) the domain of Mathematical Thinking,

    c) both domains of Language and Literacy and Mathematical Thinking,

    d) the domains of Language and Literacy, Mathematical Thinking, and Personal and Social,

    e) all 5 domains on the MWSS,

    f) overall on 70%, 75%, and 80% of the items on MWSS, and

    g) 17 or more items proficient.

We analyzed the various different proficiency rates by examining correlations, examining the percentage of children who were proficient in Kindergarten by third grade outcomes, and examining regressions. All of our analyses indicated similar findings:

- Kindergarteners who were proficient on the MWSS as measured by any of the above proficiency rates were consistently more likely to be proficient on MCA reading and math tests as well as less likely to be in special education or to have been retained by third grade.

Table 7 (see Appendix) summarizes our analyses examining the validity of MWSS proficiency indicator options for the 2006 cohort. Similar results were found for the 2003 and 2004 cohorts. As indicated in the table, there were significant differences between children who were and who were not proficient on MWSS in Kindergarten for all of the proficiency indicators for meeting or exceeding MCA math and reading standards and for exceeding MCA math and reading standards.

Correlations

- Higher scores on each item on the MWSS were related to higher MCA reading and math scores across all three years (2003, 2004, & 2006). Table 8 (see Appendix) provides correlations between MWSS items and third grade MCA reading and math scores and any special education by third grade. Therefore, students who had higher kindergarten scores also had higher third grade scores.

- On average, the items with the highest correlations across all years for both MCA reading and math are:

   o "Demonstrates phonological awareness"

   o "Begins to develop knowledge about letters"

   o "Shows beginning understanding about number and quantity"

- Among the individual domains, the domains of Language and Literacy and Mathematical Thinking consistently correlated the most highly with the third grade MCA reading and math scores.

- Both raw correlations and partial correlations controlling for child's gender, race/ethnicity, income, parent education, and special education at Kindergarten all showed significant correlations between proficiency in Kindergarten for all of the proficiency indicators and MCA Reading and Math outcomes.

Examining Kindergarten Proficiency by Third Grade Outcomes

We examined the percentage of students who were "proficient", "in process", and "not yet" on the MWSS by domain at kindergarten entry and their classification in third grade as "exceeds standards", "meets standards", and "partially or does not meet standards". Third grade proficiency rates were assessed for reading, math, and special education for 2003, 2004, and 2006. An example of these analyses is shown for 2006 in table 9 (see Appendix).

- For all three years, a higher percentage of children who were proficient in each domain on the MWSS at kindergarten entry exceeded standards on the MCA reading and math scores in third grade compared to those children who were not yet proficient at kindergarten entry.

- Those Kindergarteners who were proficient on MWSS in all domains were more likely to exceed standards on both MCA reading and math scores in third grade compared to those Kindergarteners who were not yet proficient.

- Kindergarteners who were not yet proficient on MWSS domains were more than twice as likely to have been in special education by third grade compared to those Kindergarteners who were proficient.

Proficient in Kindergarten Less Likely to Ever be in Special Education by 3rd Grade
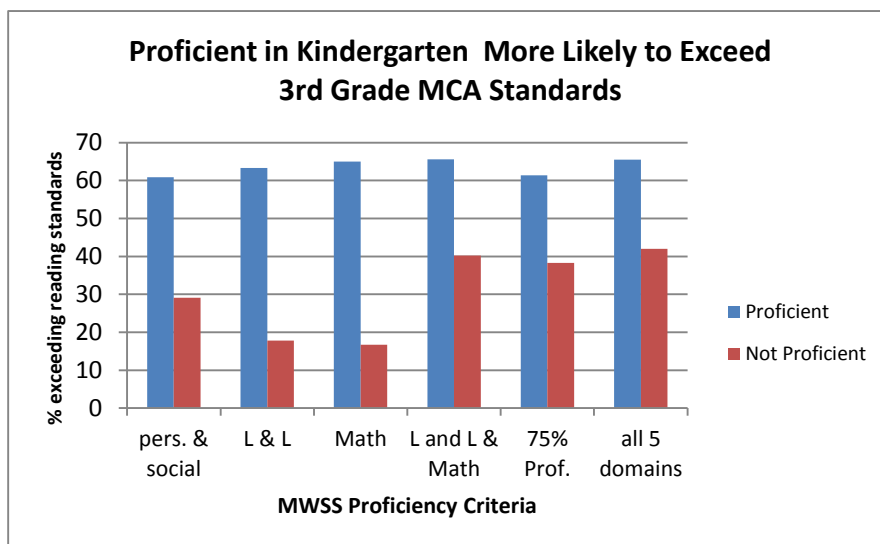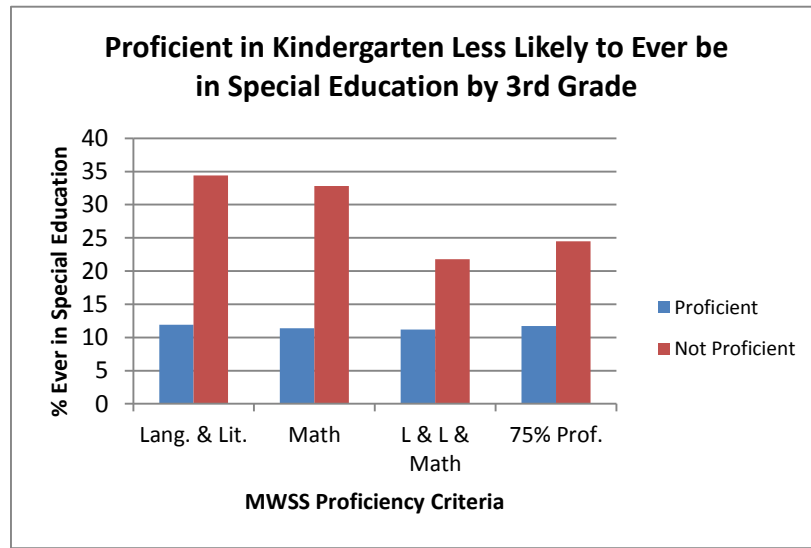
- The pattern of these results is similar across all years, across reading and math MCA scores and special education by 3rd grade, and across all domains and proficiency criteria.

Regression Analysis

A series of regressions were calculated for 2003, 2004, and 2006 cohorts. The purpose of these analyses was to assess which MWSS proficiency rate best predicted third grade proficiency rates. The analyses predicted to the following:

a) meeting or exceeding MCA reading proficiency,

b) exceeding MCA reading proficiency,

c) meeting or exceeding MCA math proficiency,

d) exceeding MCA math proficiency,

e) special education or grade retention by 3rd grade,

f) special education by 3rd grade,

g) MCA reading scores in 3rd grade, and

h) MCA math scores in 3rd grade.

- Results consistently indicated that all proficiency cuts that were examined, including the domains of Language and Literacy, Mathematical Thinking, Language and Literacy plus Mathematical Thinking, Language and Literacy plus Mathematical Thinking plus Personal and Social Development, proficiency on all 5 domains, proficient on 17 items, as well as the overall 70%, 75%, and 80% proficiency rates significantly predicted MCA Reading and Math outcomes in 3rd grade for each year.

- Holding constant gender, race/ethnicity, parent education, income, and IEP status in Kindergarten, those Kindergarteners who were proficient on Language and Literacy or Mathematical Thinking or were proficient at the 75% rate overall were two to three times as likely to meet or exceed MCA reading and math proficiency in all three years as those Kindergarteners who were not proficient on MWSS.

- Holding all of the above identified variables constant, Kindergarteners who were not proficient on MWSS were, on average, twice as likely to have been in special education or retained by 3rd grade.

3. Is the predictive value of the MWSS similar across different demographic groups of children?

The MWSS proficiency rates were compared for all children and by subgroups for outcomes on 3rd grade MCA reading and MCA math for all three cohorts (2003, 2004, and 2006) to determine if results examining the entire group held up across subgroups. The subgroups that were compared were race/ethnicity, gender, ever retained or special education, number of moves at Kindergarten, Title 1 school in Kindergarten, Kindergarten schedule, and family income. Table 10 (see Appendix) shows an example table comparing 3rd grade MCA reading outcomes by MWSS overall proficiency at the 75% level.

Boys and girls proficient on MWSS at 75% proficiency in 2006 were more likely to exceed 3rd grade MCA Reading Standards
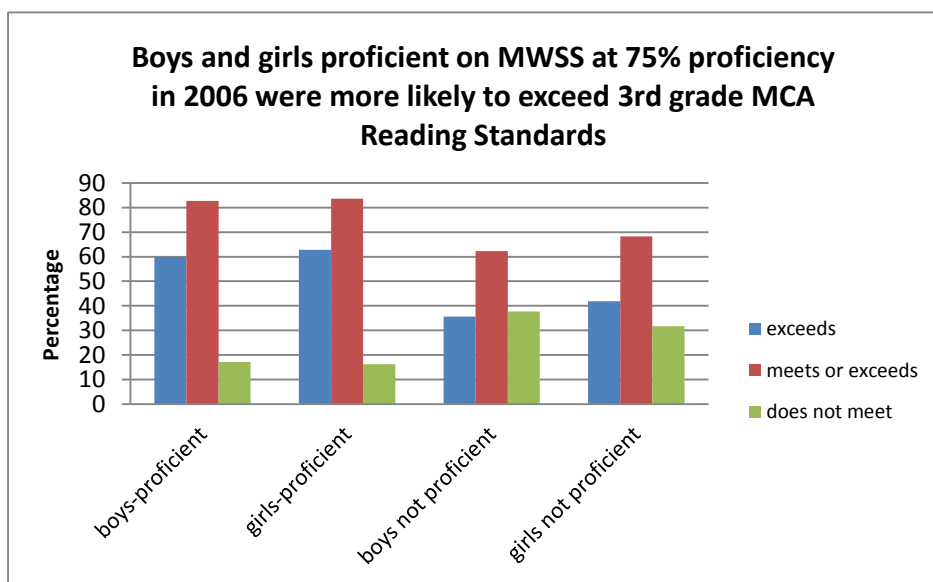
- Within subgroups, Kindergarteners who were proficient on MWSS (by all three measures) were more likely to exceed standards on MCA reading and math in 3rd grade compared to Kindergarteners who were not proficient on MWSS on most comparisons.

Across ethnicities, children proficient on MWSS at 75% proficiency were more likely to exceed 3rd grade MCA Reading Standards in 2006

Across income levels, children proficient on MWSS at 75% proficiency were more likely to exceed 3rd grade MCA Reading Standards in 2006

Across income levels within ethnicity, children proficient on MWSS at 75% proficiency were more likely to exceed 3rd grade MCA Reading Standards in 2006

Table 11 (see Appendix) provides information for the 2006 cohort for children who were proficient on MWSS and their rates of exceeding MCA reading standards by subgroups. As indicated in the table, for most subgroups, all cuts of the MWSS proficiency indicators showed significant differences in predicted probabilities when controlling for other demographic variables. Due to small group sizes when the sample was cut into various subgroups, some data were insufficient to identify the effect of the MWSS measure.

Summary

- Minnesota established the goal that all children entering kindergarten will be school ready by 2020.

- 26 states collect school readiness data, of these Minnesota is the only state that collects only a sample of students.

  o 11 states collect data on between five and nine domains

  o 10 states collect data only on reading

  o 2 collect data on math and reading only

  o 2 states do not specify the domains assessed by schools.

- Teacher ratings are an effective measure of school readiness

  - Teacher ratings in Kindergarten and early elementary school predict achievement later in school as well as high school completion and college attendance.

  - Teacher ratings of school performance predict school achievement as good as or better than test scores.

  - The WSS in particular predicts later achievement test scores.

- Although the MWSS measures multiple domains, the domains are all related and there is one overall dimension.

- Proficiency rates fluctuate across years, across domains, and across different ways of measuring proficiency.

- Ethnicity, parent education, and family income all differentiated Kindergarten children who were proficient on the MWSS from those who were not.

- Kindergarteners who were proficient on the MWSS were consistently more likely to meet or exceed standards on the MCA reading and math tests and less likely to be in special education by third grade.

  - Students who had higher Kindergarten scores also had higher third grade scores.

  - A higher percentage of children who were proficient at Kindergarten entry exceeded standards on the MCA reading and math scores in third grade compared to those who were not yet proficient at Kindergarten entry.

  - Kindergarteners who were not yet proficient in Kindergarten were more than twice as likely to have been in special education or retained by third grade compared to those Kindergarteners who were proficient, even when controlling for gender, race/ethnicity, parent education, income, and IEP status.

  - When controlling for gender, race/ethnicity, parent education, income, and IEP status at Kindergarten, children who were proficient in Kindergarten were two to three times as likely to meet or exceed MCA reading and math proficiency compared to Kindergarteners who were not proficient on the MWSS.
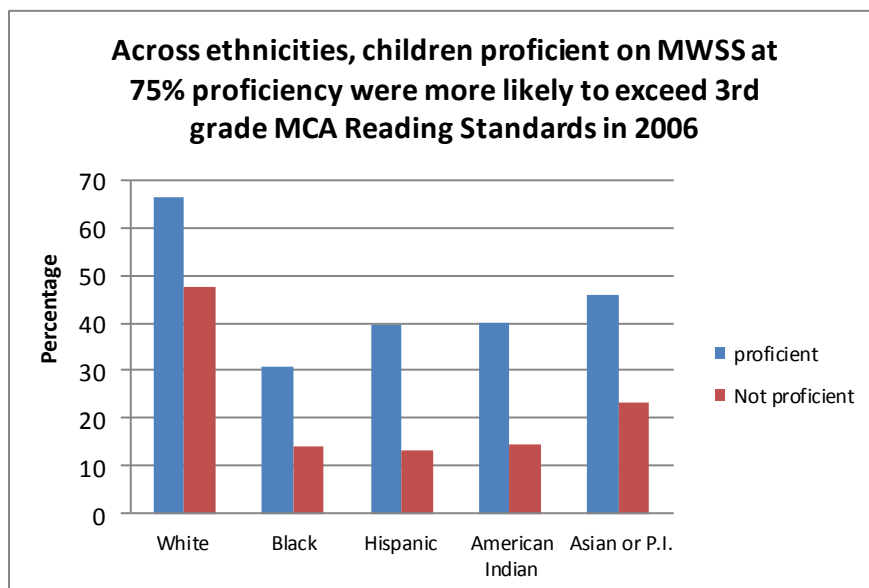
- Across different demographic groups of children, those children who were proficient in Kindergarten were more likely to meet or exceed standards on MCA reading and math in third grade compared to those children who were not proficient in Kindergarten. This holds for gender, ethnicity, and income levels.

