Graphing Student Academic Data for Universal Screening and Progress Monitoring

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As educators incorporate response to intervention (RTI) approaches to address students at risk for academic difficulty, measuring and charting student progress have become critical activities. Graphing student progress data is essential to evaluating students' response to classroom instruction in order to identify instructional priorities and to identify students in need of additional intervention. This handout provides school psychologists, special educators, classroom teachers, and preservice personnel with a resource to assist with graphing academic data in the evolving RTI climate and era of accountability in education.

Given that school-based professionals may not have access to commercially available graphing software, this handout includes recommendations for free resources to assist with graphing as well as directions for creating graphs, trend lines, and slopes with Microsoft Excel, using a PC. (See note at the end of this handout for Mac users.) It also presents templates for illustrating universal screening data and reviews additional resources.

PURPOSE OF GRAPHING STUDENT DATA

RTI approaches to service provision rely on the use of direct assessments of students' academic skills in order to assess all students' response to instruction and to identify students at risk for failure. Graphs are typically used to display this information, allowing educators to make data-based decisions regarding the needs of entire classrooms or grade levels and to quickly identify those students in need of supplemental services. Once at-risk students are identified and provided with supplemental instruction, their progress on periodic assessments is graphed across time (progress monitoring).

The progress monitoring graph generally displays two key elements: (a) the student's performance during a given week, which can then be compared to the performance of peers, and (b) the student's rate of progress (e.g., weekly increases in academic scores). On the graph, each data point represents the student's score on a brief academic fluency assessment. In addition, a trend line (the visual representation of progress) and slope of progress (a numeric value indicating the weekly rate of growth) are typically included to evaluate the student's rate of response to the implemented intervention. In an RTI framework, graphing student progress data and creating a trend line/slope are keys to evaluating student response to intervention, revising specific goals, and deciding when to implement an instructional change or refer to a more intense level of service.

GRAPHING UNIVERSAL SCREENING DATA

The purpose of universal screening (Tier 1 in an RTI model) is to obtain data about all students in order to assess the effectiveness of the core curriculum and to determine which students may be at risk and in need of additional intervention. One example of a research-based screening procedure is Dynamic Indicators of Basic Early Literacy Skills (DIBELS; Kaminski & Good, 1996), perhaps the most widely used assessment for conducting universal academic screening, specifically literacy. DIBELS monitors the development of preliteracy and early literacy skills with brief, repeatable fluency assessments.

To assist schools in illustrating and evaluating these universal data, DIBELS scoring templates were developed at the State University of New York at Oswego. Graphing templates are Microsoft Excel spreadsheets designed to perform prearranged functions, in this case to display DIBELS results. DIBELS scoring templates are available for Grades K–6 and include columns for input of student names and scores from appropriate DIBELS tasks according to grade level. Table 1 is an illustration of a template displaying the data from a kindergarten benchmark assessment.

