DIBELS Pathways of Progress: Setting Ambitious, Meaningful, and Attainable Goals in Grade Level Material

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Introduction
Currently, educators have a variety of means to set academic goals. The three most typical ways to set goals are by using: (1) data from previous research on the amount of progress expected for students in various grades (i.e., number of words correct gain per week); (2) data on local or national percentiles; or (3) data from empirically-based benchmarks. All of these methods offer valuable guidance for setting goals, in particular in the context of monitoring the progress of students receiving additional instructional support. However, a concern with each of these methods is that they don’t take into account different measurement materials used, different times of year, and different levels of student’s initial skills.

In this poster, we present student progress percentiles as a proposed method to assist and inform educators in setting meaningful, ambitious, and attainable goals. We will illustrate the development and use of student progress percentiles using third grade as an exemplar. The student progress percentiles are based on a normative sample of 8,900 third-grade students in 56 districts and 150 schools.

DIBELS® Pathways of Progress™ are based on student progress percentiles. They are designed to be used with DIBELS Next® to assist educators in: (a) setting an ambitious, meaningful, attainable goal and an aim line for individual, grade-level progress monitoring; and (b) evaluating rates of progress for individual students. Pathways of Progress are based on student rates of reading progress relative to other students with similar initial skills. This information provides a normative reference for professionals to consider when establishing a goal and aim line for an individual student. Pathways of Progress are intended to be one of several frames of reference that should be considered when establishing a goal.

Considerations in Making Progress and Establishing Individual Student Goals

<table>
<thead>
<tr>
<th>Considerations for the Rates of Progress for Establishing Individual Student Goals</th>
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<tbody>
<tr>
<td>Rate of progress necessary to</td>
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<tr>
<td>• Achieve important benchmark goals.</td>
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<tr>
<td>• Increase odds of achieving subsequent goals.</td>
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<tr>
<td>• Narrow the achievement gap with students making adequate progress.</td>
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<tr>
<td>Rate of progress that is</td>
</tr>
<tr>
<td>• Possible with a very effective, research-based intervention.</td>
</tr>
<tr>
<td>• Typical or expected relative to other students with similar initial skills.</td>
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<table>
<thead>
<tr>
<th>Statistical Considerations</th>
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<tbody>
<tr>
<td>Nonlinearity of the relationship between the composite score and the outcome measure.</td>
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<tr>
<td>Homoscedasticity between groups of students separated by their beginning-of-year scores.</td>
</tr>
<tr>
<td>Change in variance from the lower-end to the upper-end of the scoring range of the composite score.</td>
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</table>
Goal Setting Logic and Methodology
By observing a student's current skills and later benchmark goals, we are able to set meaningful goals for the student that will either achieve or increase the odds of achieving subsequent goals.

Pathways of Progress emphasizes the end point of the pathway and provides a normative framework for comparison in setting goals and evaluating individual student progress. Student progress is evaluated relative to the student's peers, that is, growth is compared to students with similar initial skills at the same grade level on the same material. Progress that is typical or above typical is considered attainable progress. Progress that is above typical or well-above typical can be considered ambitious progress.

Statistical Considerations and Analysis
First, we created a prediction expression that modeled student outcomes across the school year given the student's beginning-of-year skills. Second, we modeled the variability of actual outcomes around the predicted outcome for each level of initial skills. Third, we divided the actual outcomes relative to predicted outcomes into five categories that we labeled well-below typical progress to well-above typical progress.

With one prediction expression, we created four outcome levels, and each outcome level represents the end-point of a pathway of progress border (well-below to well-above typical progress). The expression follows this format:

\[
\text{Prediction Equation} + \text{Z-Score} \times \text{Variance Component}
\]

<table>
<thead>
<tr>
<th>Prediction Equation</th>
<th>The prediction of the mean based on a model predicting the EOY individual DIBELS measure from the BOY Composite Score.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z-Score</td>
<td>The 20th, 40th, 60th, or 80th quantile from the standard normal distribution. These quantiles represent the borders for the pathways.</td>
</tr>
<tr>
<td>Variance Component</td>
<td>The prediction for the variance based on a separate model predicting the standard deviation from the mean BOY composite score. In cases where the assumption of homoscedasticity is not violated, we used the Root Mean Squared Error (RMSE) as the Variance Component.</td>
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</tbody>
</table>