- The MWSS in Kindergarten predicts third grade MCA scores in both reading and math.

- The MWSS in Kindergarten predicts special education and special education or retention by third grade.

Strategies to Increase School-Ready Proficiency at Kindergarten Entry

Although new investments in early education must consider feasibility, cost, and evidence of effectiveness, implementation of strategies most likely to increase proficiency levels substantially deserve the highest priority in funding decisions. The most researched approach for improving Kindergarten proficiency is pre-kindergarten programs for 3- and 4-year-olds. In the past decade, evaluations of state-financed pre-kindergarten programs in approximately 28 states have been completed; evaluations of 22 state-financed pre-kindergarten programs have been completed between 2008 and 2010. Most evaluations used standardized test of language and math skills (e.g., Woodcock-Johnson tests) that are highly correlated with teacher ratings of

kindergarten proficiency. Relative to children who did not participate in state-financed Pre-k, State Pre-k participation was associated with an average performance increase at Kindergarten entry of 3 to 4 months (0.25 to 0.35 of a standard deviation). These findings are equivalent to an average improvement in school-ready proficiency of 10 to 15 percentage points. Improvements would be greater for children at higher levels of risk and for children receiving longer duration of services. As expected, effect sizes vary by state and increase as program quality increases[9].

This evidence provides a foundation for strengthening programs and investments in Minnesota for meeting the 2020 readiness goal. After considering approaches for optimizing effectiveness and for promoting synergistic effects of participation in different programs, findings for Minnesota could demonstrate even greater effectiveness than shown in other states.

Policy Recommendations

1. Establish a definition of school-ready proficiency. Being school-ready implies demonstration of behaviors and attitudes beneficial for success. Proficiency is the most common and understandable concept in educational assessment. It also is a positive indicator that is consistent with the 2020 readiness goal. A working definition is as follows: consistent demonstration of mastery or proficiency in skills, behaviors, and attitudes that promote successful transition to kindergarten and are instrumental (predictive) of optimal learning and achievement. These skills and behaviors include the domains of language, literacy, math, socio-emotional development, the arts, and physical health. Proficiency in multiple domains is especially beneficial for smooth transitions to kindergarten.

2. Establish key indicators for measuring the rate of school-ready proficiency. Numerous proficiency levels on the MWSS were examined in order to determine the best measure of school readiness. Based on our analysis, the indicator of overall proficiency having the greatest number of strengths is a score of 75% or more of the total points available across the 32 checklist items. This corresponds to a score of 48 points or higher on the 64-point scale used in this report.

3. Consider revisions to Minnesota's data collection process for the School Readiness Study.

> a) **Collect annually as part of the Kindergarten assessment (or earlier), information on prior early care and education and a broader set of parenting and family characteristics**. Extending the current parent survey to obtain children's participation in early childhood education and care will provide knowledge about the extent to which these programs promote school readiness. Parenting practices that link to child development and learning also would provide insight into the family predictors of school success. In many states, this information is routinely collected each year from either parents or teachers. In Minnesota, the MDE is conducting a pilot program in the current school year (2010-2011) to obtain this information. This pilot program is voluntary, and includes approximately 1,300 students from 20 schools, nearly one-quarter of the sample. The pilot schools are distributed across the Minneapolis/St. Paul 7-county metropolitan and rural areas.

> b) **Collect MWSS data annually on all Minnesota Kindergarteners.** The current 10% voluntary stratified sample of schools is insufficient to consistently ensure a representative sample of the entire state and to accurately describe proficiency levels of diverse subgroups of children. Collecting data on all children would allow the identification of children who are not school ready and the specific problem domain(s) in order to more specifically target academic interventions. Minnesota is the only state that collects data on such a small percentage of children. The trend is to collect information annually on entire cohorts of entering

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[9] Reynolds, A. J., & Temple, J. A. (2008). Cost-effective early childhood development programs from preschool to third grade. *Annual Review of Clinical Psychology, 4*, 109-139.
Reynolds, A. J., Temple, J. A., & Ou, S. (2003). School-based early intervention and child well-being in the Chicago Longitudinal Study. *Child Welfare, 82*, 633-656.

kindergarteners. It must be recognized that costs of data collection for annual ratings of 60,000 Minnesota children are substantial. Given the current economic climate, this may be difficult to implement; this work would, however, strengthen accountability for meeting the 2020 readiness goal.

c) **Consider use of the Kindergarten version of the WSS developmental checklist rather than the Pre-Kindergarten version.** There are two major advantages for use of the Kindergarten version. First, the average age upon entry into Kindergarten is five-and-a-half years old. The age-4 prekindergarten version thus misses skill development during the school transition. A second advantage of the Kindergarten version is that it enables direct comparison to other states that use versions of the WSS checklist. All of these states (e.g., Maryland) use the Kindergarten version. Another option may be to set up a translation between the prekindergarten and kindergarten version. This would keep the advantages of currently using the prekindergarten version which includes appropriate expectations for children entering kindergarten towards the end of their fourth year of life as defined by state statute. Continuing to use the prekindergarten version would also allow the state to track progress on meeting the goal of having all children school ready by 2020 by allowing direct comparison with earlier years.

4. Given the large gap between current rates of school readiness and the legislatively mandated goal that all children will be ready for school by 2020, strategies most likely to close this gap are needed as soon as possible. Based on the 75% overall proficiency standard, 53% of Minnesota Kindergarteners were school-ready in fall 2009. Proficiency by demographic groups ranges from 35% (parental education less than high school) to 75% (females). Although new investments in a variety of programs and services are needed, evidence from evaluations of state-financed Pre-k programs in approximately 12 states indicates that Pre-k participation for one year is associated with average improvements in school readiness of 10 to 15 percentage points, or an improvement of 50-65%[10]. Improvements are greater for children at risk, higher quality programs, and for longer duration of services. The possibility of synergistic effects with other investments and spill-over effects to other family members and to the larger community may increase the level of improvement.

5. Continue to track the currently analyzed cohorts to eighth grade and beyond. This report examines three longitudinal cohorts to third grade to assess the validity of the Work Sampling System Developmental Checklist. Tracking the progress of these cohorts to the end of elementary school and into high school will provide key information about the long-term effects of school readiness on student performance. Continuing longitudinal studies will also provide many opportunities to investigate a broader set of child, family, and school predictors of school performance and achievement. Third-grade school achievement will be available in the summer of 2011 for the 2007 kindergarten cohort. These data will provide the most recent data on the prediction of school achievement from school readiness indicators.

6. Begin a longitudinal study in 2011 that tracks the Kindergarten assessment sample through school and all other data systems they and their families may access (e.g., public aid, child welfare, justice). A major advantage of this study would be to help develop an integrated cross-agency data base on predictors and outcomes of early childhood experiences for Minnesota children. The study will provide new knowledge on how school readiness affects broader health and well-being.

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[10] Seethe Human Capital Research Collaborative website http://humancapitalrc.org/6a_evaluations.cfm for further information on pre-k evaluations.

Appendix

Table 1: Item by item comparison of select states using school readiness items similar to those on the MWSS Kindergarten Entry Developmental Checklist[11]

Minnesota *Work Sampling System Kindergarten Entry Developmental Checklist(based on Preschool-4 Guidelines)*	Alaska *Revised Alaska Developmental Profile*	Florida *Florida Kindergarten Readiness Screener (ECHOS)*	Maryland *Work Sampling System Kindergarten Assessment Guidelines*	Vermont *Vermont School Readiness Initiative*
Personal and Social Development				
Shows some self-direction.			Shows some self-direction.	Persists with self-directed activity. Initiates activities in the classroom.
Follows simple classroom rules and routines.			Follows classroom rules and routines.	Follows simple rules.
Manages transitions.				Adapts to transitions.
Shows eagerness and curiosity as a learner.	Shows curiosity and interest in learning new things and having new experiences.	Shows eagerness and curiosity about new topics and ideas.		Appears enthusiastic. Is curious.
Attends to tasks and seeks help when encountering a problem.	Sustains attention to tasks and persists when facing challenges.			Knows how and when to use adults.
Approaches tasks with flexibility and inventiveness.				Uses a variety of problem-solving strategies.
Interacts easily with one or more children.	Participates positively in group activities.	Talks to, and plays cooperatively with, other children.	Interacts easily with one or more children.	Can meet/play with different children.
Interacts easily with familiar adults.				Interacts positively with adults.
Shows empathy and caring for others.				
Seeks adult help when				Uses problem-solving skills in

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[11] The states included on this table also include other items in other domains that Minnesota does not include. Some of the other domains are cognition, social studies and science.

Minnesota *Work Sampling System Kindergarten Entry Developmental Checklist(based on Preschool-4 Guidelines)*	Alaska *Revised Alaska Developmental Profile*	Florida *Florida Kindergarten Readiness Screener (ECHOS)*	Maryland *Work Sampling System Kindergarten Assessment Guidelines*	Vermont *Vermont School Readiness Initiative*
needed to resolve conflicts.				social situations.
Language and Literacy				
Gains meaning by listening.	Uses receptive communication skills.		Gains meaning by listening.	
Follows two- or three-step directions.				Understands simple directions.
Demonstrates phonological awareness.	Demonstrates phonological awareness.		Demonstrates beginning phonemic awareness.	Shows beginning awareness of letter/sound correspondence.
Speaks clearly enough to be understood without contextual clues.			Speaks clearly and conveys ideas effectively.	Communicates needs.
Uses expanded vocabulary and language for a variety of purposes.	Uses expressive communication skills.			Engages in conversation.
Shows appreciation for books and reading.		Knows how to use a book.		Shows awareness of how books are organized and used.
Shows beginning understanding of concepts about print.	Demonstrates awareness of print concepts.		Shows some understanding of concepts about print.	
Begins to develop knowledge about letters.	Demonstrates knowledge of letters and symbols (alphabet knowledge).			Can identify 10 or more letters of the alphabet.
Comprehends and responds to stories read aloud.		Retells a story or part of a story that has been read to the class.	Comprehends and responds to fiction and non-fiction text.	
Represents ideas and stories through pictures, dictation, and play.				
Uses letter-like shapes, symbols, and letters to convey meaning.		Demonstrates awareness of distinction between "kids' writing" and conventional writing.	Uses letter-like shapes, symbols, letters and words to convey meaning.	Uses scribbles, symbols, or letters to write or represent words or ideas.

Minnesota *Work Sampling System Kindergarten Entry Developmental Checklist(based on Preschool-4 Guidelines)*	Alaska *Revised Alaska Developmental Profile*	Florida *Florida Kindergarten Readiness Screener (ECHOS)*	Maryland *Work Sampling System Kindergarten Assessment Guidelines*	Vermont *Vermont School Readiness Initiative*
Mathematical Thinking				
Begins to use simple strategies to solve mathematical problems.			Begins to use and explain strategies to solve mathematical problems.	
Shows beginning understanding of number and quantity.	Demonstrates knowledge of numbers and counting.	Counts objects in a collection by creating one-to-one correspondence between each number word and each object.	Shows understanding of number and quantity.	Shows ability to count 5 or more objects using one-to-one correspondence.
Begins to recognize and describe the attributes of shapes.		Identifies two-dimensional geometric shapes and their uses.	Recognizes and describes some attributes of shapes.	Can identify several basic geometric shapes.
Shows understanding of and uses several positional words.				
The Arts				
Participates in group music experiences.			Participates in group music experiences.	
Participates in creative movement, dance, and drama.		Creates movements that correspond to different types of music.	Participates in creative movement, dance, and drama.	Engages in imaginative play.
Uses a variety of art materials for tactile experience and exploration.			Uses a variety of art materials to explore and express ideas and emotions	
Responds to artistic creations or events.			Responds to artistic creations or events.	
Physical Development and Health				
Coordinates movements to perform simple tasks.	Demonstrates strength and coordination of large motor muscles.	Engages voluntarily in large-muscle activity.		
Uses eye-hand coordination to perform tasks.	Demonstrates strength and coordination of small motor	Demonstrates increasing ability to use hands and	Uses eye-hand coordination to perform tasks effectively.	

Minnesota	Alaska	Florida	Maryland	Vermont
Work Sampling System Kindergarten Entry Developmental Checklist(based on Preschool-4 Guidelines)	*Revised Alaska Developmental Profile*	*Florida Kindergarten Readiness Screener (ECHOS)*	*Work Sampling System Kindergarten Assessment Guidelines*	*Vermont School Readiness Initiative*
	muscles.	fingers to perform tasks.		
Performs some self-care tasks independently.			Performs self-care tasks competently.	Demonstrates self-help skills.

