The Lexile® Framework and myON™ reader

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Introduction

This paper provides an introduction to The Lexile® Framework for Reading and describes how the results from myON™ reader, developed by Capstone Digital, can be used to support the Common Core State Standards (CCSS) Initiative. This material should be helpful to educators using myON reader in the classroom, educators working to implement the CCSS, and for any individuals with an interest in improving education.

Developed for Pre Kindergarten to Grade 12 students, myON reader is a personalized reading environment that provides 24-hour online access to enhanced digital books. Students are matched to books based on their interests and reading level. These recommended books personalize learning for each student.

myON reader is correlated to state and common core standards and includes over 4,500 enhanced digital books in a growing collection. Educators can use myON reader to integrate with existing teaching tools for lesson planning, instruction, assessment and reporting. Reports can be generated on a student's historic and current reading levels while forecasting future growth. The collection of books in myON includes quality titles equipped with reading scaffolds (like an embedded dictionary, recorded audio, and highlighting). It includes student-, teacher-, building-, and district-level reporting. The book collection includes seventy percent non-fiction titles to grow informational reading skills (critical to the CCSS), as well as thirty percent fiction titles.

"Students are targeted with reading materials at an appropriate level that provides challenge, but not frustration."

This integrated reading solution can adapt to each student's profile to increase reading growth and motivate students to read. An online assessment system which utilizes The Lexile Framework for Reading is employed to ensure that students are targeted with reading materials at an appropriate level that provide challenge, but not frustration. In addition to personalizing learning, myON reader also forecasts future reading growth for students.

myON reader consists of several components to help guide and motivate student reading: a wide selection of online books, book comprehension quizzes to monitor basic comprehension, and benchmark assessments to target reading selections and monitor reading improvement. When students log-in to myON reader they are presented with an interest survey to help guide their book selections. They also are administered a placement test to determine their reading ability. Based on the results of the interest survey and the placement test, students can select from a wide array of high-interest reading material from the myON collection. The computer-adaptive system allows students to access those reading selections that are within their individual targeted reading range to ensure that students have a successful reading experience that encourages reading growth.

After reading an online book, students are given the option to take a book quiz to evaluate understanding of the specific content of the book. In addition, students are administered periodic Lexile® benchmark tests. While reading the benchmark passage, students are presented embedded completion statements (similar to fill-in-the-blank items and cloze items) which they complete by clicking on the best response from four choices. Once the passage is completed, the scoring process is triggered, and the student's updated Lexile measure is computed. Using this structure, myON reader continually generates updated Lexile measures and students are always presented with reading materials at an appropriate level of complexity (difficulty).

The Lexile Framework for Reading and Lexile measures

The Lexile Framework for Reading is a psychometric system for matching readers with texts of appropriate difficulty. With the Lexile Framework, both the reader and the text can be placed on the same measurement scale. A Lexile measure is the numeric representation of an individual's reading ability or a text's complexity (or difficulty), followed by an "L" (for Lexile). The Lexile scale is a developmental scale for reading that ranges from below 0L for emerging readers and beginning texts to above 1600L for advanced readers and texts. Values at or below 0L are reported as Beginning Reader (BR).

A Lexile text measure is obtained through analyzing the text complexity of a piece of text. The Lexile Analyzer®, a software program specially designed to evaluate the reading demand of text, analyzes the text's semantic and syntactic characteristics and assigns it a Lexile measure. All books in myON include a certified Lexile measure.

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A Lexile measure for readers is typically obtained by administering a test of reading comprehension to a reader. The myON placement and benchmark tests report directly in the Lexile metric recording a Lexile measure for the reader.

Extensive information about the development of the Lexile Framework can be found in the "Researchers" section of the Lexile website (www.Lexile.com). A white paper (Lennon & Burdick, 2004) entitled The Lexile Framework as an Approach for Reading Measurement and Success (http://www.lexile.com/about-lexile/white-papers/) provides detailed descriptions of each component of the Lexile Framework.