Table 1. DIBELS Universal Screening Data for Kindergarten Students

Student	ISF	LNF	PSF	NWF	ISF Descriptor	LNF Descriptor	PSF Descriptor	NWF Descriptor
Jacob	20	31	34	10	Emerging/Some Risk	Established/Low Risk	Established/Low Risk	Emerging/Some Risk
Madison	15	27	1	10	Emerging/Some Risk	Established/Low Risk	Deficit/At Risk	Emerging/Some Risk
Tequan	4	27	1	4	Deficit/At Risk	Established/Low Risk	Deficit/At Risk	Deficit/At Risk
Cole	28	43	52	34	Established/Low Risk	Established/Low Risk	Established/Low Risk	Established/Low Risk
Taganay	20	28	9	16	Emerging/Some Risk	Established/Low Risk	Emerging/Some Risk	Established/Low Risk
Jessie	19	20	33	10	Emerging/Some Risk	Emerging/Some Risk	Established/Low Risk	Emerging/Some Risk
Mitchell	22	45	35	22	Emerging/Some Risk	Established/Low Risk	Established/Low Risk	Established/Low Risk
Ayah	17	22	0	5	Emerging/Some Risk	Emerging/Some Risk	Deficit/At Risk	Emerging/Some Risk
Avida	15	19	2	3	Emerging/Some Risk	Emerging/Some Risk	Deficit/At Risk	Deficit/At Risk
Khyra	21	14	38	25	Emerging/Some Risk	Deficit/At Risk	Established/Low Risk	Established/Low Risk
Shytek	5	12	0	0	Deficit/At Risk	Deficit/At Risk	Deficit/At Risk	Deficit/At Risk
Joseph	6	6	0	0	Deficit/At Risk	Deficit/At Risk	Deficit/At Risk	Deficit/At Risk
Naviae	21	39	38	42	Emerging/Some Risk	Established/Low Risk	Established/Low Risk	Established/Low Risk
Justice	20	23	12	13	Emerging/Some Risk	Emerging/Some Risk	Emerging/Some Risk	Established/Low Risk
Monet	21	28	44	21	Emerging/Some Risk	Established/Low Risk	Established/Low Risk	Established/Low Risk
Aleseia	17	40	15	10	Emerging/Some Risk	Established/Low Risk	Emerging/Some Risk	Emerging/Some Risk

Note: Initial Sound Fluency (ISF), Letter Naming Fluency (LNF), Phoneme Segmentation Fluency (PSF), and Nonsense Word Fluency (NWF) are kindergarten preliteracy assessments on the DIBELS. ''Descriptor'' refers to the performance ranges based on DIBELS benchmarks.

Graphing Proficiency Ranges for Individual Students

The templates can be accessed at http://www.schooltoolz. us. Click on ''Graphing,'' then on ''DIBELS Scoring Templates.'' To use these templates, download the desired grade level, save to your computer, and read the instructions (available by clicking on the "Instructions" tab at the bottom of the spreadsheet). As specified, the gray area is for the input of student names and scores (delete contrived data first but do *not* alter cells outside of the shaded area, as these contain important formulas). When student scores are added, descriptive ranges automatically appear in subsequent columns arranged by DIBELS task for each student. As illustrated by Table 1, educators can easily identify and highlight at-risk students requiring intervention based on deficit range scores on one or more tasks.

Using Graphs to Determine Instructional Priorities

In addition to displaying proficiency ranges by individual student, the templates also include graphs and tables illustrating the percent and frequency of students in each proficiency level (e.g., deficient, emerging, established) for each task. This is helpful when assigning instructional priorities for the classroom and evaluating overall response to classroom instruction. With each template, four sheets are provided: (a) for beginning of the year

Figure 1. A graph from the DIBELS scoring template.

Grade 2 Year-Long DIBELS Comparison
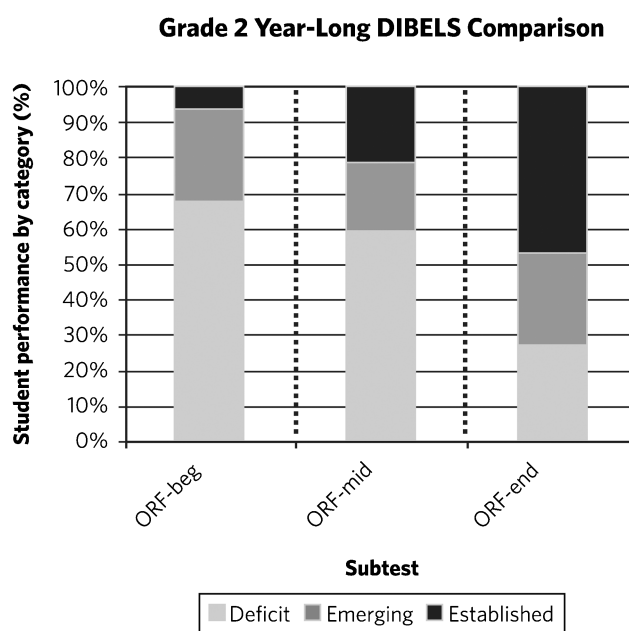
Note. Oral reading fluency (ORF) is a subtest of DIBELS. The figure represents ORF data from one second-grade classroom from the beginning (beg), middle (mid), and end of the year (end) assessments.