Table 2: State-Funded Pre-K Program Effects on School Readiness Measures[12]

State	Program Name	Program Year	Dosage	# of 10 NIEER Benchmarks Met	Assessment Tool Used	Sample	Effect on Literacy	Effect on Math	Effect on Overall School Readiness Rate
Colorado [13]	Colorado Preschool Program (CPP)	2006-2007	2.5 hrs/day, 4 days/wk	5	DIBELS, DRA-2, or PALS-varies by district	Qualified children who did not participate vs. CPP participants	5.7 point increase in "% at or above grade level" on selected measure	Not measured	Not measured
Florida [14]	Voluntary Pre-Kindergarten Program	2008-2009	Varies locally	3	ECHOS	Non-VPK participants (n=68,213) vs. VPK completers	Not measured separately	Not measured separately	14.1% increase in children rated as "Demonstrating" (skills they should

[12] Barnett, W. S., Hustedt, J.T., Robin, K.B., Schulman, K.L. (2005). The state of preschool: 2005 state preschool yearbook. New Brunswick, NJ: The National Institute for Early Education Yearbook.

Barnett, W. S., Hustedt, J.T., Friedman, A.H., Boyd, J.S., Ainsworth, P. (2007). The state of preschool: 2007 state preschool yearbook. New Brunswick, NJ: The National Institute for Early Education Yearbook.

Barnett, W. S., Epstein, D.J., Friedman, A.H., Sansanelli, R., Hustedt, J.T. (2009). The state of preschool: 2009 state preschool yearbook. New Brunswick, NJ: The National Institute for Early Education Yearbook.

Wong, V.C., Cook, T. D., Barnett, W. S., Jung, K. (2008). An effectiveness-based evaluation of five state pre-kindergarten programs. Journal of Policy Analysis and Management, 27, 122- 154.

[13] http://www.cde.state.co.us/cpp/download/CPPDocs/2010_CPP_LegislativeReport.pdf

[14] http://www.fldoe.org/news/2010/2010_03_25/VPKResultsFS.pdf

State	Program Name	Program Year	Dosage	# of 10 NIEER Benchmarks Met	Assessment Tool Used	Sample	Effect on Literacy	Effect on Math	Effect on Overall School Readiness Rate
	(VPK)					(n=103,943)			know at beginning of K)
Michigan	Michigan School Readiness Program	2004-2005	At least 2.5 hrs/day, 4 days/wk	4	Literacy: PPVT-III (receptive vocabulary) and Pre-CTOPPP (print awareness) Math: Woodcock-Johnson, 3rd ed., Subtest 10 Applied Problems	Comparison (n=386) vs. Treatment (n=485)	Pre-CTOPPP 22.14% more items correct (.96 SD)	1.82 points increase (.47 SD)	Not measured
New Jersey	Abbott Preschool Program	2004-2005	10 hrs/day, 5 days/wk	9	Literacy: PPVT-III and Pre-CTOPPP Math: Woodcock-Johnson, 3rd ed., Subtest 10 Applied Problems	Comparison (n=895) vs. Treatment (n=1177)	PPVT-III 6.10 raw points increase (.36 SD) Pre-CTOPPP 13.02% more items correct (.50 SD)	.87 points increase (.23 SD)	Not measured
Oklahoma	Early Childhood Four-Year-Old Program	2004-2005	Varies locally	8	Literacy: PPVT-III and Pre-CTOPPP Math: Woodcock-Johnson, 3rd ed., Subtest 10 Applied Problems	Comparison (n=407) vs. Treatment (n=431)	PPVT 5.12 raw points increase (.29 SD) Positive effects seen on Pre-CTOPPP but not considered reliable due to sampling issues.	Positive effects seen here but not considered reliable due to sampling issues.	Not measured

State	Program Name	Program Year	Dosage	# of 10 NIEER Benchmarks Met	Assessment Tool Used	Sample	Effect on Literacy	Effect on Math	Effect on Overall School Readiness Rate
South Carolina	Half-day Child Development Program (4K); First Steps to School Readiness Initiative	2004-2005	2.5 hrs/day, 5 days/wk	8	Literacy: PPVT-III and Pre-CTOPPP	Comparison (n=424) vs. Treatment (n=353)	Pre-CTOPPP 21.01% increase (.79 SD)	Not measured	Not measured
West Virginia	Early Childhood Education Program	2004-2005	Varies locally	6	Literacy: PPVT-III and Pre-CTOPPP Math: Woodcock-Johnson, 3rd ed., Subtest 10 Applied Problems	Comparison (n=341) vs. Treatment (n=379)	Pre-CTOPPP 20.15% increase (.83 SD)	Not significant	Not measured
New Mexico[15]	New Mexico PreK Initiative	2008-2009	Varies locally	8	Literacy: PPVT-III (receptive vocabulary) and TOPEL, Pre-CTOPPP (print awareness) Math: Woodcock-Johnson, 3rd ed., Subtest 10 Applied Problems	No Preschool (n=706) vs. Preschool (n=653)	PPVT-III 5 raw score points (.24 SD) TOPEL 23 raw points (1.3 SD)	2 points (.37 SD)	Not measured

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[15] Hustedt, J.T., Barnett, W. S., Jung, K., Friedman, A.H. (2010). The New Mexico prek evaluation: impacts from the fourth year (2008-2009) of New Mexico's state-funded pre-k program. New Brunswick, NJ: The National Institute for Early Education.

Table 3: Representativeness of Kindergarten Samples

2006 Demographic Distributions			
	State	**2006 Cohort File**	**2006 Longitudinal**
Gender			
Female	49%	48.7%	48.3%
Male	51%	51.2%	51.7%
N=	60,712	2,990	2,342
Race			
White	74%	73.5%	77.0%
African American	10%	7.3%	6.2%
Hispanic	8%	9.3%	8.5%
American Indian	2%	2.1%	1.1%
Asian/Pacific Islander	6%	6.2%	6.0%
Other	N/A	1.5%	1.2%
N =	60,712	2,600	2,089
Parents' Education			
Less than H.S.	11%	5.8 %	5.2%
High School	20%	18.5%	18.4%
Trade School/Some College		29.2%	29.9%
Associate's Degree	69%[16]	11.6%	11.8%
Bachelor's Degree		23.6%	23.5%
Graduate Degree		11.3%	11.2%
N=		2,222	1,840
Income			
0 to $35,000	<100% FPL:16% 100-200% FPL:18% Above low income: 65% 441,975 (all under age 6)	28.3%	26.8%
$35,000 to $55,000		22.1%	22.3%
$55,001 to $75,000		21.1%	21.7%
$75,001 or more		28.6%	29.2%
N=		2,133	1,768
Special Education			
Yes	15.8%	8.2%	16.7%
No	84.2%	91.8%	83.3%
N =	P-12	2,986	2,352
Home Language			
English	91.7%	76.5%	89.1%
Not English	8.3%[17]	23.5%	10.9%
N =	56,931	2,990	2,105
% School Free & Red. Lunch			
Average	31.1%	Free:28.0%	42.0%
N =	P-12	Reduced 8.5%	2,352
STRATA			

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[16] Represents any schooling beyond high school
[17] Based on state school data of Limited English Proficiency %

1 Minneapolis & St Paul	11%	17.3%	16.3%
2 7 Country metro excluding MSP	43%	27.5%	26.6%
3 Outstate enrollment 2,000+	23%	20.8%	21.3%
4 Outstate enroll. 1,000 -1,900	12%	20.4%	21.0%
5 Outstate enrollment 500 – 999	8%	9.2%	9.7%
6 Outstate enrollment 500	4%	1.3%	1.5%
N=	60,712	2,886	2,256

Table 3.1: Representativeness of Kindergarten Samples by School Strata

Strata	City	2003_2	2004_2	2006_1	2006_2	2007	2008	2009
Total N		1405	2394	2990	2342	6493	3497	6392
Minneapolis and St. Paul		5.7%	21.2%	17.3%	16.3%	9.8%	12.3%	12.6%
	MINNEAPOLIS	5.6%	.6%	0%	0%	3.0%	3.9%	4.5%
	ST. PAUL	.1%	20.6%	17.3%	16.3%	6.8%	8.4%	8.1%
7 county Metro excluding MPLS/STP		47.3%	14.7%	27.5%	26.6%	35.2%	31.6%	23.0%
Outstate - Enroll 2000 or more		12.5%	30.4%	20.8%	21.3%	20.9%	30.5%	25.3%
Outstate - Enrollment 1000-1999		14.0%	15.3%	20.4%	21.0%	17.0%	12.2%	20.7%
Outstate - Enrollment 500-999		10.7%	4.0%	9.2%	9.7%	13.5%	10.4%	10.9%
Outstate - Enrollment less than 500		8.3%	2.3%	1.3%	1.5%	3.6%	3.0%	7.5%

Note: 2003_2, 2004_2, and 2006_2 are the sample matched with 3rd grade MCA scores. 2003 and 2004 include only the children who do not have any missing WSS ratings.

Table 4: Correlations of MWSS Items by Overall Factor from Principle Components Analysis

	2003	2004	2006
Personal and Social development			
Shows some self-direction	.788	.778	.819
Follows simple classroom rules and routines	.720	.709	.737
Manages transitions	.727	.720	.734
Shows eagerness and curiosity as a learner	.768	.785	.780
Attends to tasks and seeks help when encountering a problem	.798	.788	.801
Approaches tasks with flexibility & inventiveness	.814	.796	.816
Interacts easily with one or more children	.726	.702	.726
Interacts easily with familiar adults	.770	.732	.736
Shows empathy and caring for others	.708	.709	.747
Seeks adult help when needed to resolve conflicts	.750	.731	.750
Language and Literacy			
Gains meaning by listening	.787	.798	.809
Follows two or three step directions	.777	.793	.811
Demonstrates phonological awareness	.720	.720	.780
Speaks clearly enough to be understood w/o contextual clues	.730	.670	.705
Uses expanded vocabulary & language for a variety of purposes	.810	.756	.800
Shows appreciation for books and reading	.789	.766	.788
Shows beginning understanding of concepts about print	.762	.758	.784
Begins to develop knowledge about letters	.719	.747	.776
Comprehends and responds to stories read aloud	.816	.794	.820
Represents ideas and stories through pictures, dictation, & play	.807	.790	.811
Uses letter-like shapes, symbols, and letters to convey meaning	.757	.747	.778
Mathematical Thinking			
Begins to use simple strategies to solve mathematical probs.	.776	.760	.801
Shows beginning understanding of number & quantity	.741	.755	.793
Begins to recognize & describe attributes of shapes	.753	.720	.756
Shows understanding of & uses positional words	.772	.753	.791
The Arts			
Participates in group music experiences	.732	.704	.719
Participates in creative movement, dance, & drama	.725	.692	.704
Uses a variety of art materials for tactile exprnc. & exploration	.740	.734	.717
Responds to artistic creations or events	.755	.724	.713
Physical Development and Health			
Coordinates movements to perform simple tasks	.744	.688	.725
Uses eye-hand coordination to perform tasks	.724	.691	.725
Performs some self-care tasks independently	.727	.625	.692

Table 5: Comparing Definitions of Work Sampling System Proficiency Rates – WSS Domain Scores

	2003₁	2003₂	2004₁	2004₂	2006₁	2006₂	2007	2008	2009
Personal and Social Development (PSD)									
MDE PSD Proficiency Rate from MDE Report 60%+ Proficient (≥ 6 Items proficient) n=	47% 3,002	47% 3,002	51% 3,423	51% 3,423	57% 2,987	57% 2,987	52% 6,493	49% 6,310	53% 6,392
MDE Defined PSD Proficiency Rate 60%+ Proficient (≥ 6 Items proficient) n=	44% 2,933	44% 1469	49% 3247	50% 2,846	56% 2,990	59% 2,342	51% 6,372	48% 3,497	50% 6,280
7+ PSD Proficiency Rate 70%+ Proficient (≥ 7 Items proficient) n=	39% 2,933	39% 1469	44% 3247	45% 2,846	50% 2,990	53% 2,342	46% 6,372	42% 3,497	45% 6,280
8+ PSD Proficiency Rate 80% Proficient (≥ 8 Items proficient) n=	33% 2,933	34% 1469	39% 3247	39% 2,846	45% 2,990	47% 2,342	41% 6,372	37% 3,497	40% 6,280
Language and Literacy (LL)									
MDE LL Proficiency Rate from MDE Report 55%+ Proficient (≥ 6 Items proficient) n=	43% 3,002	43% 3,002	47% 3,423	47% 3,423	54% 2,987	54% 2,987	50% 6,493	47% 6,310	51% 6,392
MDE Defined LL Proficiency Rate 55%+ Proficient (≥ 6 Items proficient) n=	36% 2,956	35.0% 1419	46% 3250	48% 2,855	54% 2,989	59% 2,342	51% 6,350	48% 3,497	50% 6,265
7+ LL Proficiency Rate 64%+ Proficient (≥ 7 Items proficient) n=	36% 2,956	35.0% 1419	42% 3250	43% 2,855	51% 2,989	54% 2,342	48% 6,350	45% 3,497	46% 6,265
8+ LL Proficiency Rate 73%+ Proficient (≥ 8 Items proficient) n=	32% 2,956	34.8% 1419	37% 3250	38% 2855	46% 2,989	49% 2,342	43% 6,350	41% 3,497	42% 6,265
MDE LL Proficiency Rate + Prof. phon. aw. & let. know. 73%+ Proficient (≥ 6 Items proficient n=)	24% 2,956	25.3% 1419	29% 3250	30% 2855	40% 2,989		37% 6,350	37% 3,497	39% 6,265
Mathematical Thinking									
MDE Math Proficiency Rate from MDE Report 75%+ Proficient (≥ 3 items prof.) n=	40% 3,002	40% 3,002	46% 3,423	46% 3,423	52% 2,987	52% 2,987	50% 6,493	44% 6,310	49% 6,392
MDE Defined Math Proficiency Rate 75%+ Proficient (≥ 3 items prof.) n=	34% 2,984	37.3% 1491	41% 3316	43% 2907	48% 2,990	51% 2,342	46% 6,447	43% 3,497	44% 6,344
The Arts									
MDE Arts Proficiency Rate from MDE Report 75%+ Proficient (≥ 3 items prof.) n=	47% 3,002	47% 3,002	53% 3,423	53% 3,423	58% 2,987	58% 2,987	53% 6,493	49% 6,310	53% 6,392
MDE Defined Arts Proficiency Rate 75%+ Proficient (≥ 3 items prof.) n=	42% 2,908	43.8% 1482	48% 3311	50% 2895	48% 2,990	57% 2,342	49% 6,441	47% 3,497	47% 6,328
Physical Development and Health (PHYS)									
MDE PHYS Proficiency Rate from MDE Report 67%+ Proficient (≥ 2 items prof.) n=	57% 3,002	57% 3,002	67% 3,423	67% 3,423	71% 2,987	71% 2,987	65% 6,493	61% 6,310	65% 6,392
MDE Defined PHYS Proficiency Rate 67%+ Proficient(≥ 2 items prof.) n=	58% 2,970	56.6% 1484	48% 3311	67% 2902	71% 2,990	74% 2,342	65% 6,464	64% 3,497	65% 6,358
Overall Proficiency Rate									
75% of Items Proficient (48 out of 64 points)	42%	45%	51%	53%	66%	61%	54%	52%	53%
Proficient in All 5 Domains	21%	23%	26%	26%	23%	38%	31%	29%	31%
Proficient in at least Language & Literacy and Math	27%	29%	35%	36%	44%	48%	42%	40%	41%

Note: 2003₂, 2004₂, and 2006₂ are the sample matched with 3ʳᵈ grade MCA scores. 2003 and 2004 include only the children who do not have any missing WSS ratings.

