



# Real Problems and Potential Solutions for Oral Reading Fluency Progress Monitoring

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# Oral Reading Fluency (ORF) -- What we Know/Don't Know so far

## Know

- Oral Reading Fluency is a remarkably reliable and valid indicator of reading proficiency that is sensitive to instruction and can model progress.
- Oral Reading Fluency can be used to differentiate levels of intensity of instructional support students need to achieve literacy goals.
- Readability of passages can change appropriate benchmark goals and thereby instructional decisions.

## Don't Know

- How to establish passage readability (difficulty) with precision.

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# Construct Validity of Oral Reading Fluency: Passage Difficulty Doesn't Matter

- The number of words read correct per minute on an oral reading fluency passage correlates highly with almost any criterion measure of reading that is examined.
- High correlations with criterion measures are found across an extremely broad range of passage difficulty:
  - Third grade students reading a first grade level passage
  - Third grade students reading a third grade level passage
  - Third grade students reading a fifth grade level passage

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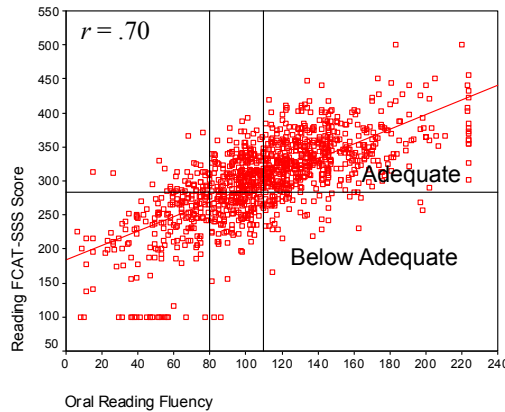
# Decision Utility of Oral Reading Fluency Passage Difficulty Matters

- Passage difficulty affects the establishment of instructional goals for adequate progress in reading.
- Passage difficulty is essential to consider in establishing a cutoff for at risk status.
- DIBELS goal setting is based on the odds of achieving subsequent instructional goals
  - Odds in favor (85%+/-) → On Track
  - Odds 50 – 50 → Needs support
  - Odds against (15%+/-) → Needs intensive intervention.

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## Linkage of Oral Reading Fluency to State Reading Outcome Assessments



Above 110, the odds are 91% the student will rank "adequate" on the FL State Assessment.

Below 80, the odds are 19% the student will rank "adequate" on the FL State Assessment.

Buck, J., & Torgesen, J. (2003). The relationship between performance on a measure of oral reading fluency and performance on the Florida Comprehensive Assessment Test (Technical Report 1). Tallahassee, FL: Florida Center for Reading Research.

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## Oral Reading Fluency Challenges

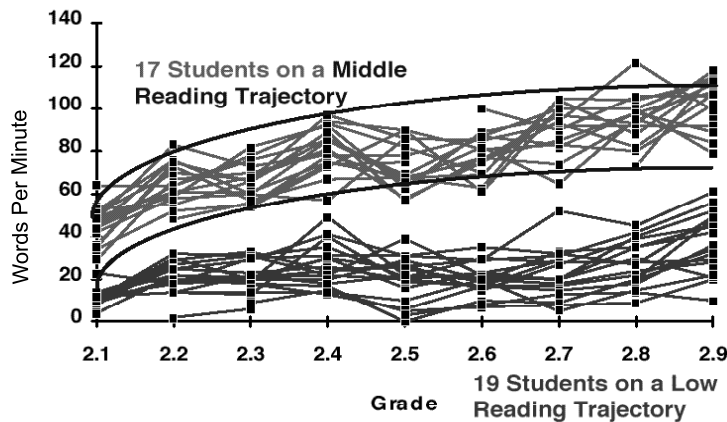
- States have outcome measures of varying degrees of rigor.
  - DIBELS tries to set a general standard that is rigorous, meaningful, and broadly applicable.
- Passage difficulty affects the benchmark goals and instructional decisions.
  - Note: correlation is high and robust for passages of different difficulty, but odds can change dramatically.
  - This means educators must specify material when they specify a goal. For example, 110 on *DIBELS Oral Reading Fluency* by the end of third grade.

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## Some Passage Differences are Shared; Others are Idiopathic



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## How can we Control or Reduce Variability in Text Difficulty?

- No agreed upon standard for evaluating text difficulty.
- Passage analysis of things we can count, for example:
  - Word length.
  - Frequency of common words or rare words.
  - Sentence length.
  - But, there are many features it is difficult to count or we can't count.
- Research analysis of passage difficulty by examining student performance on the passages in a repeated measures design.
  - Advantage of empirical evidence of passage difficulty.
  - Disadvantage of order effects, satiation, context.