Table 2. Second-Grade DIBELS Performance

Subtest	Descriptor	N	%
Oral Reading Fluency-beg	Deficit	44	67.69%
	Emerging	17	26.15%
	Established	4	6.15%
Oral Reading Fluency-mid	Deficit	40	60.61%
	Emerging	12	18.18%
	Established	14	21.21%
Oral Reading Fluency-end	Deficit	16	27.59%
	Emerging	15	25.86%
	Established	27	46.55%

Note: The table represents oral reading fluency (ORF) data from beginning (beg), middle (mid), and end of the year (end) assessments.

data, (b) for midyear data, (c) for end of the year data, and (d) a results page which, when printed, will generate a four-page comparative report illustrating results from across the school year.

Example: Second-Grade DIBELS Performance

Figure 1 and Table 2 illustrate in graphic and table format the overall second-grade DIBELS performance for one school across the academic year. It would appear from this information that one instructional priority for this class might address increasing reading fluency, because 68% of students scored in the deficient range during the first assessment.

Based on these data, it also appears that, while the number and percent of students reaching established ranges of performance increased across the school year (e.g., from 6.15 to 46.55%), the end goal of having roughly 80% of students at established levels of reading fluency was not achieved. This might suggest the need for revisions in the curriculum or instructional practices prior to the next school year.

GRAPHING PROGRESS MONITORING DATA

At the heart of the RTI model is monitoring student progress to inform instructional practices. Graphs of these data are invaluable in determining which students benefit from instruction and which students need instructional or curricular modifications. As previously noted, progress monitoring graphs should include a trend line and slope of progress to evaluate the student's rate of response to the implemented intervention. These functions are fairly easy to perform in Microsoft Excel, although some basic knowledge of the Excel program is

required. For more detailed directions on graphing, go to http://www.schooltoolz.us; in the Graphing section, click on the ''Tricking out Your Graphs'' link.

Set Up the Spreadsheet

To get started, open an Excel spreadsheet and label the first cell in column A ''Date'' and the first cell in column B ''CRW'' or another abbreviation for the data to be entered. With this setup, care must be taken to format the date column properly. To do this, highlight the cells that will be used in that column (column A) and right-click on them. Then select ''format cells'' and click on the ''number'' tab. Select ''date'' in the menu. This will treat all of your data as days. On the right-hand side is a menu for ''type,'' indicating the type of date displayed. Choose an option that includes two spaces each for day, month, and year (e.g., 03/14/01). Avoid those choices with an asterisk beside them. Your setup is now complete and

Figure 2. Student progress monitoring graph.
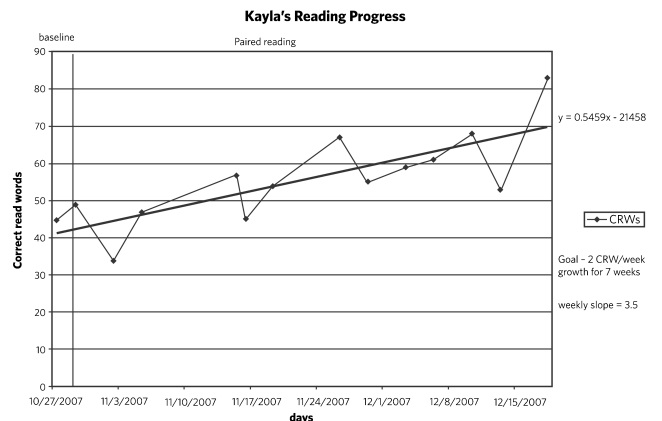
you can input the assessment dates in the first column and the student monitoring data in the second column.