The Lexile Framework for Reading provides teachers and educators with tools to help them link assessment results with subsequent instruction. Assessments, such as the ones in myON reader, which report directly in the Lexile metric, provide tools for matching students with appropriate reading materials and for monitoring the progress of students at any time during the course of instruction.

When a reader takes the myON reader placement test or answers the questions associated with a benchmark test, his or her results are reported

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as a Lexile measure. This means, for example, that a student whose reading ability has been measured at 500L is expected to read with 75-percent comprehension a book that is also measured at 500L. When the reader and text are matched (same Lexile measures), the reader is "targeted." A targeted reader reports confidence, competence, and control over the text. When a text measure is 250L above the reader's measure, comprehension is predicted to drop to 50 percent and the reader experiences frustration and inadequacy. Conversely, when a text measure is 250L below the reader's measure, comprehension is predicted to go up to 90% and the reader experiences control and fluency. The Lexile Range, the suggested range on the Lexile scale at which the reader should be reading, is from 50L above his or her Lexile measure (71-percent expected comprehension rate) to 100L below (82-percent expected comprehension rate). When reading a book within his or her Lexile range, the reader should comprehend enough of the text to make sense of it, while still being challenged enough to maintain interest and learning.

Lexile Measures and Grade Equivalents

A frequently asked question by parents and educators is "My student is in Grade 5 – what Lexile level should they be reading at?". No company or organization can provide this type of Grade Equivalency, since no reading test studies include the same students within the samples. Instead, each grade-equivalent study only reflects the unique students within that study, so results cannot be assumed to be equivalent.

Because of this limiting factor, each state or testing agency has created their own scale of reading ability expectations (which could be by grade, age, or other demographic consideration). In the myON Lexile Growth Trajectory report, the state grade reading expectations can be included as an educator guideline to help determine which students need to improve reading abilities before the state reading test.

Much has been written about the problems with grade equivalents and the common misconceptions about their use (e.g., AERA/APA/NCME, 1999; Airasian, 1994; Miller, Linn, & Gronlund, 2009; Stiggins, 1997). In 1991, The International Reading Association (IRA) crafted a resolution about the misuse of grade equivalents and stated that it "...strongly advocates that those who administer standardized reading tests abandon the practice of using grade equivalents to report performance of either individuals or groups of test takers..." (IRA).

Text Complexity and the Common Core

The Common Core State Standards for English Language Arts focus on the importance of text complexity. As stated in Standard 10, students must be able to "read and comprehend complex literary and informational texts independently and proficiently" (Common Core State Standards for English Language Arts, College and Career Readiness Anchor Standards for Reading, NGA Center and CCSSO, 2010a, p.10). CCSS notes the following reasons for incorporating these more rigorous standards:

"Text complexity is a transaction between text, reader, and task."

"The Lexile measure directly reflects the Common Core transactional definition of text complexity."

- The text complexity of K-12 textbooks has become increasingly easier over the last 50 years.
- The text demands of college and careers have remained consistent or increased over the same time period.
- As a result, there is a significant gap between students' reading abilities and the text demands of their postsecondary pursuits. The Common Core states, "Being able to read complex text independently and proficiently is essential for high achievement in college and the workplace and important in numerous life tasks" (Common Core State Standards for English Language Arts, Appendix A, NGA Center and CCSSO, 2010, p. 4).

The Common Core State Standards recommends a three-part model for evaluating the complexity of a text that takes into account its qualitative dimensions, quantitative measure, and reader and task considerations. It describes text complexity as "the inherent difficulty of reading and comprehending a text combined with consideration of reader and task variables…a three-part assessment of text [complexity] that pairs qualitative and quantitative measures with reader-task considerations" (NGA Center and CCSSO, 2010a, p. 43). In simpler terms, text complexity is a transaction between text, reader, and task. When examining a text, this three-part model is evidenced by (1) aspects of text best measured by attentive human readers; (2) aspects of text such as word length/frequency, sentence length, cohesion best measured by computer algorithms; and (3) variables such as the reader's cognitive capabilities, motivation, reading purpose, and the knowledge and experiences unique to each reader. In the classroom, all three aspects of text complexity must be considered because different readers bring unique abilities and dispositions to the endeavor. Consistent with the Common Core definition of text complexity as the transaction between reader, text, and task, the underlying mathematical equation used to generate a Lexile measure is based on the relationship between an examinee's actual reading comprehension level (for a given task) and the features of a specific text. In short, the Lexile measure directly reflects the Common Core transactional definition of text complexity.