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## Things we can count: Decoding Difficulty or Word Length

1. Characters per word
2. Proportion of words with 3 or more characters
3. Proportion of words with 6 or more characters
4. Proportion of words with 7 or more characters
5. Syllables per word
6. Proportion of words with 2 or more syllables
7. Proportion of words with 3 or more syllables



## Things we can count: Semantic Difficulty or Word Exposure

8. Word frequency (text with lots of low frequency words will be harder)
9. Proportion of rare words (words not found on a word list)
10. Proportion of words that are different words



## Things we can count: Syntactic Difficulty or Sentence Complexity

12. Words per sentence
13. Number of characters per sentence
14. Number of syllables per sentence
15. Number of words with 7 or more letters per sentence
16. Number of words with 3 or more syllables per sentence
17. Proportion of words that are conjunctions
18. Proportion of words that are prepositions
19. Number of punctuation marks per sentence



## Things it is Really, Really Hard to Count:

- Proportion of decodable words (decodable words are defined differently at different points in the curriculum, and for different curricula).
- Is the text well-behaved? Do sentences flow and does meaning build? Are new words or concepts explained or illustrated? Is text choppy and disjointed? Is the text considerate of the reader and generally engaging?



## Things we Just Can't Count

- Background knowledge – Is the passage about a familiar or new topic? Did the class just have a unit on meteorology? Did the individual just go to the science museum and get fascinated by a meteorology exhibit?
- Vocabulary knowledge – has the student learned the words in the text?
- Curriculum emphasis – Is the class learning expository text strategies? Narrative text structures?
- Curriculum content – Did the class just complete a unit on the Grand Canyon?
- Context – is it the week before winter break? Did students just come from an assembly? Recess? Reading class?
- Student interest – does the student like meteorology?

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## A Pragmatic Approach: DIBELS Next

- Research Based DMG Passage Difficulty Index combines syntactic difficulty, word difficulty, semantic difficulty
- Authored narrative and expository passages meeting design specifications and DMG Passage Difficulty Index
- Extensive review and revision to ensure (a) well behaved, (b) accurate, (c) sensitive and respectful, (d) represent diversity, and (e) met DMG Passage Difficulty Index.
- 40 passages that meet rigorous standards empirically examined in a scientific study of student performance using a repeated measures design
- Include 32 of 40 best performing passages for DIBELS Next
- Arrange 32 passages in triads to facilitate and enhance decisions
- DIBELS: make educational decisions based on 3 passages
- Consider individual variability in performance

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### 1 DIBELS® Oral Reading Fluency G3/Benchmark 1.1

**Directions:** Make sure you have reviewed the scoring rules in the *DIBELS Assessment Guide* and have them available. Say these specific directions to the student:

▶ **I would like you to read a story to me. Please do your best reading. If you do not know a word, I will read the word for you. Keep reading until I say "stop." Be ready to tell me all about the story when you finish.**

▶ Go to the next page.

### 1 DIBELS® Oral Reading Fluency G3/Benchmark 1.1 continued

▶ Begin testing. **Put your finger under the first word** (point to the first word of the passage). **Ready, begin.**

**Timing** 1 minute. Start your stopwatch after the student says the first word of the passage. Place a bracket ( ) and say **Stop** after 1 minute.

**Wait** If no response in 3 seconds, say the word and mark it as incorrect.

**Discontinue** If no words are read correctly in the first line, say **Stop**, record a score of 0, and do not administer Retell.  
If fewer than 10 words are read correctly on passage #1, do not administer Retell or passages #2 and #3.  
If fewer than 40 words are read correctly on any passage, use professional judgment whether to administer Retell for that passage.

**Reminders** If the student stops (and it's not a hesitation on a specific item), say **Keep going**. (Repeat as often as needed.)  
If the student loses her/his place, point. (Repeat as often as needed.)

## Finding a Nest

► As Patrick walked along the path to his neighbor's house, he tripped over a tree root covered by some spiky leaves. He bent down to see if the leaves had scratched him. It was then that he saw the nest. It was tucked into the leaves with two tiny eggs inside. He remembered from his school trip to the nature center that he shouldn't touch it. He looked around for the mother bird. Not seeing her, he quietly backed away and continued down the path.

Each day, Patrick walked down the path and carefully checked the nest. Patrick made sure not to disturb anything that was near it. He knew that the brush protected the nest from predators. By the end of the week, there were a total of five eggs in the nest. Just one week later, there were nine eggs. He wondered what kind of bird would hatch out of them. The eggs were smaller than chicken eggs and they were cream-colored with brown speckles. One day, Patrick got his answer. As he crept over to look at the nest, he saw a mother quail sitting on the eggs.

Patrick continued to check on the nest every day. He was determined to keep it safe. After about three weeks, the eggs finally hatched. Patrick was thrilled to see all the little quails scurrying around their mother.