Within the borders, we define the rates of progress as follows:

<table>
<thead>
<tr>
<th>Quantile Range</th>
<th>Definition of Rate of Progress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above 79%</td>
<td>Well Above Typical Progress</td>
</tr>
<tr>
<td>60%–79%</td>
<td>Above Typical Progress</td>
</tr>
<tr>
<td>40%–59%</td>
<td>Typical Progress</td>
</tr>
<tr>
<td>20%–39%</td>
<td>Below Typical Progress</td>
</tr>
<tr>
<td>Below 20%</td>
<td>Well-Below Typical Progress</td>
</tr>
</tbody>
</table>

Models were fit individually for each grade and time of year. Model fit was evaluated in myriad ways: residual plots, fit statistics, and variability charts. Care was taken not to over-fit to the sample, i.e., the predictability of the model is not localized to this sample. Whenever possible, the simpler model was chosen.
An Illustrated Example

To illustrate the concept of Pathways of Progress, we present an example from third grade (N ≈ 8,900) focusing on the DIBELS Next Composite Score (DCS) and examining DIBELS Next Oral Reading Fluency Words Correct (DORF Words Correct). Data on approximately 166,000 students in kindergarten through sixth grade from 502 schools within 164 school districts from across the United States was exported from users who entered their data into Dynamic Measurement Group’s data system, DIBELSnet®. The sample was approximately 60% white, 23% Hispanic, and 7% Black with a free-reduced lunch rate of 35%. From this larger sample, we selected all third grade students with reported scores for beginning- and end-of-year composite score. Our third-grade sample size was approximately 8,900.

![Figure 1. Pathways of Progress for third-grade end-of-year DIBELS Composite Score.](image)

Figure 1. Pathways of Progress for third-grade end-of-year DIBELS Composite Score.

![Figure 2. Model for the residual variance of the prediction](image)

Figure 2. Model for the residual variance of the prediction.

In third grade, the best fit for the end-of-year DCS was a cubic regression with a quadratic variance component (see Figure 1). The residual variance of the prediction indicated heteroscedasticity, i.e., the variance was not stable across groups (see Figure 2). Instead of using the RMSE of the prediction to define our borders, we used the model for the variance. In Figure 1, Pathways of Progress end-of-year DCS outcomes are illustrated for a beginning-of-year composite score of 75.
For third-grade DORF Words Correct, analysis of the data suggested that a model for the entire score range would be a poor fit at the lower-end of the scoring range. After a thorough investigation of multiple ways to model the data, the best fit proved to be a piece-wise regression with a linear variance component (see Figure 3).

For the first piece, we fit a simple linear regression predicting to the raw scores of end-of-year DORF Words Correct. For the second piece, we fit a stiff spline regression to the quantiles of end-of-year DORF Words Correct (see Figure 4). Overlaying the two regressions on top of the data revealed a natural cut-point for the piece-wise fit, which was approximately 40. Thus, for BOY DCS scores greater than 40, the simple linear regression modeled the data well. For scores less than 40, the stiff spline regression modeled the quantiles well. While we feel that this fit is the best solution, the prediction is less precise at the extreme lower-end of the DCS scoring range. In addition, for instructional purposes when DCS scores are below 40 we recommend DIBELS Next Survey to consider out-of-grade-level progress monitoring, and DIBELS Deep to identify areas of instructional need.

The residual variance of the prediction indicated increasing variance across groups. Again, instead of using the RMSE of the prediction to define our borders, we modeled the variance with a simple linear regression (see Figure 5). In Figure 3, Pathways of Progress end-of-year DORF outcomes are illustrated for a beginning-of-year composite score of 75.

Similar analyses were conducted at all grade levels and for all DIBELS Next component measures.
Case Studies

Along with DIBELS Next Benchmark Goals, Pathways of Progress is a powerful tool to enable teachers and administrators to set short and long-term goals for their students. The recommended goals for each case study shown were designed to be:

- **Meaningful:** At or above benchmark or reduce risk
- **Attainable:** Typical or above typical progress is attainable
- **Ambitious:** Based on BOY skills, progress is appropriately ambitious.