In a study comparing various measures of text complexity (Nelson, Perfetti, Liben, & Liben, 2011), Lexile text measures were compared to various judgments of text difficulty (e.g., texts mapped to the grade bands in Table 1) and various estimates of student performance. The report concluded that "all of the metrics were reliably, and often highly, correlated with grade level and student performance-based measures of text difficulty across a variety of reference measures" (p. 46). Lexile measures were moderately correlated with texts selected for inclusion in Appendix B of the Common Core State Standards for English Language Arts whose complexity estimate was based on educator judgment; and highly correlated with texts whose complexity estimate was based on empirical data from actual student performances with the texts.

The quantitative aspect of defining text complexity consists of a stair-step progression of increasingly difficult text by grade levels (see Table 1)

(Common Core State Standards for English Language Arts, Appendix A, NGA Center and CCSSO, 2010b, p. 8).

Table 1. Text Complexity Grade Bands and Associated Lexile Ranges	**Text Complexity Grade Bands**		**Lexile Ranges Aligned to College and Career Readiness Expectations**
	K–1	N/A*	
	2–3	420L–820L	
	4–5	740L–1010L	
	6–8	925L–1185L	
	9–10	1110L–1335L	
	11–CCR**	1185L–1385L	

* Not Available at this time.
** CCR = College and Career Ready

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MetaMetrics' research on the typical reading demands of college and careers contributed to the Common Core State Standards as a whole and, more specifically, to the Lexile-based grade bands. The following section describes the three-step process undertaken by MetaMetrics to define the grade band ranges in Table 1 above.

In the Journal of Advanced Academics (Summer 2008), Williamson investigated the gap between high school textbooks and various reading materials across several postsecondary domains. The resources Williamson used were organized into four domains that correspond to the three major postsecondary endeavors that students can choose—further education, the workplace, or the military—and, the broad area of citizenship, which cuts across all postsecondary endeavors. Williamson discovered a substantial increase in reading expectations and text complexity from high school to these various postsecondary domains— a gap large enough to help account for high remediation rates and disheartening graduation statistics (Smith, 2011).

Expanding on Williamson's work, MetaMetrics aggregated the readability information across the various postsecondary options available to a high school graduate to arrive at a standard of reading needed by individuals to be considered "college and career ready" (Stenner, Sanford-Moore, and Williamson, 2012). In the study, additional citizenship materials were included beyond those examined by Williamson (e.g., national and international newspapers and other adult reading materials such as Wikipedia articles). Using a weighted mean of the medians for each of the postsecondary options (education, military, work place, and citizenship), a measure of 1300L was defined as the general (median) reading demand for postsecondary options and could be used to judge a student's "college and career readiness."

In Texas, two studies were conducted to examine the reading demands in various postsecondary options – technical college, community college, and 4-year university programs. In terms of mean text demand, the results across these two studies and two other state postsecondary text demand studies produced similar estimates of the reading ability needed in higher-education institutions: Texas, 1230L; Georgia, 1220L; and Tennessee, 1260L. When these results are incorporated with the reading demands of other postsecondary endeavors (military, citizenship, workplace, and adult reading materials [national and international newspapers], and Wikipedia articles), the college

and career readiness standard for reading is 1293L (Stenner, Sanford-Moore, and Williamson, 2012).