**1** DIBELS® Oral Reading Fluency  
Grade 3/Benchmark 1.1

Total words: \_\_\_\_\_  
Errors (include skipped words): - \_\_\_\_\_  
Words correct: = \_\_\_\_\_

**Finding a Nest**

0 As Patrick walked along the path to his neighbor's house, he tripped 12  
12 over a tree root covered by some spiky leaves. He bent down to see if 27  
27 the leaves had scratched him. It was then that he saw the nest. It was 42  
42 tucked into the leaves with two tiny eggs inside. He remembered from 54  
54 his school trip to the nature center that he shouldn't touch it. He looked 68  
68 around for the mother bird. Not seeing her, he quietly backed away and 81  
81 continued down the path. 85  
85 Each day, Patrick walked down the path and carefully checked the 96  
96 nest. Patrick made sure not to disturb anything that was near it. He knew 110  
110 that the brush protected the nest from predators. By the end of the week, 124  
124 there were a total of five eggs in the nest. Just one week later, there were 140  
140 nine eggs. He wondered what kind of bird would hatch out of them. The 154  
154 eggs were smaller than chicken eggs and they were cream-colored with 166  
166 brown speckles. One day, Patrick got his answer. As he crept over to look 180  
180 at the nest, he saw a mother quail sitting on the eggs. 192  
192 Patrick continued to check on the nest every day. He was determined 204  
204 to keep it safe. After about three weeks, the eggs finally hatched. Patrick 217  
217 was thrilled to see all the little quails scurrying around their mother. 229  
229 After that, every time he passed the spot where the nest had been, he 243  
243 remembered the little baby birds and smiled. 250

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## Most Readability Formulas use a Indicators in Two Areas

	Word length					words/ word freq.		Sentence Difficulty	
	1	4	5	6	7	8	9	12	14
Lexile						X		X	
Dale-Chall							X	X	
Flesch			X					X	
FOG					X			X	
Powers			X					X	
SMOG					X				
Forcast				X					
Fry								X	X
Spache							X	X	
DMG passage difficulty index	X	X	X		X		X	X	
	Decoding Difficulty					Semantic Difficulty		Syntactic Difficulty	



Table 48  
Third Grade Benchmark Passage Difficulty Variables and Indicators for DIBELS Next

Title	Assignment	Number of words	Syntactic Difficulty	Decoding Difficulty			Semantic Difficulty		
				Median words per sentence	Characters per word	Percent of words with 3 or more syllables	Percent of words with 7 or more characters	Number of syllables per word	Percent of unique rare words
Finding a Nest	BOY 1	250	11.0	4.24	3.20	13.20	1.29	11.20	-0.40
A Famous Food: The History of Pizza	BOY 2	254	12.0	4.35	3.54	10.63	1.37	12.99	-0.11
Living in Singapore	BOY 3	262	12.0	4.10	4.20	11.83	1.26	12.21	-0.27
Horseback Treasure Hunt	MOY 1	276	11.0	4.26	3.62	11.96	1.26	14.86	-0.19
Raising a Calf	MOY 2	292	11.5	4.06	3.77	10.27	1.26	11.30	-0.43
Skimboarding	MOY 3	294	12.5	4.33	5.78	12.93	1.34	11.22	-0.11
A Surprising Discovery	EOY 1	299	12.0	4.00	5.35	15.38	1.34	13.71	-0.05
A Day for a Shadow Dance	EOY 2	297	11.0	4.34	4.38	15.49	1.37	10.77	-0.27
A Triple Challenge	EOY 3	292	11.5	4.15	5.82	10.96	1.33	13.01	-0.18
Northern Lights	Survey 1	300	12.0	4.35	5.33	14.67	1.35	11.67	-0.10
Caring for Sheep	Survey 2	253	11.0	4.29	3.56	12.25	1.33	10.67	-0.40
Independence Day in India	Survey 3	251	11.0	4.25	6.77	14.74	1.36	11.16	-0.22
Mean		276.67	11.54	4.23	4.61	12.86	1.32	12.06	-0.23
Standard Deviation		21.08	0.54	0.12	1.16	1.85	0.04	1.31	0.13



Table 49  
Third Grade Progress Monitoring Passage Difficulty Variables and Indices for DIBELS Next

Title	Assignment	Number of words	Median words per sentence	Characters per word	Percent of words with 3 or more syllables	Percent of words with 7 or more characters	Number of syllables per word	Percent of unique rare words	DMG passage difficulty index
A New Ball Game	PM 1	273	12.0	4.27	5.13	13.92	1.32	10.62	-0.23
Swimming the Channel	PM 2	259	12.0	4.21	1.93	14.67	1.32	12.36	-0.21
Rooftop Gardens	PM 3	285	12.0	4.21	3.86	15.44	1.32	12.63	-0.12
Learning to Skateboard	PM 4	293	12.0	4.22	4.10	15.02	1.28	11.95	-0.20
Glassmaking	PM 5	297	11.0	4.42	4.04	15.15	1.35	14.81	-0.02
Space Camp	PM 6	290	12.5	4.31	4.83	16.21	1.36	12.07	-0.01
A Woodland Path	PM 7	287	12.5	4.24	3.83	14.98	1.30	11.50	-0.16
How Ryan Made a Difference	PM 8	297	12.0	4.38	5.39	14.81	1.32	10.44	-0.20
Rachel's Box	PM 9	292	12.0	4.14	4.79	12.33	1.31	10.96	-0.28
The Pinecone Feast	PM 10	298	12.0	4.47	5.37	14.09	1.33	11.41	-0.11
Save the Turtles!	PM 11	289	11.0	4.34	5.19	15.92	1.36	13.84	-0.05
Planting a Butterfly Garden	PM 12	284	11.0	4.30	7.04	14.44	1.33	11.27	-0.23
Lan's First Day	PM 13	289	11.0	4.31	5.88	16.61	1.30	12.80	-0.14
Kayla's Special Owl	PM 14	299	11.0	4.24	4.35	11.71	1.32	12.71	-0.27
Amazing Dolphins	PM 15	284	12.5	4.17	1.76	15.49	1.27	10.92	-0.28
Strawberry Festival Day	PM 16	255	10.5	4.26	5.49	15.69	1.32	10.59	-0.36
A Poetry Contest	PM 17	296	11.0	4.31	5.41	16.89	1.33	14.19	-0.04
Keeping the Planet Clean	PM 18	263	12.0	4.09	6.08	11.79	1.29	12.55	-0.18
How Worms Help Gardens	PM 19	295	12.0	4.27	4.41	12.20	1.30	15.25	0.01
A Chess Tournament	PM 20	277	10.5	4.42	4.33	15.88	1.30	14.08	-0.14
Mean		285.10	11.63	4.28	4.66	14.66	1.32	12.35	-0.16
Standard Deviation		13.21	0.67	0.10	1.26	1.56	0.02	1.46	0.10