DIBELS Next measures, on which Pathways of Progress are based, are powerful, reliable, and valid indicators of student’s reading proficiency. They are also brief and efficient. **The goal is always to make good decisions.** The end-of-year goals will be a professional judgment informed by the end-of-year benchmark goals and the Pathways of Progress. We present four, unique case studies to illustrate how the Pathways of Progress can be used to set individual goals and to evaluate individual student progress.

Penelope, Strategic Support Case Study

![Figure 6: Penelope’s Beginning-of-year DIBELS scores and end-of-year Pathway of Progress goals.](image)

Penelope began the year below the benchmark on the DIBELS Composite Score, and is likely to need strategic support. Penelope’s fluency score is adequate for her grade level, but she lacks accuracy in decoding.
An appropriate EOY goal for Penelope would be…

Penelope will read grade-level text orally
- at a rate of 105 or more words correct per minute (above-typical progress),
- with at least 97% accuracy (at least typical progress),
- be able to talk about what she has read with at least 45 words relevant to the passage (above-typical progress),
- She will read grade-level text silently, using context for meaning, with a Daze adjusted score of 20 words correct (above typical progress).

Penelope’s Goal is…
- Meaningful: This goal achieves the benchmark and increases the odds of meeting future goals.
- Attainable: Penelope is making typical or above typical progress.
- Ambitious: In areas where Penelope is currently below benchmark, above-typical progress is appropriate.

If Penelope achieves this goal, she will be at or above benchmark on all measures by the end of year, and reading at an adequate rate with a high degree of accuracy for meaning.

Penelope’s DORF Words Correct aimline is relatively flat; she needs to dramatically increase her accuracy while maintaining an adequate rate of reading.
Tabitha, Strategic Support Case Study

Tabitha also began the school year below benchmark on the DIBELS Composite Score, and is likely to need strategic support. An evaluation of her scores reveal that she has a different set of academic concerns than Penelope; her reading accuracy is good, but her fluency and comprehension are below benchmark.

Tabitha’s goal is similar to Penelope’s goal because their initial skills were similar, but Tabitha has different instructional needs, which are reflected in each component skill’s pathway.

**Figure 6a: Tabitha’s Beginning-of-year DIBELS scores and end-of-year Pathway of Progress goals.**

If Tabitha achieves this goal, she will be at or above benchmark on all measures by the end of year, and reading at an adequate rate with a high degree of accuracy for meaning.
Because Tabitha started out below benchmark, her progress needs to be above-typical or greater to reach a score that is above the benchmark goal by the end of the year.
Alistair, Intensive Support Case Study

### Figure 7: Alistair’s Beginning-of-year DIBELS scores and end-of-year Pathway of Progress goals.

Alistair started out the school year below the cut-point for risk on the DIBELS Composite Score, and is likely to need intensive support to reach future benchmark goals.

**Alistair would be an excellent candidate for DIBELS Deep to identify word reading and decoding deficits and DIBELS Next Survey to identify out-of-level progress monitoring level.**

**An appropriate EOY goal for Alistair would be...**

**Alistair’s Goal is...**

- **Meaningful:** The Pathways of Progress inform us that aiming for the benchmark goal is not realistic for Alistair, and that he will need a more intensive and long-term approach. Thus, in order to increases the odds of meeting future goals, Alistair needs to make above typical to well-above typical progress.

- **Attainable:** Alistair is already behind, but by focusing on what is possible, he can catch up by making above- to well-above typical progress.

- **Ambitious:** Above typical progress or greater is appropriate for Alistair given how far below expectations he is currently performing.

If Alistair achieves this goal, he will be on his way to reading at an adequate rate with a high degree of accuracy for meaning. Using Pathways of Progress, we need to maintain above-typical progress to achieve benchmark status by the end of his fourth- or fifth-grade year.