In 2008, MetaMetrics conducted research to describe the typical reading demands and develop a text continuum of reading materials across Grades 1-12 (Williamson, Koons, Sandvik, and Sanford-Moore, 2012). For the Grade 1 through Grade 12 text demand, commonly adopted textbooks were measured to determine their difficulty (Lexile measure). A total of 487 textbooks in Grades 1 through 12 were included in the final sample. This 2008 "current" continuum (see the blue curve in Figure 1 below) can be envisioned as the "middle" or typical textbook difficulty in each grade. The curve indicates that actual text complexity increases most rapidly during the early years of schooling (Grades 1-5) and less rapidly over the remaining grades, culminating at approximately 1170L at the end of high school.

This continuum can be "stretched" to describe the reading demands expected of students in Grades 1-12 who are "on track" for college and career (Sanford-Moore and Williamson, 2012). To create the "stretch" continuum, the additional reading demand between the 2008 Grade 12 estimate of 1170L and the college and career readiness standard of 1300L was allocated across grades in the same relative proportions as it is in the current text continuum (see the pink curve in Figure 1 below). It begins at the same point as the current median text demand in Grade 1 and increases to reach 1300L at Grade 12. These two curves give a vision of what the text continuum "ought to be" to align more effectively with postsecondary demands.

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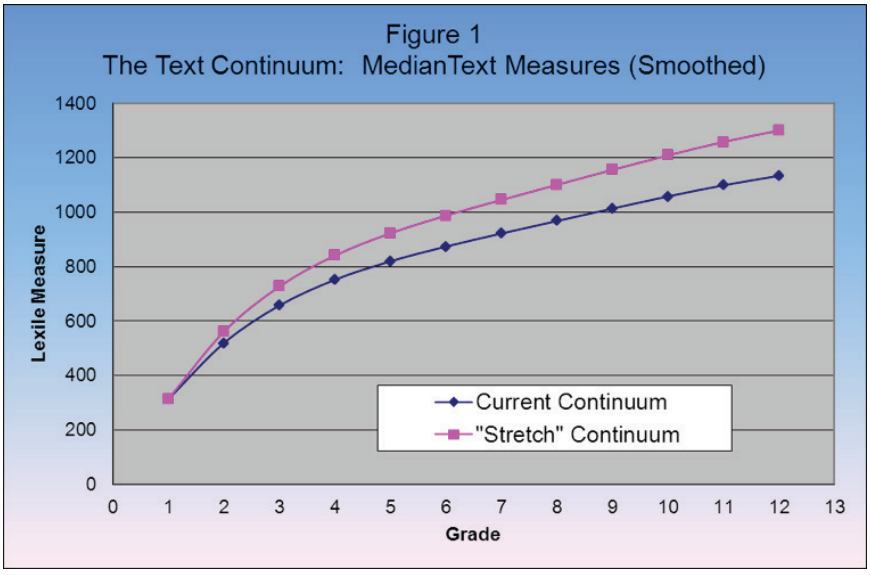
Figure 1
The Text Continuum: MedianText Measures (Smoothed)



Using myON reader Measures

Teachers, parents, and students can use the tools within myON reader provided by the Lexile Framework to plan instruction. myON reader automatically creates a student-specific list of recommended titles that match the students' Lexile measures and reported interests.

To encourage optimal progress with the use of any reading materials, teachers

"myON reader reports help teachers quickly identify students that are reading outside their Lexile range."

"Targeting reading levels promotes growth and literacy by providing the optimal balance."

need to be aware of the complexity level of the text relative to a student's reading level. A text that is too difficult may serve to undermine a student's confidence and diminish learning. Frequent use of text that is too easy may foster poor work habits and unrealistic expectations that will undermine the later success of even the best students. myON reader reports help teachers quickly identify students that are reading outside their Lexile range.

When students confront new kinds of texts, the introduction can be softened and made less intimidating by guiding the student to easier reading. On the other hand, students who are comfortable with a particular genre or format can be challenged with more difficult reading levels, which will prevent boredom and promote the greatest rate of development of vocabulary and comprehension skills.