Table 50  
Third Grade Passage Difficulty Variables and Indices: A Comparison of DIBELS Next and DIBELS 6th Edition

Variable	DIBELS Next					DIBELS 6th Edition				
	Mean	SD	Min	Median	Max	Mean	SD	Min	Median	Max
Number of words	281.94	16.79	250.00	289.00	300.00	245.07	14.70	218.00	248.00	264.00
Median words per sentence	11.59	0.61	10.50	12.00	12.50	11.78	1.59	9.00	11.00	16.00
Characters per word	4.26	0.11	4.00	4.27	4.47	4.17	0.27	3.76	4.25	4.73
Percent of words with 3 or more syllables	4.64	1.20	1.76	4.60	7.04	5.13	2.80	1.71	3.98	12.05
Percent of words with 7 or more characters	13.99	1.87	10.27	14.67	16.89	13.64	3.12	7.52	13.65	20.54
Number of syllables per word	1.32	0.03	1.26	1.32	1.37	1.30	0.06	1.21	1.31	1.43
Percent of unique rare words	12.24	1.39	10.44	12.01	15.25	12.12	2.66	6.46	12.11	17.11
DMG passage difficulty index	-0.19	0.12	-0.43	-0.19	0.01	-0.20	0.26	-0.52	-0.29	0.53

DIBELS Next and DIBELS 6th means are very close.  
DIBELS Next standard deviations are about half of DIBELS 6th.



## Overview of Participants and Procedures

- One elementary school and one middle school in the Mountain West region of the US.
- For each grade 1<sup>st</sup> through 6<sup>th</sup>, 22-25 students were selected.
- The results are based on a final sample of 140 students.
- Data were collected by university students (12 graduate and 1 undergraduate).
- A total of 21 teachers were involved in the project.
- There were approximately 5600 data points collected during the course of the study.



## Readability Study Participants

- Two schools (one elementary and one middle school)
  - Elementary school size is 466 students in grades K – 5
  - Middle school size is 513 students in grades 6 - 8
  - Student/Teacher ratio is 17:1 at elementary school & 14:1 at the middle school
  - Free/reduced price lunch is 39% at elementary school & 56% at the middle school
  - Elementary school is 13% Native American, 4% Asian, 1% Black, <1% Hispanic, 81% White students
  - Middle school is 6% Native American, 2% Asian, <1% Black, 2% Hispanic, 89% White students
- Students (n = 140) drawn from 21 teachers' classrooms
  - Grades 1, 4 & 5 each had 23 participants
  - Grade 2 had 25 participants, while grades 3 & 6 had 22 and 24 participants, respectively



## University Student Data Collectors

- Data collectors were all majors in education-related fields.
- Data collectors were trained by the principal investigator, Kelly Powell-Smith, and received ongoing guidance from a co-principal investigator, Trent Atkins.
- Atkins directly observed each data collector and completed a 9-item assessment integrity checklist.
- These checks indicated excellent fidelity.
- Select data collectors were responsible for entering data into an Excel spreadsheet.
- Data were entered twice and scoring accuracy was checked by DMG personnel on all passages.
- Data collectors also provided anecdotal information about each passage.

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## Teachers

- A total of 21 teachers were involved in the project and were provided with a \$50 gift card (student \$15 and each school \$1,000).
- Teacher involvement was minimal. Teachers made students available to data collectors (some more willingly than others).
- Most of the elementary teachers have been involved in some professional development in RTI. The school does use DIBELS.
- Due to scheduling difficulties, the middle school created some logistic challenges, but the teachers turned out to be very helpful.
- The middle school does not use DIBELS.

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## Data Collection

- Students were administered 40 DIBELS Next Reading passages during 8-10 testing sessions.
- Students were administered a 4<sup>th</sup> grade NAEP passage and one DIBELS 6<sup>th</sup> edition passage.
- Students in grades 1 and 2 read 4 passages per session, and students in grades 3-6 read 5 passages per session.
- Each student had a unique sequence of passages in a random order.
- Discontinue rules were applied and some students were exited from the project.
- A total of 5600 data points were collected as part of this project.

