Using Early Childhood Measures To Predict Literacy Attainment

A NATIONAL LITERATURE REVIEW
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believe 2 BECOME

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Greetings:

In 2017, we commissioned a national review of literature and an analysis of results in early childhood interventions.

The work of improving long-term academic gains through investments in early childhood programs is both important and urgent. Each year's work has long-term impact in children's lives—for better or worse. And each year's work has an immediate impact in children's lives right now—for better or worse. In this report, we found good news and bad news.

The good news: a few things have evidence that they work.

> Susan Landry's approach, evidence-based home visits with parents of children under age six, works, giving very young children a stronger foundation for learning.

> Quality preschool for 3- and 4-year-olds works, resulting in higher kindergarten readiness and early academic achievement.

> Work from Columbia, Harvard, and Stanford universities show promise, enough to merit more extensive studies that meet the rigor of peer review.

The bad news: significant sums are spent on approaches that do not work. It is critical to understand which investments are producing measurable results, and build on those investments. It is equally important to understand the approaches that are not an effective use of the finite dollars available to effect positive change for children, and shift those resources to better use.

Those of us who have the privilege and opportunity to work on behalf of young children also have a grave responsibility to get it right. Their futures depend on us.

We are happy to share the insights contained in this report, so that we may all tend to both the important and urgent work before us... with as much evidence and insight as possible.

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Early Childhood Literacy Predictors

Learning to read is arguably the single, most important skill a student will learn from the schooling establishment. An illiterate individual is essentially doomed to lifelong economic malaise. Led by an influential 1998 report by the National Research Council (Snow et al), in the past few decades the nation's policy and political forces have coalesced around third grade as the threshold by which students should be expected to read fluently. As the popular adage goes, "Students before third grade students learn to read, and after third grade students read to learn." Legislatures have inserted themselves into this issue, with – as of July, 2016 – laws on the books in over twenty states mandating the retention of students who do not reach reading proficiency by the end of third grade ("K-3 Quality", 2017). Researchers have explored the numerous factors that influence the likelihood of students reaching proficiency by third grade, including the study of both malleable and fixed characteristics.

Identifying Leading Indicators

It is within this policy environment that we explore early grades measures that provide predictive signals concerning early grade literacy performance. The identification of available, predictive early childhood measures is challenged, however, by the fragmentation of the early childhood assessment landscape. Unlike in middle and high school grades – which, due to *No Child Left Behind*, generally have rigorous, consistent assessments administered statewide – measures in early childhood programs are driven by grant requirements or other ad hoc needs. Early childhood predictors can also be broadly specified, such as a student's ability to play nicely with his or her peers. Our ultimate goal is to assist in the identification of locally validated measures that both identify students who are at risk for future reading deficiencies and provide information about how to mitigate these risks. Ideal measures will have the following characteristics:

- Commonly collected prior to kindergarten or within the first few months of the academic year
- Strongly predictive of third grade literacy
- Stable across different student demographic groups
- Easily communicated to stakeholders
- Provides actionable information to practitioners and parents

Potential predictive measures are surfaced through a comprehensive scan of peer-reviewed publications, building on a foundation of the existing literature.

Measurement Breadth and Depth

Early childhood predictive measures from the literature can be generally grouped into the following categories:

Curriculum-based measures: These measures are commonly collected within early grades and perhaps have the most intuitive appeal, as these are foundational reading skills such as alphabet knowledge and word recognition. The predictive value of these measures is strongly supported by theory.

General readiness measures: These measures are broader than the skill-based focus of curriculum-based measures, and include verbal, auditory, and perceptual aptitude. Researchers have also investigated the predictive power of students during play, including levels of cooperative and engagement.

Pathway measures: Measures in this category involve the dosage of formal academic enrollment received by students, such enrollment within pre-kindergarten, half-day/full-day kindergarten, and student relative ages.

Socio-economic measures: Measures in this category include neighborhood characteristics, family and parent factors such as income and educational level, and home-based academic support, such as the number of books available within the home.

Curriculum-Based Measures

Curriculum-based measures (CBM), as defined by Deno (1993), are those that use curricular materials as the very basis for assessment. At its core, CBM could refer to all of the classroom-based, informal teacher-run processes of checking for understanding, including daily homework and pop-quizzes. CBM is distinguished from standardized assessments by a teacher's direct observation and tracking. A commonly used CBM, and one used within Grand Rapids Public Schools, is DIBELS, which measures students' ability to read and comprehend text. It is administered routinely by a teacher through listening to a student reading a passage and tracking the frequency and type of errors made. The ubiquitous use of DIBELS and its close alignment to reading skills makes it a pragmatic and powerful predictor of future literacy. Burke et al, (2007) found substantial predictive validity of DIBELS on second grade literacy levels for both general and special education students. Betts et al (2008) find similar results between kindergarten CBM results and second grade literacy scores with a similar CBM, the Minneapolis Kindergarten Assessment.

Morris et al, (2003) go further by examining the predictive power of six potential indicators of early childhood literacy: alphabet knowledge and recognition; consonant

awareness; words in text; spelling; phoneme segmentation; and word recognition. The researchers found alphabet knowledge to be a significant predictor of later literacy and reading achievement, noting that alphabet knowledge is likely a proxy for pre-kindergarten literacy and reading exposure. Words in text – the ability of a student to identify the correct word in a passage – was also a strong predictor of early grade literacy. Consonant awareness was not found to be a predictor of early childhood literacy, but it's lack of predictive power is likely due to its correlation with alphabet knowledge. Likewise, spelling was found to be a predictor of later literacy and reading achievement. Morris' analysis is useful as it highlights four relatively strong kindergarten predictors (alphabet knowledge; words in text; spelling; and word recognition) of early literacy. The authors also note that these measures remain predictive throughout the school year, so gauging student risk factors can occur numerous times within an academic year.