To become better readers, students need to be challenged continually—they need to be exposed to less frequent and more difficult vocabulary in meaningful contexts. A 75% comprehension level provides an appropriate level of challenge, but is not too challenging. If text is too difficult for a reader, the result is frustration and potentially a growing dislike for reading. If text is too easy, the result is often boredom. Targeting reading levels promotes growth and literacy by providing the optimal balance.

myON reader results can be examined at both the student level and aggregate levels (e.g., classes, grades, schools). At the individual student level, results can be used to monitor growth and forecast performance on state end-of-year assessments. Questions such as "how will a particular student likely comprehend the materials in tomorrow's lesson?" and "is student reading ability increasing across the school year?" can be answered with the results. At the aggregate level, educators can look to compare performance and growth for various groups. Figure 2 shows how a building administrator can compare student growth across two grades. Questions such as "are students growing at the same rate in both grades?" or "generally, will students have enough time to get to the 'proficient' level before the end-of-year assessment?" can be answered with this level of reporting. Typically, we expect students in middle school to grow at a slower rate than students in elementary school. If we see that the middle school students are growing at a similar rate compared to the elementary school students, then we know that students' reading abilities are really growing (and changes cannot be attributable to measurement error).

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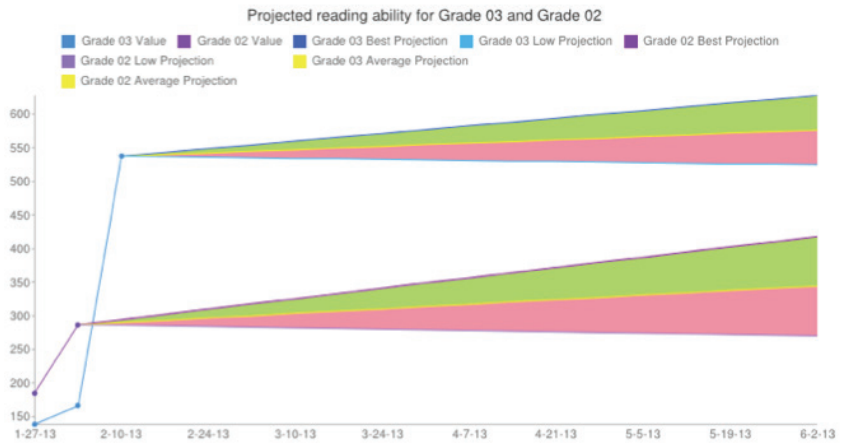

Figure 2. Sample myON reader Lexile growth report, across grades.

In addition to the Lexile measure for matching students with text, interests play an important role. Research suggests that individual interests and the ability to choose based on these interests influence motivation. Research also suggests that students are more motivated readers when they self-select texts of interest (Guthrie & Humenick, 2004; Schiefele, 1991; Wigfield and Guthrie, 1997). And, consequently, as students become more motivated to read they read more (Schiefele, 1991; Wigfield and Guthrie, 1997).

Studies investigating summer reading loss have shown that when students are provided with books at their reading level and interest areas, their gains in reading were comparable to gains one would expect in summer school (Kim, 2006). Since motivation is key to voluntary reading, two critical features of book selection are interest and reading level, and both were addressed in Kim's study. Kim demonstrated in a randomized field study that low-income students are not destined to summer loss; but rather, showed that low-income students' skills could, in fact, grow over the summer if they were able to select books at their interest level and reading level similar to how students select books within myON reader. Kim also used The Lexile Framework for Reading to match students with books at an appropriate complexity (difficulty) level.

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Bayesian Scoring within myON reader

We have all heard the adage that "the best predictor of future behavior is past behavior." This notion is incorporated into myON reader by combining the results of the various assessments using a Bayesian statistical model. Bayesian methodology provides a paradigm for combining prior information with current data, both of which are subject to uncertainty, and for arriving at an estimate of current status, which is again subject to uncertainty. Uncertainty is modeled mathematically using probability.

For myON reader, when a student is administered the placement test, the prior information comes from knowing the student's grade level. When a student

is administered a benchmark test, the prior information comes from the placement test and previous benchmark tests. The current data in this context is the performance on the current test (i.e., placement test or benchmark test), which can be summarized as the number of items answered correctly out of the total number of items on the test.