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## Research Questions

- What are the 32 best passages at each grade level (grades 1 through 6)?
- How does student variability contribute to decision-making about passage selection?
- How do the new ORF passages correlate to the median 6<sup>th</sup> edition ORF passage?
- How do the new ORF passages correlate to a standard 4<sup>th</sup> grade NAEP passage?

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## Data Analysis

- Initial Data Analyses
  - Regression lines were fit to the data for each student for all 40 data points (day by score). We examined:
    - slope
    - intercept
    - RMSE
    - predicted scores
    - passage residuals for individual students
    - mean and standard deviation of the residuals across students within grade



## Data Analysis

- Initial Data Analyses (continued)
  - Alternate form reliability for passages within a grade
  - Correlation of NAEP and 6<sup>th</sup> edition passages with each passage at each grade level
  - Mean Euclidean Distance
  - Rasch IRT
  - Visual inspection of individual student data graphs
  - Examination of anecdotal data from examiners



## Passage Selection & Assignment

- The 32 best passages at each grade level were organized as follows:
  - 10 easier passages
  - 12 medium passages
  - 10 harder passages
- Passages within these groups were rank ordered and the middle 4 passages in each of these groups were identified.
- Each set of benchmark passages included an easier, medium and harder passage selected from the middle of these groups.



## Results...

- Third grade results are provided for illustration
- Results are Organized as Follows:
  - DMG Passage Difficulty Index Data
  - Descriptive Statistics
    - individual passages
    - passage aggregates
  - Individual Student Data Graphs
  - Passage Selection and Placement Data for Individual Passages and Aggregates
  - Sample IRT Curves
  - SEM for Single Probe & Passage Aggregates





Table 8  
Third Grade Benchmark Passage Descriptive Statistics for DIBELS Next with Comparison Passages

Title	Assignment	N	Mean	SD	Min	Q1	Med	Q3	Max
Finding a Nest	BOY Benchmark 1	22	117.23	44.76	38	74	133	146	208
A Famous Food: The History of Pizza	BOY Benchmark 2	22	111.00	36.16	42	86	114	138	201
Living in Singapore	BOY Benchmark 3	22	103.77	42.06	24	76	104	130	204
Horseback Treasure Hunt	MOY Benchmark 1	22	118.00	41.04	35	87	127	140	214
Raising a Calf	MOY Benchmark 2	22	107.64	42.13	31	71	114	139	201
Skimboarding	MOY Benchmark 3	22	103.27	40.46	28	80	107	127	199
A Surprising Discovery	EOY Benchmark 1	22	116.00	43.00	25	86	133	140	204
A Day for a Shadow Dance	EOY Benchmark 2	22	109.14	43.20	32	69	122	136	179
A Triple Challenge	EOY Benchmark 3	22	103.64	36.82	35	80	106	136	161
Northern Lights	Survey 1	22	116.09	37.56	35	93	119	145	177
Caring for Sheep	Survey 2	22	110.64	36.59	44	78	123	132	189
Independence Day in India	Survey 3	22	102.91	42.76	24	84	108	127	217
Animal Tracks	6th Edition EOY 2	22	112.32	35.54	29	90	120	136	182
The Box in the Barn	NAEP Passage	22	113.45	40.28	38	81	127	145	183



## Mean Difficulty of 3 Passage Medians is Extremely Well Behaved

Table 10

Third Grade, 3-Passage Aggregates of Benchmark and Progress Monitoring Passages for DIBELS Next

Aggregate	N	Mean	SD	Min	Q1	Med	Q3	Max
Median of 3 Passages								
BOY Benchmark	22	110.18	40.50	38	76	111	140	204
MOY Benchmark	22	110.45	40.77	31	80	117	139	201
EOY Benchmark	22	109.86	40.16	32	80	124	138	179
Survey	22	109.91	36.62	35	84	119	131	189
Dyad (PM 1 & 2)	22	110.43	35.49	44	86	117	136	193
Triad 1 (PM 3 - 5)	22	108.05	37.49	36	82	112	129	188
Triad 2 (PM 6 - 8)	22	111.64	40.21	34	79	122	132	197
Triad 3 (PM 9 - 11)	22	111.14	38.40	30	81	122	134	194
Triad 4 (PM 12 - 14)	22	111.00	37.08	36	85	122	140	188
Triad 5 (PM 15 - 17)	22	108.55	42.18	31	84	123	133	207
Triad 6 (PM 18 - 20)	22	110.45	37.61	31	81	117	136	187



## Multiple Considerations in Selecting Passages and Arranging Into Triads

Table 29  
Passage Selection and Placement Considerations for Grade 3 DIBELS Next Benchmark Passages