Graph the Data

To graph this information, highlight the data in the two columns by dragging your cursor over them (include the top cells that label the data). Once they are highlighted, click on the ''chart wizard'' (the icon on the toolbar above your spreadsheet that looks likes a small multicolored bar graph). Next, select the chart type, which in this case will be a line graph. If the sample graph is correct, then select ''next'' (if not, you may have to select ''series'' and remove ''dates'' as a graphed series). Next, include a chart title (e.g., Johnny's reading progress) and label the x-axis ''days'' and the y-axis ''correct read words'' (or ''data graphed''). After including the titles, click ''finish'' and you'll have a graph.

Display Rate of Progress

As indicated earlier, the graph can also be used to display the student's rate of academic progress. This is done by having Excel plot a trend line and compute a slope. To display a trend line and slope, make sure that your graph is selected (i.e., the border around it includes little black squares at the corners and midsections, if not, just click on the graph). On the top toolbar, click on ''chart'' and select ''add trend line.'' The default will be ''linear,'' which is what you want. Next, click on ''options'' and select ''display equation on chart.'' This will chart the trend line and compute a daily slope.

The last step is to multiply the computed slope by seven in order to derive a weekly slope that can be compared to rates-of-progress estimates commonly reported in the curriculum-based measurement literature (e.g., Silberglitt & Hintze, 2007). Figure 2 is an illustration of a progress monitoring graph utilizing this procedure. The slope computed by Excel was 0.5459. When .5 was multiplied by 7, the approximate weekly slope was 3.5, indicating a high rate of progress.

SUMMARY

The recent emphasis on accountability and data-based decision making in education has increased the importance of graphing students' academic performance and rates of progress. This handout provides educators with information and suggests free online resources to assist with graphing student data. It also includes a discussion of the correct way to display a trend line and compute a slope so that educators can accurately assess a student's rate of progress.

REFERENCES

Deno, S. L., Fuchs, L. S., Marston, D. B., & Shin, J. (2001). Using curriculum-based measurement to establish growth standards for students with learning disabilities. *School Psychology Review*, *30*, 507–524.

Kaminski, R. A., & Good, R. H. (1996). Toward a technology for assessing basic early literacy skills. *School Psychology Review*, *25*, 215–227. See also DIBELS website: https://dibels.uoregon.edu

Silberglitt, B., & Hintze, J. M. (2007). How much growth can we expect? A conditional analysis of R-CBM growth rates by level of performance. *Exceptional Children*, *74*, 71–84.

RECOMMENDED RESOURCES

These are free online resources to assist with graphing and student progress monitoring.

Dynamic Indicators of Basic Early Literacy Skills (DIBELS): https://dibels.uoregon.edu

The DIBELS assessment materials and benchmarks for student progress are available as free downloads. DIBELS also has a progress monitoring service that produces student graphs, which is available for a fee.

Intervention Central: http://www.interventioncentral.org

See ''Chart dog'' under ''Online tools'' for another graphing resource for charting academic monitoring data. Look also in the ''CBM Warehouse'' for the CBM recording form for oral reading fluency (ORF) data. This form includes two sets of CBM norms as well as weekly slopes/growth estimates.

National Center on Student Progress Monitoring: http://www.studentprogress.org

See the ''Library'' for articles and research and informative presentations on student progress monitoring, graphing, goal setting, data-based decision making, and other relevant issues.

Schooltoolz.org: http://www.schooltoolz.us

Dr. James L. McDougal's website. Look under ''graphing'' for graphing templates covering both academic and behavioral monitoring techniques. In the ''Tricking out your Graphs'' section, see handy instructions for adding phase lines and text boxes to your graphs in addition to other tips. Also on this webpage are the DIBELS scoring templates discussed above.

Note for Mac users: Some Mac users may encounter difficulties with the Excel instructions in this handout. Please contact Dr. McDougal for templates at mcdougal@oswego.edu

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