However, if a substantial amount of time has passed since the last assessment, then allowance is made for an uncertain amount of growth in reading ability since the last assessment. This allowance is accomplished by means of a growth model, which estimates as a function of elapsed time both student growth and the augmentation in uncertainty. MetaMetrics, developers of the Bayesian scoring program used within myON reader, developed a growth-rate model based on an analysis of a longitudinal dataset that examined growth in reading and mathematics across grades 1 through 12 for approximately 100,000 students (the population was racially/ethnically diverse with about 16% of the students enrolled in special education programs, about 5% of the students enrolled in gifted education programs, and about 5% of the students enrolled in limited-English proficiency programs). The purpose of the study was to describe the functional form of growth across the grades during the school year. It was found that younger students grow at a faster rate than older, experienced students. Modeling the growth rate as a decreasing function of current ability incorporated this difference.

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The result of the Bayesian methodology within myON reader is that the student's "true" reading ability is reported after each assessment rather than how the student performed on the specific assessment on the particular day.

Managing Multiple Measures

Just as myON reader uses the Lexile scale to report results, so do many other assessments. Across these various assessments the meaning of a specific Lexile measure remains the same because the scale is anchored by a theory of text complexity. This characteristic is called "invariance." A Lexile measure of 690L has the same meaning in terms of the text it contains and in terms of the reader who will likely be able to read the text with 75-percent comprehension. When looking at two Lexile measures for the same student from two different assessments, it's not that either measure is "right" or "wrong", but rather that we have two estimates of a student's "true" reading ability. If the length of time between the administrations of the tests is less than 30 days, then the student's "true" reading ability is a composite of the two estimates (e.g., average weighted by the reliabilities of the two assessments).

However, linking to the Lexile scale does not overcome biasing factors associated with the design or use of assessments that have been linked, or biases associated with the contexts of assessment administrations (Williamson, 2006). When comparing scores from two different assessments, it is important to first understand the assessments (MetaMetrics, 2012). First, the purposes of the two tests need to be understood (e.g., summative, progress-monitoring, high-stakes, low-stakes), how they were designed (e.g., computer adaptive, fixed-form, wide or narrow difficulty range), and what

type of reader the tests were designed to measure (e.g., struggling reader, advanced reader, all readers in general). Knowing these details about the tests will help in understanding why student scores may be different from one test to the next. For example, students may perform differently on a high-stakes test (e.g., state end-of-grade test) when compared with results from a low-stakes, progress-monitoring test due to motivational factors. In addition, the two tests being compared may have different psychometric properties (e.g., different reliabilities) which may also affect how similar the test results are likely to be. All of these factors can result in the same student receiving different Lexile measures from different tests. Indeed, it is highly unlikely for a student to receive identical measures (Lexile measure or otherwise) from taking two equivalent forms of the same test given the normal measurement error of a test and a student.

MetaMetrics has an application on their website (http://www.lexile.com/managing-multiple-measures/) that can be used to quantify a student's "true" reading ability based on multiple estimates of his or her reading ability.

Forecasting Student Performance with Lexile measures

There are two basic ideas underlying forecasting: first, that the experiences of the past can be used to predict the future; and second, that any such predictions include some level of uncertainty that increases the further in the future that the predicted event will occur.

A well-known type of forecasting is predicting where a hurricane will make landfall. A typical "tracking" map will depict the path that the hurricane has taken to its current position, and then a cone emanates from that position that grows wider and wider as the hurricane's future positions are predicted, typically in twelve-hour increments. The same issues that challenge the prediction of hurricane movement are also in effect when it comes to predicting a student's future performance on a test. In Figure 3, the Xs indicate a student's performance on an interim assessment instrument administered in October, December, and January. The solid line running between the Xs captures the approximate student's growth through January with the slope of the line representing the rate of growth.