Passage	Genre	N	Mean Residual	Standard Deviation of Residuals	Mean Euclidean Distance	IRT Rasch Model Difficulty Parameter	Alternate-Form Reliability	Correlation with 6th Edition	Correlation with NAEP Passage
BOY Benchmark 1	Narrative	22	6.66	11.22	88.31	42.27	0.94	0.91	0.94
BOY Benchmark 2	Expository	22	0.68	14.02	91.82	50.07	0.88	0.88	0.87
BOY Benchmark 3	Narrative	22	-6.18	11.50	88.34	62.07	0.92	0.93	0.90
MOY Benchmark 1	Narrative	22	7.92	8.77	83.12	6.14	0.93	0.92	0.93
MOY Benchmark 2	Expository	22	-2.95	10.39	84.76	62.07	0.92	0.91	0.94
MOY Benchmark 3	Narrative	22	-6.58	9.79	83.12	62.07	0.92	0.92	0.94
EOY Benchmark 1	Narrative	22	5.60	10.11	84.59	32.89	0.93	0.96	0.92
EOY Benchmark 2	Narrative	22	-1.98	21.39	118.64	42.27	0.80	0.84	0.84
EOY Benchmark 3	Expository	22	-6.38	14.63	97.22	62.07	0.89	0.87	0.91
Survey 1	Narrative	22	5.84	13.36	95.71	32.89	0.89	0.88	0.93
Survey 2	Narrative	22	-0.29	8.76	75.47	42.27	0.93	0.92	0.97
Survey 3	Expository	22	-6.96	10.16	88.67	67.12	0.93	0.92	0.91
DIBELS 6th Edition		22	3.07	12.02					0.92
NAEP Passage		22	4.87	10.47				0.92	

DIBELS Next 3rd grade somewhat harder than DIBELS 6th Edition 3rd grade passages..



Table 30  
Passage Selection and Placement Considerations for Grade 3 DIBELS Next Progress Monitoring Passages

Passage	Genre	N	Mean Residual	Standard Deviation of Residuals	Mean Euclidean Distance	IRT Rasch Model Difficulty Parameter	Alternate-Form Reliability	Correlation with 6th Edition	Correlation with NAEP Passage
Progress Monitor 1	Narrative	22	2.97	17.33	104.37	50.07	0.84	0.85	0.83
Progress Monitor 2	Expository	22	-3.66	8.47	73.97	50.07	0.94	0.92	0.96
Progress Monitor 3	Expository	22	8.56	12.07	88.96	21.05	0.93	0.93	0.92
Progress Monitor 4	Narrative	22	-3.97	8.43	75.08	62.07	0.94	0.92	0.96
Progress Monitor 5	Narrative	22	-5.35	10.82	85.72	56.53	0.92	0.90	0.89
Progress Monitor 6	Narrative	22	5.55	8.94	78.65	42.27	0.94	0.94	0.93
Progress Monitor 7	Narrative	22	3.09	16.91	100.23	50.07	0.88	0.86	0.88
Progress Monitor 8	Expository	22	-8.23	11.49	91.54	56.53	0.93	0.90	0.97
Progress Monitor 9	Narrative	22	11.00	9.36	89.05	6.14	0.94	0.94	0.93
Progress Monitor 10	Narrative	22	-3.10	9.28	75.40	56.53	0.94	0.90	0.95
Progress Monitor 11	Expository	22	-4.02	13.24	90.13	56.53	0.90	0.88	0.90
Progress Monitor 12	Expository	22	4.07	7.63	76.08	21.05	0.93	0.90	0.92
Progress Monitor 13	Narrative	22	2.50	10.24	79.13	50.07	0.93	0.92	0.92
Progress Monitor 14	Narrative	22	-6.86	14.11	95.85	67.12	0.88	0.91	0.87
Progress Monitor 15	Expository	22	10.84	12.98	100.96	21.05	0.93	0.90	0.92
Progress Monitor 16	Narrative	22	-3.76	14.12	92.98	62.07	0.91	0.89	0.91
Progress Monitor 17	Narrative	22	-7.20	11.76	91.12	56.53	0.92	0.93	0.96
Progress Monitor 18	Expository	22	3.50	9.23	76.14	50.07	0.94	0.91	0.96
Progress Monitor 19	Expository	22	2.98	9.16	75.99	50.07	0.94	0.92	0.93
Progress Monitor 20	Narrative	22	-4.31	11.03	82.43	62.07	0.92	0.90	0.94



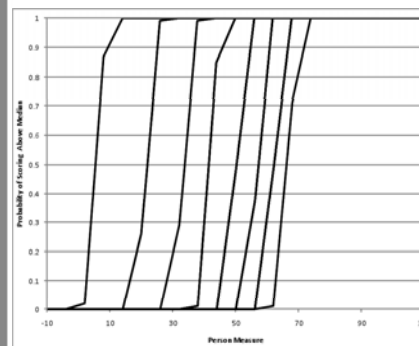
Table 31  
Third Grade Passage Selection and Placement Considerations for 3-Passage Aggregates of Benchmark and Progress Monitoring Passages for DIBELS Next