Table 6: Work Sampling System Subgroup Analysis (2008)

	Personal and Social Development			Language and Literacy			Mathematical Thinking			The Arts			Physical Development and Health			Overall		
	Not yet	In Process	Proficient	Not yet	In Process	Proficient	Not yet	In Process	Proficient	Not yet	In Process	Proficient	Not yet	In Process	Proficient	75%	80%	All 5 Domains
All Children																		
	5.4	45.4	48.2	7.4	44.1	48.5	6.3	50.9	42.8	3.9	48.7	47.4	2.8	32.9	64.3	51.5	46.6	28.7
Race/Ethnicity																		
Black/African/African American (N=299)	15.1	45.5	39.5	17.4	43.8	38.8	16.4	53.2	30.4	14.0	45.2	40.8	11.0	35.8	53.2	39.8	37.8	22.4
American Indian/Alaskan Native (N=153)	7.2	63.4	29.4	9.2	62.1	28.8	12.4	63.4	24.2	3.3	67.3	29.4	1.3	51.0	47.7	30.1	26.8	14.4
Asian/ Native Hawaiian/Pacific Islander (N=225)	4.0	46.7	49.3	8.0	46.2	45.8	8.0	54.7	37.3	4.4	51.1	44.4	1.8	32.9	65.3	48.0	44.0	26.7
Hispanic/Latino (N=303)	8.6	55.4	36.0	18.8	54.5	26.7	14.2	66.3	19.5	5.3	59.1	35.6	4.3	45.9	49.8	32.0	28.4	11.6
White (N=2229)	3.7	43.9	52.4	4.4	40.5	55.1	3.3	46.7	50.0	2.1	46.1	51.8	1.6	29.6	68.8	58.1	52.4	33.6
Other (N=19)	15.8	36.8	47.4	15.8	52.6	31.6	21.1	57.9	21.1	15.8	36.8	47.4	15.8	21.1	63.2	36.8	36.8	21.1
Not Identified (N=60)	1.7	55.0	43.3	3.3	68.3	28.3	3.3	68.3	28.3	6.7	58.3	35.0	-	33.3	66.7	38.3	26.7	11.7
Gender																		
Male (N=1712)	6.9	50.6	42.5	8.9	46.1	44.9	6.8	50.9	42.3	4.9	55.8	39.3	3.4	35.8	60.7	47.1	41.8	24.5
Female (N=1580)	3.8	41.8	54.4	5.7	41.8	52.5	5.8	50.9	43.4	2.7	41.1	56.2	2.0	29.8	68.2	56.3	51.7	33.4
IEP Status																		
Yes (N=222)	19.8	55.0	25.2	21.6	51.4	27.0	15.8	58.6	25.7	9.5	57.2	33.3	11.7	46.8	41.4	28.4	25.2	11.7
No (N=3070)	4.4	45.8	49.9	6.4	43.6	50.1	5.6	50.3	44.0	3.5	48.1	48.4	2.1	31.9	66.0	53.2	48.1	30.0
Family Income																		
FPL 250 or less (N=1319)	7.5	53.0	39.5	10.4	50.5	39.1	8.7	58.5	32.8	5.0	53.4	41.5	3.6	38.1	58.4	42.2	37.0	21.2
FPL 251 or more (N=1352)	2.4	38.8	58.7	2.4	36.8	60.9	2.0	43.1	54.9	1.1	42.2	56.7	0.7	26.5	72.8	63.3	58.9	38.8

Note: N=3,292 and includes only cases with no missing ratings.

	Personal and Social Development			Language and Literacy			Mathematical Thinking			The Arts			Physical Development and Health			Overall		
	Not yet	In Process	Proficient	Not yet	In Process	Proficient	Not yet	In Process	Proficient	Not yet	In Process	Proficient	Not yet	In Process	Proficient	75%	80%	All 5 Domains
Parent Education																		
Less than high school (N=212)	12.7	57.9	29.4	21.3	57.0	21.7	17.2	63.8	19.0	11.3	58.8	29.9	9.5	44.3	46.2	25.3	23.1	11.8
HS Diploma/GED (N=639)	7.4	57.4	35.2	12.1	52.7	35.2	10.2	59.9	29.9	5.5	55.6	39.0	3.0	39.6	57.4	39.1	34.0	17.5
Trade school or some college (N=833)	5.9	46.3	47.8	6.6	47.1	46.3	5.3	55.0	39.7	3.5	49.9	46.6	3.0	35.7	61.3	50.3	45.3	26.2
Associate's degree (N=390)	4.1	47.2	48.7	3.6	45.6	50.8	5.1	52.3	42.6	2.8	50.5	46.7	1.8	32.6	65.6	52.8	46.9	28.2
Bachelor's degree (N=760)	2.6	37.5	59.9	3.0	32.2	64.7	2.4	38.8	58.8	2.1	39.6	58.3	1.4	23.9	74.6	65.9	61.1	41.3
Graduate or professional degree (N=365)	3.6	35.1	61.4	3.3	34.0	62.7	2.7	39.5	57.8	1.6	42.2	56.2	1.1	26.8	72.1	64.9	60.5	42.7
Strata																		
1 – Minneapolis and St. Paul (N=298)	4.0	37.9	58.1	5.0	39.9	55.0	4.7	49.0	46.3	3.7	49.0	47.3	2.7	29.9	67.4	58.1	53.0	34.9
2 – 7 country metro excluding MSP[18] (N=1130)	6.2	35.4	58.4	7.2	36.1	56.7	7.3	45.3	47.4	5.0	35.4	59.6	3.5	23.2	73.3	61.7	56.9	34.4
3 – Outstate enrollment 2,000+ (N=977)	5.3	60.3	34.4	8.1	52.9	39.0	5.0	57.0	38.0	3.8	61.0	35.2	1.7	43.2	55.1	39.6	35.5	21.3
4 – Outstate enrollment 1,000-1,999 (N=381)	7.1	45.1	47.8	10.5	41.7	47.8	9.4	44.9	45.7	2.6	51.2	46.2	4.2	41.2	54.6	50.7	44.6	33.6
5 - Outstate enrollment 500-999 (N=356)	3.9	47.5	48.6	6.5	49.4	44.1	4.8	54.8	40.4	2.2	51.7	46.1	2.0	28.1	69.9	48.0	42.1	24.4
6 - Outstate enrollment <500 (N=150)	2.0	56.0	42.0	3.3	48.0	48.7	6.7	62.7	30.7	2.7	55.3	42.0	2.0	36.0	62.0	50.0	43.3	20.0

Note: N=3,292 and includes only cases with no missing ratings.

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[18] The seven county metro area includes Anoka, Carver, Dakota, Hennepin, Ramsey, Scott and Washington Counties.

Table 7: Validity of MWSS Proficiency Indicator Options

MCA Reading Meets or Exceeds Standards (2006)							
				MCA Reading Meets or Exceeds Standards			
Proficiency Indicator	% proficient on WSS	Rate of proficiency	Raw correlation	Partial correlation controlling for child/family background[19]	Predicted probability proficient	Predicted probability not proficient	Difference in predicted probability
1. Lang and literacy (MDE)	58.8	83.9	.220**	.148***	.844	.694	0.150***
2. LL + math (MDE)	47.8	85.5	.213**	.141***	.860	.712	0.148***
3. LL +math + personal devel	42.6	86.4	.210**	.140***	.863	.729	0.135***
4. All five domains	37.9	86.2	.187**	.119***	.863	.745	0.118***
5. 70% standard (based on 0-64 points)	65.1	82.2	.200**	.132***	.831	.691	0.139***
6. 75% standard	60.6	83.2	.199**	.139***	.840	.686	0.154***
7. 80% standard	54.4	84.0	.210**	.137***	.847	.700	0.147***
8. 17 or more items proficient	60.9	82.8	.207**	.130***	.837	.701	0.136***

MCA Reading Exceeds Standards (2006)							
				MCA Reading Exceeds Standards			
Proficiency Indicator	% proficient on WSS	Rate of proficiency	Raw correlation	Partial correlation controlling for child/family background[2]	Predicted probability proficient	Predicted probability not proficient	Difference in predicted probability
1. Lang and literacy (MDE)	58.8	62.6	.245**	.167***	.595	.403	0.192***
2. LL + math (MDE)	47.8	65.6	.254**	.179***	.618	.422	0.195***
3. LL +math + personal devel	42.6	67.2	.256**	.182***	.626	.440	0.186***
4. All five domains	37.9	67.8	.242**	.171***	.618	.471	0.147***
5. 70% standard (based on 0-64 points)	65.1	60.1	.222**	.140***	.578	.401	0.177***
6. 75% standard	60.6	61.4	.212**	.148***	.584	.411	0.174***
7. 80% standard	54.4	63.6	.226**	.172***	.603	.403	0.200***
8. 17 or more items proficient	60.9	61.2	.248**	.146***	.590	.403	0.187***

[19] Child/family background variables include: child's gender, race/ethnicity (black, Hispanic, other, (white is baseline), income (less than $35,000), parent education (high school, some college, associate's degree, at least bachelor's degree (less than high school is baseline), and child received special education in Kindergarten.

MCA Math Meets or Exceeds Standards (2006)

	% proficient on WSS	Rate of proficiency	Raw correlation	Partial correlation controlling for child/family background[20]	Predicted probability proficient	Predicted probability not proficient	Difference in predicted probability
				MCA Math Meets or Exceeds Standards			
Proficiency Indicator							
1. Lang and literacy (MDE)	58.8	91.0	.227**	.170***	.933	.814	0.119***
2. LL + math (MDE)	47.8	92.6	.224**	.166***	.944	.831	0.113***
3. LL +math + personal devel	42.6	93.2	.217**	.159***	.946	.844	0.101***
4. All five domains	37.9	93.3	.198**	.144***	.948	.855	0.093***
5. 70% standard (based on 0-64 points)	65.1	89.3	.211**	.149***	.922	.817	0.105***
6. 75% standard	60.6	90.5	.197**	.167***	.925	.823	0.102***
7. 80% standard	54.4	91.3	.220**	.166***	.933	.824	0.108***
8. 17 or more items proficient	60.9	90.2	.219**	.158***	.930	.815	0.115***

MCA Math Exceeds Standards (2006)

	% proficient on WSS	Rate of proficiency	Raw correlation	Partial correlation controlling for child/family background[3]	Predicted probability proficient	Predicted probability not proficient	Difference in predicted probability
				MCA Math Exceeds Standards			
Proficiency Indicator							
1. Lang and literacy (MDE)	58.8	50.9	.213**	.167***	.480	.322	0.158***
2. LL + math (MDE)	47.8	53.5	.222**	.173***	.506	.328	0.178***
3. LL +math + personal devel	42.6	54.4	.217**	.170***	.512	.345	0.167***
4. All five domains	37.9	55.0	.206**	.162***	.526	.356	0.171***
5. 70% standard (based on 0-64 points)	65.1	49.3	.220**	.165***	.477	.285	0.192***
6. 75% standard	60.6	50.6	.202**	.173***	.484	.294	0.190***
7. 80% standard	54.4	52.0	.217**	.179***	.497	.301	0.196***
8. 17 or more items proficient	60.9	50.7	.222**	.177***	.490	.287	0.203***

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[20] Child/family background variables include: child's gender, race/ethnicity (black, Hispanic, other, (white is baseline), income (less than $35,000), parent education (high school, some college, associate's degree, at least bachelor's degree (less than high school is baseline), and child received special education in Kindergarten.