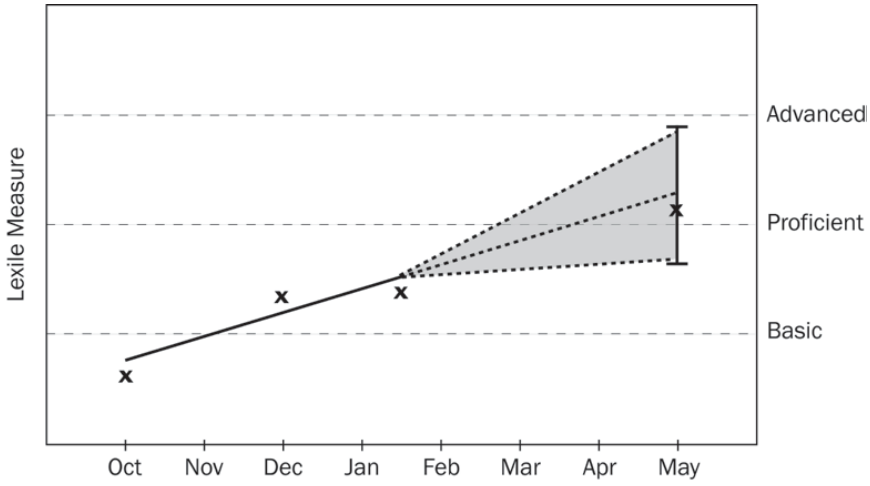

Figure 3. Sample student "tracking" map showing current test results and predicted test result.

"Reading targeted (at the student's level and interest) has been shown to lead to increased reading comprehension."

This growth rate line can be extended out to when the student will be taking an end-of-year test in May that may be used to determine if the student is promoted or retained (the dotted portion of the growth line). The promotion decision rests on whether the student achieves a score that falls above the "Proficient" performance standard. Other standards that the state may have established, in this example "Basic" and "Advanced", are also represented on the graph. The prediction is that if this student maintains his current growth rate, he will score above the "Proficient" level and will be promoted. However, since the end-of-year test will not be administered for another three months, there is a wide range of uncertainty about what his actual score may be at that time. Factors causing this uncertainty include the reliability and validity of the test score as a measure of student ability, the impact of the curriculum and the effectiveness of the instruction, and factors such as whether or not the student is feeling well when the test is administered. In this example, the student's actual score on the end-of-year test is below the prediction, but still sufficient for him to be promoted.

Conclusion

Reading targeted (at the student's level and interest) has been shown to lead to increased reading comprehension (Schiefele, 1991; Guthrie & Humenick, 2004; Jalongo, 2007; Kirsch, de Jong, LaFontaine, McQueen, Mendelovits & Monseur 2002). Smith (2009) states that research results suggest that deliberate practice consisting of the following components is essential to moving from novice to expert in a wide array of fields (Glaser, 1996; Kellogg, 2006; Shea & Paull, 1996; Wagner & Stanovich, 1996):

(1) targeted practice in which each person is engaged in developmentally appropriate activities;
(2) real-time corrective feedback that is based on each person's performance;

"With myON reader, students can engage in deliberate practice and be on a trajectory of reading development that will lead to being ready for college and career endeavors."

(3) intensive practice on a daily basis that provides results that monitor current ability;
(4) distributed practice that provides appropriate activities over a long period of time (i.e., 5–15 years); and
(5) self-directed practice in an activity for times when a coach, mentor or teacher is not available.

In addition to these five components, progress measured on an objective developmental scale can be used to monitor development. A developmental (or vertical) scale allows educators to monitor growth from novice to expert by using a scale that illustrates increasing sophistication with increasingly complex activities or tasks.

myON reader has been developed using these principals to help students "become experts" in reading and at the same time selecting materials that match their interests. With myON reader, students can engage in deliberate practice and be on a trajectory of reading development that will lead to being ready for college and career endeavors. The information in Figure 1 and the resulting ranges for grade bands (see Table 1) are used by myON reader to suggest reading materials for students that are challenging, but not too difficult. By reading materials at the upper end of his or her Lexile range, a student will be challenged while reading and grow in terms of reading ability. The student can then be matched with more demanding materials. This process can continue to spiral up to more and more demanding materials as the student's reading ability increases equaling future success in reading and CCSS support for educators and schools.

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