Aggregate	N	Mean Residual	Mean Euclidean Distance	IRT Rasch Model Difficulty Parameter	Median Alternate-Form Reliability	Correlation with 6th Edition	Correlation with NAEP Passage
Median of 3 Passages							
BOY Benchmark	22	0.21	61.60	50.07	0.94	0.92	0.93
MOY Benchmark	22	0.52	43.07	62.07	0.98	0.94	0.96
EOY Benchmark	22	-0.32	52.29	42.27	0.96	0.93	0.96
Survey	22	-0.35	48.07	42.27	0.97	0.93	0.97
Dyad (PM 1 & 2)	22	-0.34	58.74	50.07	0.94	0.92	0.93
Triad 1 (PM 3 - 5)	22	-1.88	50.23	56.53	0.97	0.94	0.94
Triad 2 (PM 6 - 8)	22	2.11	53.01	50.07	0.96	0.92	0.95
Triad 3 (PM 9 - 11)	22	0.26	43.01	56.53	0.98	0.93	0.96
Triad 4 (PM 12 - 14)	22	1.20	47.20	50.07	0.97	0.95	0.93
Triad 5 (PM 15 - 17)	22	-1.33	50.95	56.53	0.96	0.94	0.96
Triad 6 (PM 18 - 20)	22	-0.10	45.65	50.07	0.97	0.93	0.96

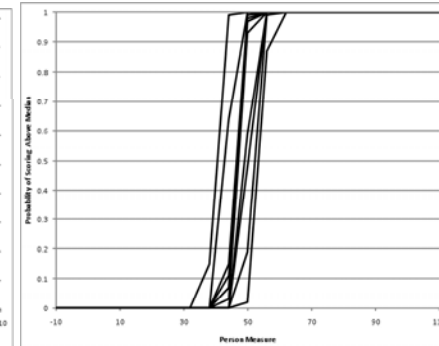


## IRT Curves for Third Grade

Individual Passages



Passage Aggregates



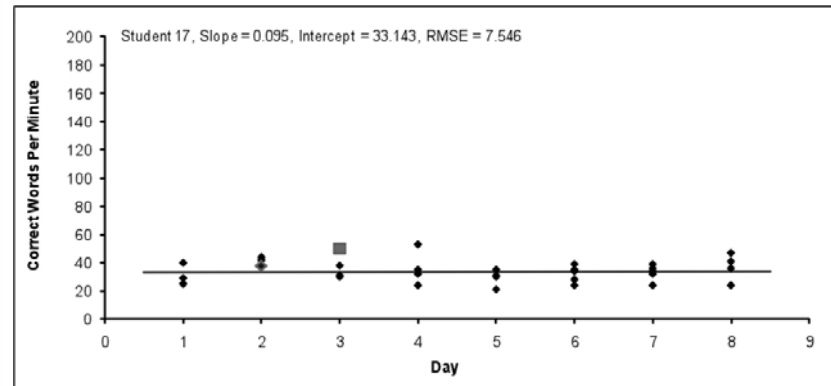
## Group Estimates of Reliability and Standard Error of Measurement

Table 41  
Standard Error of Measurement for Single Probes and 3 Probe Aggregates and Standard Error of the Mean for Individuals by Grade

Grade	Median Reliability for a Single Passage	Median SEM for a Single Passage	Median Reliability for 3-Passage Median	Median SEM for 3-Passage Median	Median Reliability for 3-Passage Mean	Median SEM for 3-Passage Mean
Grade 1	.95	10.33	.97	7.87	.98	6.27
Grade 2	.91	11.29	.94	8.13	.95	7.50
Grade 3	.93	11.12	.97	6.89	.94	6.16
Grade 4	.90	10.50	.94	7.27	.96	6.44
Grade 5	.92	10.39	.96	7.21	.97	5.46
Grade 6	.84	10.96	.90	8.08	.94	6.92



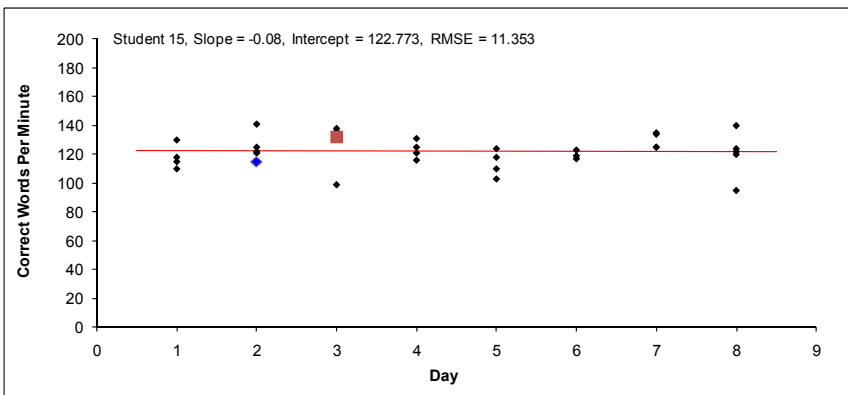
## Some Students are Less Variable: Minimum RMSE for Third Grade





## Some Students are More Variable: Median RMSE for Third Grade

Still reasonably well behaved.