Ever Received Special Education (2006)

Proficiency Indicator	% proficient on WSS	Rate Proficient Ever Receiving Special Education	Raw correlation	Partial correlation controlling for child/family background[21]	Predicted probability proficient	Predicted probability not proficient	Difference in predicted probability
			Ever Received Special Education				
1. Lang and literacy (MDE)	58.1%	8.1%	-.104**	-.083***	0.0873	0.113	-0.026*
2. LL + math (MDE)	47.2%	7.2%	-.110**	-.096***	0.0776	0.118	-0.040***
3. LL +math + personal devel	42.0%	6.2%	-.127**	-.106***	0.0715	0.118	-0.046***
4. All five domains	37.4%	5.8%	-.124**	-.108***	0.0655	0.117	-0.052***
5. 70% standard (based on 0-64 points)	64.4%	7.9%	-.127**	-.108***	0.0828	0.127	-0.044***
6. 75% standard	59.9%	7.3%	-.139**	-.114***	0.0794	0.126	-0.047***
7. 80% standard	53.8%	7.0%	-.132**	-.104***	0.0783	0.121	-0.043***
8. 17 or more items proficient	60.2%	7.5%	-.133**	-.108***	0.0810	0.124	-0.043***

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[21] Child/family background variables include: child's gender, race/ethnicity (black, Hispanic, other, (white is baseline), income (less than $35,000), and parent education (high school, some college, associate's degree, at least bachelor's degree (less than high school is baseline).

Ever Received Special Education or retained (2006)

	% proficient on WSS	Rate Proficient Ever Receiving Special Education or retained	Raw correlation	Partial correlation controlling for child/family background[22]	Predicted probability proficient	Predicted probability not proficient	Difference in predicted probability
			Ever Received Special Education or retained				
Proficiency Indicator							
1.Lang and literacy (MDE)	58.1%	8.2%	-.117**	-.090***	0.0867	0.119	-0.032**
2.LL + math (MDE)	47.2%	7.2%	-.122**	-.102***	0.0770	0.122	-0.045***
3.LL +math + personal devel	42.0%	6.2%	-.137**	-.111***	0.0709	0.121	-0.050***
4.All five domains	37.4%	5.8%	-.133**	-.112***	0.0650	0.121	-0.056***
5.70% standard (based on 0-64 points)	64.4%	8.0%	-.142**	-.116***	0.0824	0.133	-0.051***
6.75% standard	59.9%	7.4%	-.152**	-.120***	0.0789	0.132	-0.053***
7.80% standard	53.8%	7.1%	-.143**	-.110***	0.0777	0.126	-0.048***
8.17 or more items proficient	60.2%	7.5%	-.146**	-.115***	0.0805	0.130	-0.049***

[22] Child/family background variables include: child's gender, race/ethnicity (black, Hispanic, other, (white is baseline), income (less than $35,000), and parent education (high school, some college, associate's degree, at least bachelor's degree (less than high school is baseline).

Table 8: MWSS Items Correlations with Third Grade Reading and Math MCA scores and Any Special Education by Third Grade

2003 WSS Item Correlations with 3rd Grade MCA and Special Education Outcomes	MCA Reading Score	MCA Math Score	Special Education by 3rd Grade
Personal and Social development			
Shows some self-direction	.207**	.200**	-.114**
Follows simple classroom rules and routines	.173**	.169**	-.076*
Manages transitions	.173**	.158**	-.110**
Shows eagerness and curiosity as a learner	.156**	.147**	-.081*
Attends to tasks and seeks help when encountering a problem	.173**	.161**	-.090**
Approaches tasks with flexibility & inventiveness	.215**	.199**	-.118**
Interacts easily with one or more children	.088**	.087**	-.089**
Interacts easily with familiar adults	.105**	.101**	-.071*
Shows empathy and caring for others	.158**	.147**	-.108**
Seeks adult help when needed to resolve conflicts	157**	.138**	-.066*
Language and Literacy			
Gains meaning by listening	.231**	.214**	-.118**
Follows two or three step directions	.255**	.234**	-.134**
Demonstrates phonological awareness	.358**	.323**	-.138**
Speaks clearly enough to be understood w/o contextual clues	.207**	.149**	-.244**
Uses expanded vocabulary & language for a variety of purposes	.224**	.205**	-.179**
Shows appreciation for books and reading	.183**	.162**	-.105**
Shows beginning understanding of concepts about print	.270**	.229**	-.148**
Begins to develop knowledge about letters	.308**	.269**	-.136**
Comprehends and responds to stories read aloud	.223**	.188**	-.142**
Represents ideas and stories through pictures, dictation, & play	.197**	.165**	-.100**
Uses letter-like shapes, symbols, and letters to convey meaning	.236**	.219**	-.131**
Mathematical Thinking			
Begins to use simple strategies to solve mathematical probs.	.239**	.213**	-.147**
Shows beginning understanding of number & quantity	.252**	.239**	-.145**
Begins to recognize & describe attributes of shapes	.263**	.210**	-.112**
Shows understanding of & uses positional words	.221**	.190**	-.097**
The Arts			
Participates in group music experiences	.112**	.066*	-.084*
Participates in creative movement, dance, & drama	.091**	.044	-.063*
Uses a variety of art materials for tactile exprnc. & exploration	.047	.034	-.051
Responds to artistic creations or events	.090**	.051	-.044
Physical Development and Health			
Coordinates movements to perform simple tasks	.054*	.059*	-.047
Uses eye-hand coordination to perform tasks	.085**	.090**	-.095**
Performs some self-care tasks independently	.079**	.095**	-.082*

2004 WSS Item Correlations with 3rd Grade MCA and Special Education Outcomes	MCA Reading Score	MCA Math Score	Special Education by 3rd Grade
Personal and Social development			
Shows some self-direction	.261**	.271**	-.281**
Follows simple classroom rules and routines	.234**	.246**	-.240**
Manages transitions	.252**	.267**	-.260**
Shows eagerness and curiosity as a learner	.273**	.287**	-.272**
Attends to tasks and seeks help when encountering a problem	.278**	.278**	-.302**
Approaches tasks with flexibility & inventiveness	.304**	.310**	-.307**
Interacts easily with one or more children	.183**	.201**	-.252**
Interacts easily with familiar adults	.202**	.204**	-.250**
Shows empathy and caring for others	.188**	.197**	-.227**
Seeks adult help when needed to resolve conflicts	.234**	.231**	-.276**
Language and Literacy			
Gains meaning by listening	.321**	.317**	-.305**
Follows two or three step directions	.298**	.304**	-.291**
Demonstrates phonological awareness	.372**	.366**	-.292**
Speaks clearly enough to be understood w/o contextual clues	.280**	.258**	-.316**
Uses expanded vocabulary & language for a variety of purposes	.310**	.290**	-.243**
Shows appreciation for books and reading	.274**	.268**	-.188**
Shows beginning understanding of concepts about print	.313**	.301**	-.168**
Begins to develop knowledge about letters	.340**	.340**	-.237**
Comprehends and responds to stories read aloud	.330**	.313**	-.286**
Represents ideas and stories through pictures, dictation, & play	.275**	.273**	-.284**
Uses letter-like shapes, symbols, and letters to convey meaning	.285**	.291**	-.197**
Mathematical Thinking			
Begins to use simple strategies to solve mathematical probs.	.321**	.332**	-.261**
Shows beginning understanding of number & quantity	.341**	.381**	-.276**
Begins to recognize & describe attributes of shapes	.336**	.347**	-.249**
Shows understanding of & uses positional words	.321**	.301**	-.215**
The Arts			
Participates in group music experiences	.217**	.203**	-.194**
Participates in creative movement, dance, & drama	.201**	.194**	-.194**
Uses a variety of art materials for tactile exprnc. & exploration	.166**	.173**	-.188**
Responds to artistic creations or events	.218**	.226**	-.171**
Physical Development and Health			
Coordinates movements to perform simple tasks	.146**	.172**	-.294**
Uses eye-hand coordination to perform tasks	.156**	.186**	-.241**
Performs some self-care tasks independently	.111**	.131**	-.295**

2006 WSS Item Correlations with 3rd Grade MCA and Special Education Outcomes	MCA Reading Score	MCA Math Score	Special Education by 3rd Grade
Personal and Social development			
Shows some self-direction	.254***	.247***	-.175**
Follows simple classroom rules and routines	.239***	.238***	-.180**
Manages transitions	.225***	.222***	-.198**
Shows eagerness and curiosity as a learner	.271***	.285***	-.138**
Attends to tasks and seeks help when encountering a problem	.271***	.278***	-.203**
Approaches tasks with flexibility & inventiveness	.292***	.280***	-.222**
Interacts easily with one or more children	.199***	.193***	-.194**
Interacts easily with familiar adults	.180***	.161***	-.143**
Shows empathy and caring for others	.216***	.213***	-.152**
Seeks adult help when needed to resolve conflicts	.216***	.209***	-.185**
Language and Literacy			
Gains meaning by listening	.295***	.282***	-.155**
Follows two or three step directions	.308***	.309***	-.190**
Demonstrates phonological awareness	.383***	.357***	-.165**
Speaks clearly enough to be understood w/o contextual clues	.295***	.241***	-.253**
Uses expanded vocabulary & language for a variety of purposes	.342***	.289***	-.211**
Shows appreciation for books and reading	.243***	.225***	-.107**
Shows beginning understanding of concepts about print	.319***	.291***	-.123**
Begins to develop knowledge about letters	.324***	.289***	-.087**
Comprehends and responds to stories read aloud	.314***	.278***	-.122**
Represents ideas and stories through pictures, dictation, & play	.243***	.229***	-.150**
Uses letter-like shapes, symbols, and letters to convey meaning	.278***	.251***	-.147**
Mathematical Thinking			
Begins to use simple strategies to solve mathematical probs.	.299***	.289***	-.150**
Shows beginning understanding of number & quantity	.323***	.307***	-.156**
Begins to recognize & describe attributes of shapes	.310***	.286***	-.126**
Shows understanding of & uses positional words	.305***	.283***	-.123**
The Arts			
Participates in group music experiences	.185***	.176***	-.114**
Participates in creative movement, dance, & drama	.166***	.164***	-.122**
Uses a variety of art materials for tactile exprnc. & exploration	.174***	.174***	-.122**
Responds to artistic creations or events	.220***	.210***	-.122**
Physical Development and Health			
Coordinates movements to perform simple tasks	.168***	.161***	-.159**
Uses eye-hand coordination to perform tasks	.231***	.216***	-.192**
Performs some self-care tasks independently	.173***	.154***	-.132**

Table 9: 2006 Third Grade Outcomes by Work Sampling System Ratings (N=2,342)

WSS Domains, %		3rd Grade MCA Reading Scores			3rd Grade MCA Math Scores			Ever Special Ed by 3rd grade
		Exceeds Standards	Meets Standards	Does Not Meet Standards	Exceeds Standards	Meets Standards	Does Not Meet Standards	
		Mean Score=363			Mean Score=360			
Personal and Social Development	Proficient	60.9%	21.8%	17.4%	50.2%	40.4%	9.4%	11.7%
	In Process	41.3%	26.9%	31.7%	31.7%	44.8%	23.5%	22.9%
	Not Yet	29.1%	19.0%	51.9%	18.6%	37.1%	44.3%	42.3%
Language and Literacy	Proficient	63.3%	21.1%	15.7%	51.3%	40.1%	8.6%	11.9%
	In Process	40.2%	28.1%	31.6%	31.0%	45.5%	23.5%	21.3%
	Not Yet	17.8%	20.3%	61.8%	14.4%	37.1%	48.5%	34.4%
Mathematical Thinking	Proficient	65.0%	19.9%	15.1%	52.9%	39.1%	7.9%	11.4%
	In Process	41.9%	28.0%	30.1%	32.6%	45.6%	21.8%	19.3%
	Not Yet	16.7%	23.7%	59.6%	12.8%	38.3%	48.9%	32.8%
The Arts	Proficient	57.9%	21.5%	20.6%	48.7%	39.6%	11.7%	12.1%
	In Process	49.7%	25.2%	25.2%	38.7%	43.6%	17.6%	19.9%
	Not Yet	37.7%	15.1%	47.2%	34.7%	32.7%	32.6%	42.9%
Physical Development and Health	Proficient	56.5%	23.7%	19.8%	46.1%	41.3%	12.6%	11.8%
	In Process	41.9%	23.6%	34.5%	31.9%	44.4%	23.7%	24.2%
	Not Yet	25.0%	22.2%	52.8%	21.2%	33.3%	45.5%	59.5%
Language and Literacy & Math	Proficient	65.6%	19.9%	14.6%	50.9%	40.1%	9.1%	11.2%
	Not Proficient	40.2%	27.1%	32.7%	29.3%	44.7%	26.0%	21.8%
75% Proficiency	Proficient	61.4%	21.8%	16.7%	50.6%	39.9%	9.6%	11.7%
	Not Proficient	38.3%	26.6%	35.2%	28.6%	45.4%	26.0%	24.5%
80% Proficiency	Proficient	63.6%	20.4%	15.9%	52.0%	39.3%	8.7%	10.8%
	Not Proficient	38.8%	27.5%	33.6%	29.9%	45.3%	24.8%	23.8%
All 5 Domains	Proficient	65.5%	19.5%	14.9%	53.2%	39.0%	7.8%	9.0%
	Not Proficient	42.0%	26.9%	31.1%	33.2%	44.4%	22.4%	21.4%

Note: MCA scores range from 301 to 399

Table 10: Third Grade Reading Outcomes by WSS Overall Proficiency (75%) for Sample Subgroups[23] (2003, 2004 and 2006)