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### Third Grade EOY Goal Setting Utility

<table>
<thead>
<tr>
<th>DIBELS Next Composite and Components</th>
<th>Beginning of Year Initial Skills</th>
<th>Specify End of Year Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIBELS Composite Score</td>
<td>12</td>
<td>109</td>
</tr>
<tr>
<td>DORF Words Correct</td>
<td>12</td>
<td>45</td>
</tr>
<tr>
<td>DORF Accuracy (Percent)</td>
<td>60</td>
<td>70</td>
</tr>
<tr>
<td>DORF Retell</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Daze</td>
<td>0</td>
<td>6</td>
</tr>
</tbody>
</table>

**Component Check:** 109 *

<table>
<thead>
<tr>
<th>Pathways of Progress for EOY Outcomes</th>
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</thead>
<tbody>
<tr>
<td><strong>DIBELS Next Composite and Components</strong></td>
</tr>
<tr>
<td>Well Above Typical Progress</td>
</tr>
<tr>
<td>-----------------------------</td>
</tr>
<tr>
<td>DIBELS Composite Score</td>
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<td>Daze</td>
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</tbody>
</table>

*Component Check: The DIBELS Composite Score goal is the primary goal. Green: DIBELS Next component goals are sufficient to achieve the DIBELS Composite Score goal.
Alistair’s actual progress: Alistair made significant gains throughout the year, making well-above typical progress on DORF a rate of 61 words correct per minute, surpassing his Pathways of Progress end-of-year goal. He also made significant gains in other areas as well; he read with 88% accuracy, and was able to talk about what he read with 23 words relevant to the passage. He ended the year with a composite score of 139—well-above typical progress. Alistair’s teachers are ROCK STARS!
But the support for Alistair won’t end there, as he is still likely to require intensive support in the coming school year to reach his subsequent fourth-grade benchmark goals.

Sebastian, Benchmark Case Study

Sebastian began the school year well above the benchmark goal on the DIBELS Composite Score, and is likely to need core support. An evaluation of his scores revealed that he performed well on nearly every reading skill area.

**An appropriate EOY goal for Sebastian would be...**

- **Sebastian will read grade-level text orally**
  - at a rate of 130 or more words correct per minute (*above-typical progress*),
  - with at least 97% accuracy (at least *typical progress*),
  - be able to talk about what he has read with at least 51 words relevant to the passage (*above-typical progress*),
  - He will read grade-level text silently, using context for meaning, with a Daze adjusted score of 26 words correct.

**Sebastian’s Goal is...**

- **Meaningful**: This goal achieves the end-of-year benchmark goal and maintains Sebastian’s adequate progress.
- **Attainable**: Sebastian is making typical or above typical progress.
- **Ambitious**: Because Sebastian is well above benchmark at beginning-of-year, typical progress or greater is appropriately ambitious.

*By the end of the year, Sebastian will read at an adequate rate with a high degree of accuracy for meaning. While Sebastian only needs to maintain at least typical progress, above typical or well-above typical progress is attainable.*
Caveats And Considerations

Consider the quality of the data.
Students may have a difficult day or otherwise obtain an inaccurate score, and if teachers or administrators believe that DIBELS Next scores are not accurate for any reason, we should always be ready to validate the decision with additional information. The quality of data-based decisions is only as good as the quality of the data.

Consider the fidelity of the assessment.
DIBELS Next should be administered by trained personnel using standardized directions and procedures. Specific forms must not be used for practice or instruction. Practice and instruction should emphasize the skills, the form should be new to the student.
Do The Pathways Matter?

Are the Pathways of Progress meaningful for helping students achieve important end-of-year outcomes?

If students are going to make reasonable gains throughout the year, those gains need to be related to important differences in outcomes. One important outcome for third grade instruction is the initial skills with which students enter fourth grade. As illustrated in Figure 9, beginning of third grade skills are an important predictor of beginning of fourth grade skills, explaining 67% of the variance. Student's Pathway of Progress in third grade contributes significant additional variance explained (6%).

For example, from Figure 9, students who are below benchmark and making at least typical progress or better are performing better at the beginning of fourth grade than students who are barely at or above benchmark (220-283) and making below to well-below typical progress.

Summary

The Pathways of Progress analysis is an innovative approach to setting individual instructional goals and evaluating individual student progress. Using the DIBLES Next Benchmark Goals and Pathways of Progress, educators are empowered to set goals that are meaningful, ambitious, and attainable for students at every level of initial skill. Pathways of Progress provides a normative context for evaluating progress compared to other students with similar initial skills. Pathways of Progress, when combined with the DIBLES Next benchmark goals and the DIBLES Next Composite Score, provides educators with important tools for examining where their students are, specifying where they need to get to, and evaluating whether they are making adequate progress.

References


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