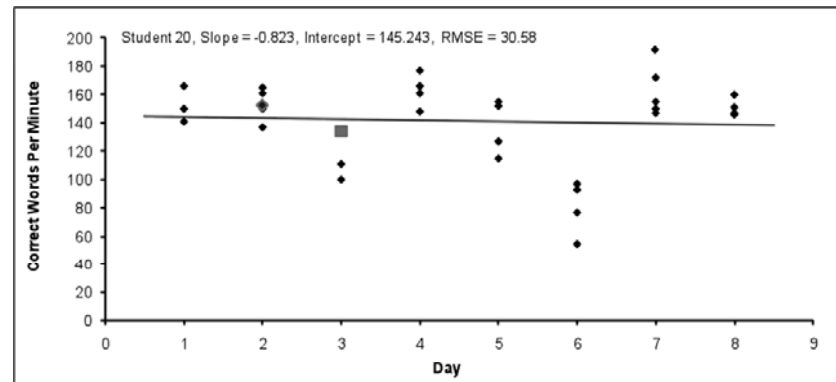


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## Sometimes it's not about the passage

For this student, no amount of passage equating or control of passage difficulty will make progress monitoring decisions defensible.



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## Individual Standard Error of Mean of 3 Probes

Table 1  
*Individual Standard Error of Mean for 3 Probe Aggregates by Grade*

Grade	Individual Standard Error of the Mean of $n = 3$ Passages for Individual Root Mean Square Residuals				
	Using Minimum RMSE	Using Q1 RMSE	Using Median RMSE	Using Q3 RMSE	Using Maximum RMSE
Grade 1	3.04	5.29	6.30	7.94	10.29
Grade 2	4.16	5.92	6.75	7.49	11.58
Grade 3	4.36	5.74	6.59	8.12	17.66
Grade 4	4.10	5.60	6.42	7.49	8.27
Grade 5	4.04	6.17	7.38	8.22	9.46
Grade 6	4.45	6.72	7.61	8.62	10.80

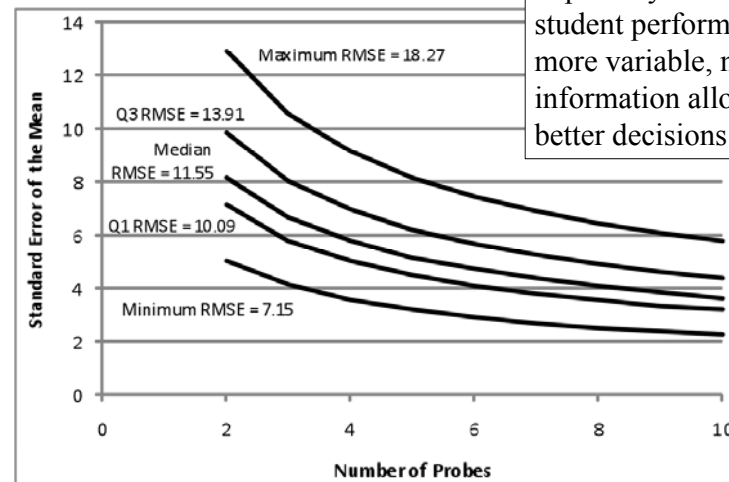
$$\text{Individual Standard Error of Mean} = \frac{\text{Individual Root Mean Square Error}}{\sqrt{n_{\text{Probes}}}}$$

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## Individual Standard Error of the Mean for Confidence Intervals

Especially when student performance is more variable, more information allows better decisions.

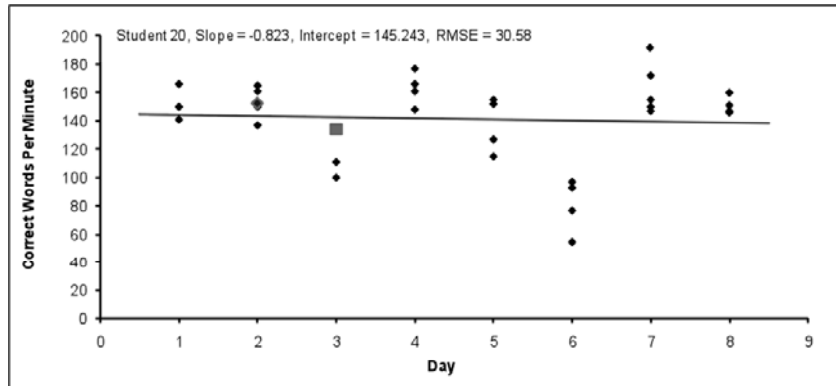


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## Sometimes Progress Monitoring Information is Not Interpretable

For this student, we are not measuring their progress in reading proficiency. We are measuring some difference in conditions.



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## Recommendations for Practice and Research

- First, start with a well-behaved set of known passages with rigorous control of all the features of passage difficulty that we can count, and with empirical evidence regarding passage difficulty.
- Arrange passages in triads to control differences in passage difficulty.
- Examine student performance on 3 passages for educational and research decisions.
- Consider individual student variability in progress monitoring. More information is important when students are more variable.
- When RMSE is greater than Q3 RMSE, make a professional judgment about whether scores are interpretable.

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