WSS Overall Proficiency[24],%, N		3rd Grade MCA Reading Exceeds Expectations			3rd Grade MCA Reading Meets Expectations			3rd Grade MCA Reading Partially or Does Not Meet Expectations		
		2003	2004	2006	2003	2004	2006	2003	2004	2006
All children										
All children	Proficient	62.3**	59.4**	61.4***	27.1**	26.6 **	21.8***	10.8**	14.0 **	16.8***
	Not Proficient	47.0	36.9	38.3	35.1	28.6	26.6	18.0	34.5	35.1
Race/Ethnicity										
American Indian	Proficient	15.8	68.2**	40.0	47.4	22.7**	20.0	36.9	9.1**	40.0
	Not Proficient	14.3	32.0	14.3	57.1	16.0	28.6	28.6	52.0	57.1
Asian or Pacific Islander	Proficient	42.9	39.1**	45.9*	50.0	37.7**	27.9*	7.1	23.2**	26.2*
	Not Proficient	35.3	15.6	23.1	41.1	30.2	29.2	23.5	54.2	47.7
Hispanic	Proficient	44.4**	30.3*	39.7***	38.9**	30.3*	34.6***	16.7**	39.4*	25.6***
	Not Proficient	14.7	17.9	13.3	32.4	26.8	31.6	53.0	55.4	55.1
Black, non-Hispanic	Proficient	51.3*	40.2**	30.8*	28.2*	34.8**	30.8*	20.5*	25.0**	38.5*
	Not Proficient	16.0	16.3	14.1	28.0	34.7	29.7	56.0	49.0	56.3
White, non-Hispanic	Proficient	65.9**	65.6**	66.4***	25.3**	24.6**	20.2***	8.8**	9.8**	13.4***
	Not Proficient	50.8	47.5	47.7	34.9	27.8	25.2	14.3	24.7	27.1
Gender										
Male	Proficient	58.8**	57.6**	59.9***	30.4**	25.8**	22.8***	10.7**	16.6**	17.2***
	Not Proficient	44.3	36.1	35.6	36.3	27.7	26.7	19.4	36.1	37.7
Female	Proficient	65.3**	61.0**	62.8***	24.1**	27.2**	20.8***	10.5**	11.8**	16.3***
	Not Proficient	50.0	38.0	41.9	33.5	29.8	26.4	16.2	32.2	31.7
Ever Special Education										
Yes	Proficient	39.7	38.1*	33.7***	30.2	23.8*	25.3***	30.2	38.1*	39.2***
	Not Proficient	28.2	9.1	20.8	34.2	18.2	20.4	39.4	72.7	57.5
No	Proficient	64.8***	62.0***	64.8**	26.8***	28.2***	21.2**	8.4***	9.4***	13.7***
	Not Proficient	51.7	31.2	43.8	35.6	41.6	28.4	12.6	27.3	27.7

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[23] Subgroups by Limited English Proficiency, Homeless or Highly Mobile, Economic Indicator, and Parent Education Level are of interest, but the sample size is not sufficient for this analysis.
[24] Proficient = 48 out of 64 possible points (75%).

WSS Overall Proficiency[24],%, N		3rd Grade MCA Reading Exceeds Expectations			3rd Grade MCA Reading Meets Expectations			3rd Grade MCA Reading Partially or Does Not Meet Expectations		
		2003	2004	2006	2003	2004	2006	2003	2004	2006
Number of Years in Special Education										
0	Proficient	**64.8*****	62.0***	**63.0*****	**26.8*****	28.2***	**21.2*****	**8.4*****	9.4***	**15.4*****
	Not Proficient	**51.7**	31.2	**41.0**	**35.6**	41.6	**27.9**	**12.6**	27.3	**30.8**
1	Proficient	**52.6**	43.2*	**46.2**	**26.3**	21.6*	**34.6**	**21.1**	35.1*	**19.2**
	Not Proficient	**35.9**	17.5	**31.8**	**30.8**	26.3	**22.7**	**33.3**	54.4	**45.5**
2	Proficient	**30.4**	50.0**	**43.9***	**21.7**	23.1**	**29.3***	**47.8**	26.9**	**26.8***
	Not Proficient	**25.8**	18.8	**42.9**	**32.3**	14.5	**4.8**	**41.9**	66.7	**52.4**
3	Proficient	**25.0**	38.5	**42.9**	**37.5**	30.8	**21.4**	**37.5**	30.8	**35.7**
	Not Proficient	**42.3**	20.0	**34.8**	**34.6**	34.5	**26.1**	**23.1**	45.5	**39.1**
4	Proficient	**46.2***	34.6	**41.7**	**46.2***	26.9	**25.0**	**7.7***	38.5	**33.3**
	Not Proficient	**15.2**	23.4	**11.8**	**32.6**	18.2	**41.2**	**52.2**	57.1	**47.1**
Special Education: Speech/Language Impaired										
Never identified with disability	Proficient	**64.8*****	62.0***	**62.1*****	**26.8*****	28.2***	**21.7*****	**8.4*****	9.4***	**15.8*****
	Not Proficient	**51.7**	31.2	**41.1**	**35.6**	41.6	**27.5**	**12.6**	27.3	**31.1**
Identified as Speech/Language Impaired	Proficient	**52.2**	51.7*	**38.1**	**26.1**	34.5*	**23.8**	**21.7**	13.8*	**38.1**
	Not Proficient	**41.0**	23.7	**14.7**	**23.1**	42.1	**26.5**	**35.9**	34.2	**58.8**
Identified with disability other than Speech/Language Impaired	Proficient	**11.1**	37.1	**22.7**	**44.4**	22.9	**22.7**	**44.4**	40.0	**50.0**
	Not Proficient	**10.9**	19.0	**14.3**	**47.8**	20.2	**14.3**	**41.3**	59.4	**68.8**
Number of Moves										
0	Proficient	**67.3***	67.5**	**63.4*****	**24.3***	23.9**	**21.3*****	**8.4***	8.6**	**15.2*****
	Not Proficient	**52.0**	49.2	**41.2**	**35.2**	28.0	**27.5**	**12.7**	22.7	**31.3**
1-2	Proficient	**35.9**	38.2**	**46.8***	**43.6**	31.9**	**27.4***	**20.5**	29.9**	**25.8***
	Not Proficient	**30.2**	18.2	**23.0**	**31.7**	29.6	**23.0**	**38.1**	52.2	**54.1**
3-4	Proficient	**46.8**	21.0**	**38.9***	**32.3**	42.7**	**25.0***	**21.0**	36.3**	**36.1***
	Not Proficient	**25.6**	16.2	**24.7**	**39.7**	29.1	**18.2**	**34.6**	54.7	**57.1**
>4	Proficient	**0.0***	9.1	**0.0**	**77.8***	27.3	**42.9**	**22.0***	63.6	**57.1**
	Not Proficient	**20.0**	16.7	**0.0**	**10.0**	33.3	**42.9**	**70.0**	50.0	**57.1**

WSS Overall Proficiency[24],%, N		3rd Grade MCA Reading Exceeds Expectations			3rd Grade MCA Reading Meets Expectations			3rd Grade MCA Reading Partially or Does Not Meet Expectations		
		2003	2004	2006	2003	2004	2006	2003	2004	2006
Title I School at Kindergarten										
Yes	Proficient	44.4	15.2	50.0	31.1	45.7	29.7	24.4	39.1	20.3
	Not Proficient	26.8	18.8	36.1	35.2	42.0	27.8	38.0	39.1	36.1
No	Proficient	63.7**	61.0**	62.0***	26.8**	25.9**	21.4***	9.5**	13.1**	16.6***
	Not Proficient	49.2	38.1	38.6	35.1	27.6	26.4	15.7	34.2	35.0
Kindergarten Schedule										
Any Half-day	Proficient	68.3**	57.4**	67.9***	21.9**	27.5**	20.1***	9.8**	15.1**	12.0***
	Not Proficient	50.6	34.1	44.1	34.5	27.4	24.4	14.9	38.5	31.5
Any Full-day	Proficient	60.2**	60.3**	60.6***	29.1**	26.2**	22.1***	10.7**	13.4**	17.3***
	Not Proficient	46.0	39.2	39.4	35.7	29.3	27.1	18.3	31.5	33.5
Family Income										
$35,000 or less	Proficient	51.2	47.7**	55.7***	30.6	32.6**	20.9***	18.2	19.8**	23.4***
	Not Proficient	40.4	29.3	36.7	29.4	27.2	24.7	30.1	43.5	38.7
More than $35,000	Proficient	70.2**	66.9**	62.8***	24.0**	23.7**	22.0***	5.7**	9.3**	15.2***
	Not Proficient	52.4	48.6	39.1	35.7	28.9	27.5	11.9	22.5	33.4

Notes: The sample sizes are: 2003 N=1,324, 2004 N=3,292, 2006 N=2,342.

Chi-squared significance: *<.05, **<.01, ***<.001

Table 11: 2006 MWSS X MCA Reading Exceeds Standards by Subgroups (N = 2342)

MCA Reading Exceeds Standards (2006) by Gender							
	MCA Reading Exceeds Standards						
Proficiency Indicator	**% proficient on WSS**	**Proficiency Rate**	**Raw correlation**	**Partial correlation controlling for child/family background**[25]	**Predicted Probability : Proficient**	**Predicted Probability: Not Proficient**	**Difference**
Males							
1. Lang and literacy (MDE)	54.7	60.7%	.250**	.157***	0.554	0.349	0.206***
2. LL + math (MDE)	45.3	63.1%	.251**	.157***	0.568	0.371	0.197***
3. LL +math + personal devel	38.4	66.2%	.265**	.173***	0.594	0.382	0.213***
4. All five domains	32.4	67.4%	.249**	.165***	0.582	0.423	0.159***
5. 70% standard (based on 0-64 points)	60.7	58.4%	.224**	.136***	0.528	0.370	0.158***
6. 75% standard	56.5	59.9%	.241**	.148***	0.543	0.362	0.181***
7. 80% standard	49.4	62.6%	.261**	.173***	0.572	0.340	0.232***
8. 17 or more items proficient	56.7	60.0%	.243**	.154***	0.557	0.334	0.223***
Females							
1. Lang and literacy (MDE)	63.2	64.2%	.230**	.177***	0.631	0.447	0.184***
2. LL + math (MDE)	50.4	67.9%	.252**	.202***	0.663	0.464	0.199***
3. LL +math + personal devel	47.0	68.0%	.239**	.193***	0.658	0.487	0.171***
4. All five domains	43.8	68.1%	.224**	.178***	0.653	0.508	0.145***
5. 70% standard (based on 0-64 points)	69.8	61.7%	.189**	.141***	0.621	0.420	0.201***
6. 75% standard	65.0	62.8%	.201**	.146***	0.620	0.456	0.164***
7. 80% standard	59.8	64.6%	.223**	.171***	0.633	0.459	0.174***
8. 17 or more items proficient	65.3	62.3%	.189**	.136***	0.619	0.468	0.150***

[25] Child/family background variables include: child's gender, race/ethnicity (black, Hispanic, other, (white is baseline)), income (less than $35,000), parent education (high school, some college, at least bachelor's degree (less than high school is baseline), and child received special education in Kindergarten.

MCA Reading Exceeds Standards (2006) by Income							
	MCA Reading Exceeds Standards						
Proficiency Indicator	% proficient on WSS	Proficiency Rate	Raw correlation	Partial correlation controlling for child/family background[26]	Predicted Probability: Proficient	Predicted Probability: Not Proficient	Difference
$35,000 or below							
1. Lang and literacy (MDE)	42.7	59.0%	.230**	.206***	0.366	0.223	0.143**
2. LL + math (MDE)	31.7	63.2%	.239**	.207***	0.413	0.223	0.190***
3. LL +math + personal devel	27.9	65.0%	.241**	.208***	0.444	0.225	0.219***
4. All five domains	25.4	67.1%	.251**	.220***	0.405	0.258	0.146**
5. 70% standard (based on 0-64 points)	51.6	54.6%	.183**	.167***	0.365	0.182	0.183***
6. 75% standard	47.7	55.7%	.191**	.164***	0.381	0.192	0.189***
7. 80% standard	41.6	58.8%	.222**	.194***	0.405	0.193	0.211***
8.17 or more items proficient	47.9	55.5%	.187**	.160***	0.385	0.187	0.198***
$35,001 or above							
1. Lang and literacy (MDE)	64.0	63.3%	.237**	.141***	0.661	0.472	0.189***
2. LL + math (MDE)	53.0	66.0%	.247**	.161***	0.679	0.493	0.186***
3. LL +math + personal devel	47.3	67.6%	.250**	.167***	0.683	0.517	0.167***
4. All five domains	41.9	67.9%	.229**	.150***	0.681	0.543	0.138***
5. 70% standard (based on 0-64 points)	69.5	61.4%	.211**	.119***	0.642	0.494	0.149***
6. 75% standard	64.8	62.8%	.227**	.131***	0.646	0.503	0.143***
7. 80% standard	58.5	64.8%	.246**	.154***	0.664	0.485	0.178***
8. 17 or more items proficient	65.1	62.6%	.222**	.131***	0.651	0.495	0.156***

[26] Child/family background variables include: child's gender, race/ethnicity (black, Hispanic, other, (white is baseline), income (less than $35,000), parent education (high school, some college, at least bachelor's degree (less than high school is baseline), and child received special education in Kindergarten.