General Readiness Measures

In contrast to Curriculum-Based Measures, General Readiness Measures are ones that are less academic/skill-based. This set of indicators is intriguing in that their conceptual mapping is much more speculative; for example, is playing nicely or understanding simple analogies predictive of future literacy achievement? Several studies have investigated these relationships, with Kurdek et al (2001), Augustyniak et al (2004), and Duncan et al, (2007) finding significant relationships between readiness measures and future literacy performance. Measures that were found to be predictive include:

- Auditory Discrimination – distinguishing between the same and similar sounding words
- Memory for Sentences – recalling a sentence that was just read or simple story comprehension skills
- Visual Discrimination – identifying the picture or pattern that "does not belong"
- Verbal Associations – identifying simple associations/analogies
- Attention Skills – the ability to concentrate and students' measured motivation for learning
- Play Interaction – a teacher-scored measure of play disruption and play disconnection

These measures are more distanced from skills required to read, but they are also clearly and intuitively associated with a student's ability to understand language. They may be less useful, however, in that they could be correlated with future reading ability yet not causal. Stated differently, unlike text decoding or other CBMs, increasing student performance on these metrics may have no impact on future reading performance.

Pathway and Dosage Measures

Variables within this category relate to the educational pathway and dosage received by students. The predictive power of prekindergarten enrollment has been vigorously debated within the literature, with numerous – but less rigorous studies – finding a strong association between prekindergarten and future literacy skills (Duncan and Magnuson, 2011). A recent, large-scale randomized control trial from Tennessee, however, actually finds a small, negative correlation between prekindergarten enrollment and second grade literacy achievement (Lipsey et al, 2015). Similarly, a recent RAND report investigated the predictive power of half-day versus full-day kindergarten (Le et al, 2006) and finds that full-day kindergarten enrollment is slightly negatively correlated with future literacy performance. These ground-shaking findings from both Lipsey and RAND have held up with several waves of cohorts, and has led to reformers shifting to a conversation of what "high-quality preparation" looks like. It may be that just prekindergarten enrollment is insufficient, and instead a prekindergarten program must provide a high-quality teacher and academically appropriate curriculum.

Another intriguing, recent study from Florida investigated a different pathway measure. Dhuey and her co-authors (2017) used a rigorous regression discontinuity design on a statewide sample of students to investigate the impact of being young versus old within one's class. The study notably controlled for family factors by only comparing siblings that had birthdays in August and September. Comparing students separated only by the externally imposed kindergarten threshold of September 1st allows for differences to be ascribed to varying, relative ages of students. The researchers consistently found that being young within your age was associated with lower academic performance throughout a student's educational journey.

Investigations into the predictive power of academic dosage as measured by attendance is more clear-cut, particularly from several studies from Gottfried (2010) who found positive relationships between student attendance and future literacy performance. This relationship may represent merely a proxy for socio-economic factors, however, as evidenced by the fact that student attendance seems have predictive ability but attending a half-day or full-day kindergarten program does not. The varying findings of the predictive power of pathway measures and the costs associated with intervening in the home environment makes these perhaps the least promising for providing guidance to practitioners.

Socio-Economic Measures

A student's home environment applies very large influences on his or her likelihood to attain third grade reading proficiency. The following factors have all been found to have a significant impact on children's' educational attainment:

- Having a teenage, unmarried mother (Romero and Lee, 2008)
- Adult composition of the home (Lu, 2000; Cancian and Reed, 2001)
- Student mobility (Ellwood and Jencks, 2004)
- The home literacy environment, including parental reading practices and the number of books in the home (Bergen et al, 2016)

Summarizing the literature is challenged by the lack of studies that rigorously unpack the relative impact of each measure. For example, to what extent does household income have a larger impact than the mother's educational level? The literature does not currently coalesce around a single metric for a child's home readiness.

The Quest for Coherence

Recall that the goal of this work is finding predictive measures that can assist in identifying students that are likely to struggle to reach third grade proficiency. A number of studies have gone beyond investigating the predictive power of individual measures to unpack the relationship between predictive measures themselves. A meta-analysis by Duncan (2007) investigates the relationship between academic, attention, and socioeconomic skills and, after controlling for varying baseline academic and background characteristics, find that early reading skills have the most predictive power of future literacy. The level of students' attention skills has the next most predictive power, with socioeconomic behaviors – such as communication and social skills –generally insignificant predictors of future literacy skills.

As with all potential measures, considering the power of predictive measures also requires a consideration of pragmatic issues around collection burdens and timelines. Many pathway measures are already centrally collected within public school system student management systems, and CBM is also commonly used in early grades. Perhaps the second category – General Readiness Measures – contains the least frequently systemically collected variables. The final category – Socio-economic Measures – is one that school systems can least easily manipulate. Regardless, there are numerous, routinely collected and available measures that can assist school districts as they consider ways to help identify elementary students less likely to gain literacy proficiency. Moving forward, this literature review will serve as the foundation of a study investigating the availability and value of predictive measures within Grand Rapids Public Schools.

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