Proficiency Indicator	MCA Reading Exceeds Standards						
	% proficient on WSS	Proficiency Rate	Raw correlation	Partial correlation controlling for child/family background[27]	Predicted Probability : Proficient	Predicted Probability: Not Proficient	Difference
White							
1.Lang and literacy (MDE)	62.4	67.0%	.199**	.148***	0.628	0.457	0.184***
2.LL + math (MDE)	51.6	69.5%	.213**	.167***	0.652	0.473	0.192***
3.LL +math + personal devel	46.0	70.9%	.217**	.169***	0.657	0.491	0.179***
4.All five domains	40.9	71.4%	.203**	.155***	0.654	0.516	0.149***
5.70% standard (based on 0-64 points)	68.4	65.1%	.170**	.127***	0.614	0.459	0.167***
6.75% standard	64.2	66.0%	.180**	.129***	0.618	0.471	0.159***
7.80% standard	57.6	68.2%	.209**	.157***	0.638	0.456	0.195***
8.17 or more items proficient	64.3	65.9%	.177**	.127***	0.624	0.463	0.174***
African American							
1. Lang and literacy (MDE)	47.3	36.2%	.220**	.222**	0.317	0.157	0.087
2. LL + math (MDE)	37.7	34.5%	.151	.147	0.266	0.213	0.031
3. LL +math + personal devel	30.8	35.6%	.145	.135	0.300	0.197	0.062
4. All five domains	27.4	37.5%	.161	.139	0.250	0.230	0.012
5. 70% standard (based on 0-64 points)	58.2	34.1%	.218**	.211*	0.357	0.0795	0.500
6. 75% standard	51.4	34.7%	.202*	.195*	0.357	0.0917	0.510***
7. 80% standard	45.9	34.3%	.174*	.161	0.322	0.138	0.097
8. 17 or more items proficient	52.1	35.5%	.226	.225**	U[28]	U	U

[27] Child/family background variables include: child's gender, race/ethnicity (black, Hispanic, other, (white is baseline), income (less than $35,000), parent education (high school, some college, at least bachelor's degree (less than high school is baseline), and child received special education in Kindergarten.
[28] Cells labeled "U" for unidentified indicate that the number of observations in the group were insufficient to identify the effect of the MWSS measure.

Proficiency Indicator	% proficient on WSS	Proficiency Rate	Raw correlation	Partial correlation controlling for child/family background[29]	Predicted Probability : Proficient	Predicted Probability: Not Proficient	Difference
Hispanic							
1. Lang and literacy (MDE)	43.5	42.2%	..46**	.275***	0.337	0.161	0.188
2. LL + math (MDE)	30.4	49.2%	.367**	.297***	0.328	0.197	0.142
3. LL +math + personal devel	27.5	52.6%	.391**	.332***	0.335	0.203	0.145
4. All five domains	26.1	51.9%	.366**	.307***	0.259	0.251	0.010
5. 70% standard (based on 0-64 points)	48.8	37.6%	.281**	.231**	U[30]	U	U
6. 75% standard	44.4	40.2%	.311**	.253***	U	U	U
7. 80% standard	38.6	45.0%	.364**	.297***	0.369	0.123	0.258**
8. 17 or more items proficient	46.4	39.6%	.310**	.254***	U	U	U
Other							
1. Lang and literacy (MDE)	48.9	47.1%	.278**	.209**	0.531	0.142	0.406***
2. LL + math (MDE)	38.2	51.5%	.295**	.200**	0.519	0.236	0.301**
3. LL +math + personal devel	34.8	53.2%	.302**	.210**	0.534	0.269	0.284**
4. All five domains	29.8	56.6%	.315**	.246**	0.531	0.317	0.233*
5. 70% standard (based on 0-64 points)	56.2	43.0%	.223**	.170*	0.459	0.260	0.213
6. 75% standard	50.6	46.7%	.277**	.224**	0.502	0.168	0.353**
7. 80% standard	46.6	48.2%	.286**	.222**	0.494	0.261	0.251*
8. 17 or more items proficient	50.6	45.6%	.253**	.193*	0.479	0.256	0.238

[29] Child/family background variables include: child's gender, race/ethnicity (black, Hispanic, other, (white is baseline), income (less than $35,000), parent education (high school, some college, at least bachelor's degree (less than high school is baseline), and child received special education in Kindergarten.

[30] Cells labeled "U" for unidentified indicate that the number of observations in the group were insufficient to identify the effect of the MWSS measure.

MCA Reading Exceeds Standards (2006) by Parent Education							
	MCA Math Exceeds Standards						
Proficiency Indicator	% proficient on WSS	Proficiency Rate	Raw correlation	Partial correlation controlling for child/family background[31]	Predicted Probability: Proficient	Predicted Probability: Not Proficient	Difference
Less than High School							
1.Lang and literacy (MDE)	37.9	30.6%	.231*	.205	U[32]	U	U
2.LL + math (MDE)	29.5	35.7%	.277**	.247*	U	U	U
3.LL +math + personal devel	25.3	41.7%	.337**	.323**	U	U	U
4.All five domains	21.1	35.0%	.212*	.194	U	U	U
5.70% standard (based on 0-64 points)	44.2	28.6%	.219*	.200	U	U	U
6.75% standard	35.8	32.4%	.255*	.227*	U	U	U
7.80% standard	33.7	34.4%	.281**	.245*	U	U	U
8.17 or more items proficient	40.0	28.9%	.208*	.184	U	U	U
High School/GED							
1. Lang and literacy (MDE)	49.9	39.3%	.102	.057	0.386	0.319	0.070
2. LL + math (MDE)	39.5	42.1%	.131*	.085	0.406	0.315	0.096
3. LL +math + personal devel	34.4	42.2%	.119*	.074	0.397	0.331	0.069
4. All five domains	30.0	41.6%	.099	.058	0.386	0.344	0.044
5. 70% standard (based on 0-64 points)	58.2	38.3%	.095	.047	0.373	0.328	0.047
6. 75% standard	53.4	38.9%	.101	.059	0.378	0.326	0.055
7. 80% standard	45.4	39.9%	.105	.066	0.382	0.328	0.057
8. 17 or more items proficient	53.1	38.5%	.092	.052	0.378	0.329	0.052

[31] Child's family background variables include: child's gender, race/ethnicity (black, Hispanic, other, (white is baseline), income (less than $35,000), parent education (high school, some college, at least bachelor's degree (less than high school is baseline), and child received special education in Kindergarten.
[32] Cells labeled "U" for unidentified indicate that the number of observations in the group were insufficient to identify the effect of the MWSS measure.

Proficiency Indicator	% proficient on WSS	Proficiency Rate	Raw correlation	Partial correlation controlling for child/family background[33]	Predicted Probability : Proficient	Predicted Probability: Not Proficient	Difference
Trade School or Some College							
1. Lang and literacy (MDE)	60.4	59.6%	.213**	.185***	0.591	0.366	0.241***
2. LL + math (MDE)	49.1	62.9%	.235**	.206***	0.615	0.395	0.237***
3. LL +math + personal devel	42.9	64.4%	.232**	.196***	0.608	0.429	0.191***
4. All five domains	38.7	64.8%	.219**	.185***	0.613	0.445	0.180***
5. 70% standard (based on 0-64 points)	66.2	57.6%	.187**	.155***	0.569	0.359	0.224***
6. 75% standard	60.0	59.6%	.213**	.183***	0.579	0.373	0.219***
7. 80% standard	53.5	62.2%	.241**	.217***	0.610	0.366	0.261***
8. 17 or more items proficient	60.4	59.9%	.221**	.189***	0.587	0.366	0.236***
Associate's Degree							
1. Lang and literacy (MDE)	60.8	61.8%	.168*	.138*	0.571	0.404	0.172*
2. LL + math (MDE)	51.2	63.1%	.165*	.121	0.592	0.420	0.177*
3. LL +math + personal devel	47.0	64.7%	.183*	.149*	0.594	0.433	0.166*
4. All five domains	41.0	66.3%	.188**	.162*	0.607	0.448	0.164*
5. 70% standard (based on 0-64 points)	67.7	62.3%	.210**	.182**	0.578	0.315	0.270***
6. 75% standard	63.6	63.0%	.213**	.176*	0.580	0.341	0.246**
7. 80% standard	58.1	63.5%	.200**	.162*	0.573	0.397	0.181*
8. 17 or more items proficient	63.1	62.8%	.203**	.167*	0.576	0.361	0.221**
At least a Bachelor's Degree							
1. Lang and literacy (MDE)	74.6	77.6%	.187**	.157***	0.753	0.536	0.227***
2. LL + math (MDE)	64.0	79.0%	.187**	.174***	0.767	0.583	0.194***
3. LL +math + personal devel	58.1	80.1%	.194**	.180***	0.785	0.585	0.210***
4. All five domains	52.0	80.1%	.173**	.161***	0.775	0.634	0.148***
5. 70% standard (based on 0-64 points)	77.6	76.0%	.138**	.104**	0.737	0.575	0.170**
6. 75% standard	75.0	76.2%	.135**	.106**	0.741	0.577	0.172**
7. 80% standard	69.5	77.5%	.161**	.136**	0.759	0.544	0.226***

[33] Child/family background variables include: child's gender, race/ethnicity (black, Hispanic, other, (white is baseline), income (less than $35,000), parent education (high school, some college, at least bachelor's degree (less than high school is baseline), and child received special education in Kindergarten.

8. 17 or more items proficient	75.1	76.3%	.138**	.111**	0.747	0.552	0.206***

ASSESSING THE VALIDITY OF MINNESOTA SCHOOL READINESS INDICATORS

Human Capital Research Collaborative

December14, 2010

Background

27 States collect school readiness data in Kindergarten

17 States require universal assessment of K students

A majority of States assess multiple domains while the rest limit to reading/literacy

3 States use versions of WSS; several States have choices from select list

Very few link early education experiences to assessment

Overview

The Minnesota Work Sampling System K Entry Development Checklist (*MWSS)* measures children on 32 indicators of school readiness in 5 domains:

- Personal and Social Development (10 items, Interacts with familiar adults)
- Language and Literacy (11 items, Demonstrates phonological awareness)
- Mathematical Thinking (4 items, Understands numbers and quantity)
- the Arts (4 items, Responds to artistic creations/events), and
- Physical Development and Health (3 items, Uses eye-hand coordination to perform tasks).

MWSS Procedure

- Began in 2002
- Administered annually
- Voluntary 10% stratified random sample of schools
- Same 32 indicators used every year; aligned to K-12
- Teacher time to complete about 5 to 7 hours
- Assessing school readiness:
  - Kindergarten teachers trained (in-person or on-line) to assess children's proficiency
  - First 8 weeks of school teachers observe kindergarteners
  - After 8 weeks teachers rate children as "Proficient", "In Process", or "Not Yet" on each indicator

Approaches to Assessing Young Children

Direct Assessment via Standardized Tests (e.g., Woodcock-Johnson tests)

Screening Instruments for Specific Purposes (e.g., Early Screening Inventory)

Performance Assessments via Teacher Observations (WSS or Child Observation Record)

Previous Studies of WSS

Show moderate to high correlation with standardized tests

Demonstrate significant prediction of school achievement in the short term

Benefit of integrated assessments beginning in preschool

Developmental checklist can be tailored to state standards

Longer-term predictive validity uncertain

Criteria for Determining Validity of Alternative Indicators and Measures

Content and alignment to standards
Readiness for state-wide use
Prediction of school achievement and performance
Fairness and opportunity (standard level)
Transparency
Time and cost of administration
Linkage to curriculum and learning activities

Major Questions

1. What are children's levels of proficiency at kindergarten entry for different definitions of school readiness?

2. How well are children who are proficient on MWSS performing in school in 3rd grade compared to those who are not proficient on MWSS?

3. Is the predictive value of the MWSS similar across different groups of children (socioeconomic status, child and family characteristics, race and ethnicity)?

Working Definition of Readiness

Consistent demonstration of mastery or proficiency in skills, behaviors, and attitudes that promote successful transition to kindergarten and are instrumental (predictive) of optimal learning and achievement. These skills and behaviors include the domains of language, literacy, math, socio-emotional development, the arts, and physical health. Proficiency in multiple domains is especially beneficial for smooth transitions to kindergarten.

Data Used in Analyses

• Data obtained from Minnesota Department of Education

• Data reported only for children without missing MWSS ratings

• Follow-up data in 3rd grade for 2003, 2004, and 2006 K cohorts

• Number of children in the matched longitudinal samples:
  • 2003 = 1,469 (2,933 original K sample)
  • 2004 = 2,846 (3,247)
  • 2006 = 2,342 (2,990)

Sample Comparison to Whole State

	2006	
	MWSS	All 5-year-olds
% Female	49	49
% White	64	74
% Black	6	10
% Hispanic	8	8
% Unknown	15	--
% Free lunch	25	28
% Reduced price	11	8
% Not eligible	64	64

Example Items in Checklist

Language/literacy

beginning understanding of concepts about print
demonstrates phonological awareness

Mathematical thinking

understands numbers and quantity
uses strategies to solve math problems

Personal and social development

approaches tasks with flexibility and inventiveness
follows class rules and routines

Physical health

performs some self-care tasks independently

Arts

responds to artistic creations and events

Factor Analysis Results

The 32 items were consistently found to be empirically represented by one underlying school-readiness factor

This factor accounted for 55-60% of the total inter-item variance

Reliability of the entire scale is .98

Items with the highest correlations to the overall factor:

comprehends and responds to stories read aloud, beginning understanding of concepts about print, approaches tasks with flexibility and inventiveness

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What are children's levels of proficiency at kindergarten entry for different definitions of school readiness?

• The following proficiency rates were examined for 2003, 2004, 2006, 2007, 2008, & 2009:

  • current MDE proficiency rates listed in each domain
  • a higher proficiency rate on specified domains
  • a total score of 75% or better (48 out of 64 points)
  • proficient in all 5 domains
  • proficient in Language and Literacy and Mathematical Thinking

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### Scoring Breakdown in Points for 75% Standard

32 items
Each item scored 2 = proficient, 1 = in process, 0 = not ready

64 points possible

48 points = 75% of the total points

16 items proficient (32)   18 items proficient (36)
16 items in process (16)   12 items in process (12),
                               2 items not ready (0)

What are children's levels of proficiency at kindergarten entry for different definitions of school readiness?

WSS Proficiency Rates by Definition
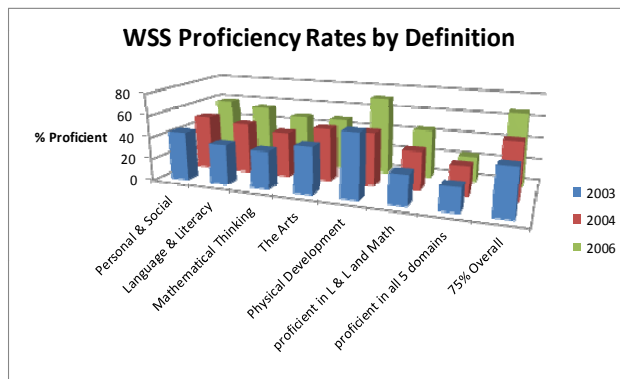
What are children's levels of proficiency at kindergarten entry for different definitions of school readiness?

• Proficiency rates fluctuate
  • across years,
  • across domains, and
  • across different ways of measuring proficiency

• For overall proficiency rate of 75%, percentage proficient ranges from:
  • 42% proficient in 2003 to
  • 66% proficient in 2006
  • similar to the rates obtained for the MDE defined proficiency rate by domain

• For proficient in all five domains, the percentage proficient ranges from:
  • 21% in 2003 to
  • 31% in 2007 and 2009

• For proficient in at least Language & Literacy and Mathematical Thinking results in proficiency rates between the 75% overall proficiency and requiring proficiency in all domains.

Trends for 3 Definitions of Readiness

Proficiency	2003	2004	2006	2007	2008	2009	2020
75% score	42%	51%	66%	54%	52%	53%	--
Lang+math	27%	35%	44%	42%	40%	41%	--
5 domains	21%	26%	23%	31%	29%	31%	--

Differences in Readiness for 3 Definitions by Low Income Status

Status	2008 75%	L&M	All5	2009 75%	L&M	All5
0-250% poverty	52%	39%	21%	42%	40%	21%
251%+ poverty	63%	62%	38%	63%	63%	39%

MCA-II Scoring, Grade 3; 2010

Category	Reading N correct (44)	Reading Pr rank	Math N correct (48)	Math Pr rank
Meets Standards	29-35	25-47	27-38	20-57
Exceeds Standards	36-44	52-99	39-48	62-99
Top 20%	40-44	78-99	42-48	77-99

How well are children who are proficient on MWSS achieving in 3rd grade compared to those who are not proficient?

- Kindergarteners who were proficient on the MWSS domain of Language and Literacy and the domain of Mathematical Thinking were consistently more likely to be proficient on MCA reading and math tests as well as less likely to be in special education or to have been retained by 3rd grade.

- Similar results were also consistently found for the overall proficiency rate of 75% on the MWSS.

How well are children who are proficient on MWSS achieving in 3rd grade compared to those who are not proficient?

- On average, the items with the highest correlations across all years for both MCA reading and math are:
  - "Demonstrates phonological awareness"
  - "begins to develop knowledge about letters"
  - "shows beginning understanding about number and quantity"

- The domains of Language & Literacy and Mathematical Thinking consistently correlated the most highly with the 3rd grade MCA reading and math scores.

How well are children who are proficient on MWSS achieving in 3rd grade compared to those who are not proficient?

- A higher percentage of children proficient on the MWSS exceeded standards on MCA reading and math scores in 3rd grade

- Kindergarteners proficient on MWSS were at least twice as likely to exceed standards on both MCA reading and math scores in 3rd grade

- Kindergarteners not yet proficient on MWSS domains were more than twice as likely to have been in special education by 3rd grade

3rd Grade Reading Performance by Kindergarten Proficiency (K in 2006, 3rd in 2010)

3rd grade	K Proficient (75% standard)	K Not Proficient (< 75% of total)
Partially or not meet	17%	35%
Meets proficiency	22%	27%
Exceeds proficiency	61%	38%
Meets or exceeds	83%	65%

Slide 1

How well are children who are proficient on MWSS achieving in 3rd grade compared to those who are not proficient?

- Significantly predicted all outcomes in 3rd grade every year:
  - The domains of Language & Literacy and Mathematical Thinking, and the overall 75% proficiency rate
- Holding constant gender, race/ethnicity, parent education, and IEP status in Kindergarten, Kindergarteners
  - proficient on Language & Literacy or Mathematical Thinking or proficient at the 75% rate overall were two to three times as likely to meet or exceed MCA reading and math proficiency
  - Kindergarteners not proficient on MWSS were, on average, twice as likely to have been in special education or retained by 3rd grade

Slide 2

Validity of 2006 MWSS Proficiency Indicators on 3rd grade MCA Reading

Proficiency Indicator	% Meets or Exceeds Standards			% Exceeds standards		
	Prof. in K	Not Prof. in K	Diff	Prof. in K	Not Prof. in K	Diff
Lang and literacy (MDE)	84.4	69.4	15.0***	59.5	40.3	19.2***
LL + math (MDE)	86.0	71.2	14.8***	61.8	42.2	19.5***
LL +math + personal devel	86.3	72.9	13.5***	62.6	44.0	18.6***
All five domains	86.3	74.5	11.8***	61.8	47.1	14.7***
70% standard (based on 0-64 points)	83.1	69.1	13.9***	57.8	40.1	17.7***
75% standard	84.0	68.6	15.4***	58.4	41.1	17.4***
80% standard	84.7	70.0	14.7***	60.3	40.3	20.0***
17 or more items proficient	83.7	70.1	13.6***	59.0	40.3	18.7***

*** p < .001. Adjusted for child's gender, race/ethnicity, income, parent education, and special education in kindergarten.

Slide 3

Is the predictive value of the MWSS similar across different demographic groups of children?

- subgroups were compared by:
  - race/ethnicity,
  - gender,
  - ever in special education,
  - number of moves at Kindergarten,
  - Title 1 school in Kindergarten,
  - Kindergarten schedule, and
  - family income

Slide 4

Meet or Exceeds 3rd Grade Reading Proficiency by Kindergarten Proficiency (K in 2006, 3rd in 2010): Select Subgroups

3rd grade	K Proficient (75% standard)	K Not Proficient (< 75% of total)
Males	83%	63%
Females	84%	68%
Whites	86%	73%
Blacks	62%	44%
Hispanics	75%	45%
Native American	60%	43%
Asian/Pacific Islander	74%	52%
Title I school	80%	64%
Other schools	83%	55%

Slide 5

Validity of 2006 MWSS Proficiency Indicators on 3rd grade MCA Reading Exceeds Standards (Gender subgroup)

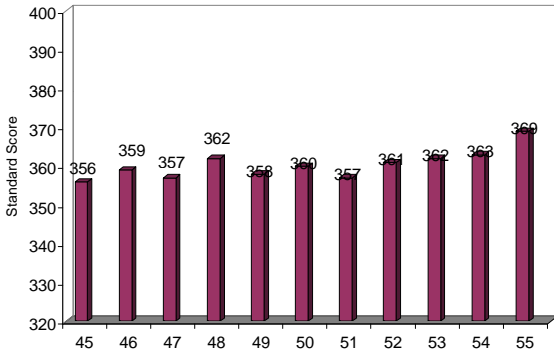| Proficiency Indicator	Males			Females		
	Prof. in K	Not Prof. in K	Diff	Prof. in K	Not Prof. in K	Diff
Lang and literacy (MDE)	55.4	34.9	20.6***	63.1	44.7	18.4***
LL + math (MDE)	56.8	37.1	19.7***	66.3	46.4	19.9***
LL +math + personal devel	59.4	38.2	21.3***	65.8	48.7	17.1***
All five domains	58.2	42.3	15.9***	65.3	50.8	14.5***
70% standard (based on 0-64 points)	52.8	37.0	15.8***	62.1	42.0	20.1***
75% standard	54.3	36.2	18.1***	62.0	45.6	16.4***
80% standard	57.2	34.0	23.2***	63.3	45.9	17.4***
17 or more items proficient	55.7	33.4	22.3***	61.9	46.8	15.0***

*** p < .001. Adjusted for race/ethnicity, income, parent education, and special education in kindergarten.

Slide 6

Validity of 2006 MWSS Proficiency Indicators on 3rd grade MCA Reading Exceeds Standards (Income subgroup)
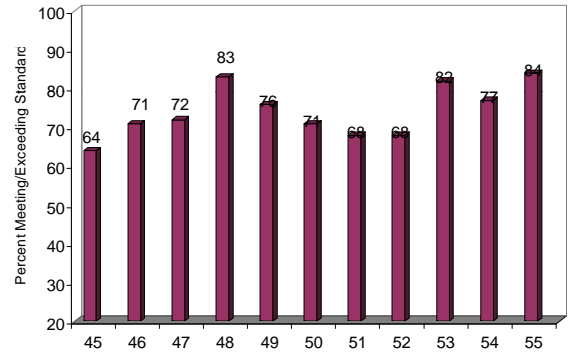
Proficiency Indicator	$35,000 or below			$35,001 or above		
	Prof. in K	Not Prof. in K	Diff	Prof. in K	Not Prof. in K	Diff
Lang and literacy (MDE)	36.6	22.3	14.3**	66.1	47.2	18.9***
LL + math (MDE)	41.3	22.3	19.0***	67.9	49.3	18.6***
LL +math + personal devel	44.4	22.5	21.9***	68.3	51.7	16.7***
All five domains	40.5	25.8	14.6**	68.1	54.3	13.8***
70% standard (based on 0-64 points)	36.5	18.2	18.3***	64.2	49.4	14.9***
75% standard	38.1	19.2	18.9***	64.6	50.3	14.3***
80% standard	40.5	19.3	21.1***	66.4	48.5	17.8***
17 or more items proficient	38.5	18.7	19.8***	65.1	49.5	15.6***

*** p < .001, ** p<.01.
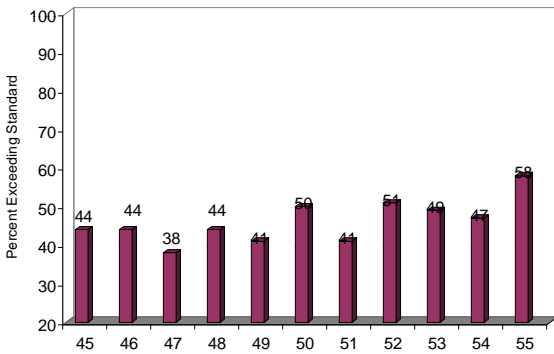Adjusted for child's gender, race/ethnicity, parent education, and special education in kindergarten.

Grade 3 Reading by MWSS Scores

Standard Score by MWSS score (45–55): 356, 359, 357, 362, 358, 360, 357, 361, 362, 363, 360

Grade 3 Reading by MWSS Scores

Percent Meeting/Exceeding Standard by MWSS score (45–55): 64, 71, 72, 83, 76, 71, 68, 68, 82, 77, 84

Grade 3 Reading by MWSS Scores

Percent Exceeding Standard by MWSS score (45–55): 44, 44, 38, 44, 41, 50, 41, 51, 49, 47, 59

3rd Grade Performance by Proficiency on the MWSS Checklist for the 2006 Kindergarten Cohort (3rd grade in 2010)

	MCA reading in 3rd Grade			
	Score	Meet/exceed	Exceed	Top 20%
MWSS Group				
1. 75% standard	367	83%	62%	32%
2. 50-74%	358	71%	41%	18%
3.< 50%	353	57%	34%	13%

3rd Grade Performance by Proficiency on the MWSS Checklist for the 2006 Kindergarten Cohort (3rd grade in 2010)

	MCA Math in 3rd Grade			
	Score	Meet/exceed	Exceed	Top 20%
MWSS Group				
1. 75% standard	363	91%	51%	32%
2. 50-74%	358	78%	32%	18%
3.< 50%	354	69%	25%	13%

Special Education Placement and School Moves up to 3rd Grade by Proficiency on the MWSS Checklist for the 2006 Kindergarten Cohort (3rd grade in 2010)

	Special education	Number of moves
MWSS Group		
1. 75% standard	7%	0.47
2. 50-74%	12%	0.97
3. < 50%	15%	1.15

Summary of State Prek/Early Ed Evaluation Evidence

	Overall effect size in SD	Minimum increase in proficiency
5-State Study (NIEER)	.22	9 points
7-State Study (Gilliam)	.36	14 points
Oklahoma, Tulsa (Gormley)	.58	22 points
New Mexico (NIEER)	.37	15 points
Arkansas (NIEER)	.30	13 points
New Jersey (NIEER)	.32	14 points
Oklahoma (NIEER)	.26	11 points
National Head Start	.24	10 points
Model Programs	.66	25 points

Recommendations

1. **Establish a definition of school-ready proficiency.**

2. **Establish key indicators for quantifying the rate of school-ready proficiency. Based on our analysis, the overall proficiency standard of 75% is recommended. Proficiency in language/literacy and mathematical thinking is a secondary indicator.**

3. **Collect MWSS data on a much larger sample of Kindergartners, preferably the entire population.**

4. **Consider use of the Kindergarten version of the WSS rather than the Pre-Kindergarten version.**

Recommendations

5. **Collect annually as part of the Kindergarten assessment (or earlier) information on prior early care and education and broad set of family characteristics.**
6. **Begin a longitudinal study in 2011 that tracks the Kindergarten assessment sample through school and all other data systems they and families may access (e.g. public aid, child welfare, justice).**
7. **Continue to track the currently analyzed cohorts to eighth grade and beyond.**
8. **Given the large gap between current rates of school readiness and the 2020 goal, strategies most likely to close this gap are needed as soon as possible.**

Key Principles for School-Ready Proficiency

1. Short-term and long-term change strategies should be considered concurrently to improve program birth to K.
2. A measurable definition of school readiness is needed to assess progress toward meeting the 2020 goal
3. To identify effective programs, school-ready proficiency should be assessed regularly.
4. Investment in programs should be targeted to those most likely to increase school-ready proficiency.
5. The logic model diagram (next slide) shows a framework for assessing and documenting how investments impact readiness and later success.

Paths from Early Education to School Success