Introduction to Part 3

This is Part 3 of the larger module, “Informal Academic Diagnostic Assessment: Using Data to Guide Intensive Instruction.” The audience for this module may include interventionists, special educators, school psychologists, counselors, and administrators, as appropriate. The following slides are intended to provide participants with an introduction to error or miscue analysis of curriculum-based measures for the purpose of identifying skill deficits, providing examples of miscue analysis in reading and mathematics. Part 4, “Identifying Target Skills,” will further link these skill deficits to intervention.

The module is part of a series of training modules on Data-Based Individualization developed by the National Center on Intensive Intervention (NCII) aimed at district or school teams involved in initial planning for using DBI as a framework for providing intensive intervention in academics and behavior. For more information, please visit the DBI Training Series page on NCII’s website at: http://www.intensiveintervention.org/content/dbi-training-series.

Instructions for using the speaker notes

- Text formatted in standard font is intended to be read aloud or paraphrased by the facilitator.
- Text formatted in bold is excerpted directly from the presentation slides.
- Text formatted in italics is intended as directions or notes for the facilitator; italicized text is not meant to be read aloud.
- Text formatted in underline indicates an appropriate time to click to bring up the next stage of animation in an animated slide.

Speaker notes for Title Slide

Welcome participants to the training on Miscue and Skills Analysis. Introduce yourself (or selves) as the facilitator(s) and briefly cite your professional experience with regard to intensive intervention and DBI. Explain that this section introduces miscue analysis with examples in reading and mathematics.

Please ensure that participants have access to a pen or pencil and the following handouts during this training:

- Reading Miscue Analysis (introduced on slide 16 and needed for an activity beginning on slide 22)
- Computation Error Analysis Practice (needed for an activity beginning on slide 36)
Explain to participants that this section is part of a larger module titled “Informal Academic Diagnostic Assessment: Using Data to Guide Intensive Instruction”. This section will focus on miscue and skills analysis in reading and mathematics. The larger module is available at this link: http://www.intensiveintervention.org/content/dbi-training-series
Purpose and Objectives

**Purpose:** Provide an introduction to the use of miscue analysis to identify academic skill deficits for instructional planning.

**Objectives:**
1. Learn how to analyze student miscues on Passage Reading Fluency assessments to identify error types.
2. Learn how to analyze mathematics computation errors.

*Review purpose and objectives.*

Miscue analysis is also known as error analysis.
When progress monitoring data tell us the student is not sufficiently responding to the current intervention, we use diagnostic assessment to determine specific needs. Error or miscue analysis is a type of informal diagnostic assessment.

For more information on DBI, see “Introduction to Data-Based Individualization (DBI): Considerations for Implementation in Academics and Behavior (DBI Training Series Module 1)” at http://www.intensiveintervention.org/resource/introduction-data-based-individualization
The same progress monitoring assessments that tell us when an instructional change is needed may also reveal error patterns that will provide information on student’s strengths and weaknesses in a given academic area. Once specific academic skill deficits are identified, the intervention can be adapted to meet those needs. Sometimes, miscue analysis may indicate a need for additional diagnostic assessment and guide the selection of a more formal measure, if needed.

Remind participants that CBMs are a type of general outcome measure (GOM) used for instructional decision making. CBMs should:
• Be standardized, with well-documented validity and reliability.
• Reflect overall competence in the annual curriculum.
• Have alternate forms of equivalent difficulty to allow for repeated assessment.

For more information on administering and scoring reading and mathematics CBMs, see Part 1 of this module, “Administering Academic Progress Monitoring Measures.”

If the current intervention is not working, we should not conclude immediately that there is a mismatch between the intervention and the student’s skill deficits. First, we should rule out general factors related to implementation and engagement.

We also should be sure that the progress monitoring tool is sensitive to change for this student. As discussed in Part 2 of this module (Reviewing Progress Monitoring Data), very low, flat scores could suggest the student’s instructional level is too far below the assessment level. We must also consider the alignment between the academic skills being assessed and the content of instruction.
Has the intervention been delivered with fidelity? If we still think the intervention is a good match for the student’s needs (i.e., targeting appropriate academic skills), is there a way we could intensify instruction? For example, we could increase explicit instruction.

We also need to ask if the student has received enough of the intervention. How long has the student been receiving the intervention? Has it been long enough for progress monitoring to reveal a change in the target skills? Has the intervention been delivered as scheduled, in terms of minutes per session or number of sessions per week? Have sessions been missed due to student absences or scheduling conflicts?
If the student is not engaged in instruction and practice during intervention, the intervention will not be effective. Attention and effort during assessment also may impact progress monitoring scores. In any of these cases, consider adding a motivational component.

*Ask participants if they have anything else to add to this list.*
Now, let’s examine miscue analysis in reading. This section includes—

• Common error types in student oral reading
• A quick miscue analysis table to support analysis of curriculum-based measurement reading passages
• An example case using the table to analyze errors and make instructional recommendations
• A practice activity
While the student reads the passage following standard administration procedures, the examiner records student miscues or errors on the examiner copy. You may want to consider audio recording the student’s reading to improve accuracy, or so that someone else can analyze errors after administration.

*For more information on administering and scoring reading CBMs, see Part 1 of this module, “Administering Academic Progress Monitoring Measures.”*
A miscue of a single word may involve more than one type of error. We will talk about each error type in more detail in the following slides.
Graphophonetic Error

- Preserves some important phonetics of the written word, even if it does not make sense.
- **Example**: Written word is “friend,” but spoken word is “fried.”

*Review slide.*
Syntactic Error

- Preserves the grammar of the written word.
- **Example:** “Ran” is the same part of speech as “jogged.”

*Review slide.*
**Semantic Error**

- Preserves the meaning of the sentence.
- **Example**: “The woman is tall” has the same meaning as “the lady is tall.”
- **Practice**: what is a possible semantic miscue for the written word “pony?”

**Animated slide. Click at underlined text.**

**Review first two bullets.**

**Now**, let’s practice. What is a possible semantic miscue for the written word “pony?”

**Give participants time to think and share answers. A possible example is “horse.”**
Animated slide. Give participants time to provide an example of each error type, then click to bring up possible answers.
The handout *Reading Miscue Analysis* includes a blank Quick Miscue Analysis Table along with instructions and the error types we reviewed on the last slide. After we review how to use the table, we’ll review a sample table that has been filled out.

To fill out table, the first 10 student errors are written in the rows labeled 1-10. In the Written Word(s) column, record what the student should have said, the word or words from the passage. Next, fill out the Spoken Word(s) column with what the student actually said. Compare these to determine if each error is graphophonetic, syntactic, or semantic, writing yes or no in the appropriate column. Include additional details when appropriate (e.g., for graphophonetic errors, you may want to note if the initial or final sound in the word was preserved or if a specific sound was omitted). As you review each error, it may help to ask yourself the following questions:

- Does the spoken word contain some of the same sounds as the written word? If so, this is a graphophonetic error, whether or not the spoken word makes sense.
- Does the spoken word have the same part of speech as the written word? If so, this is a syntactic error that preserves the grammar of the written word, regardless of meaning.
- Does the error preserve the meaning of the written sentence? If so, this is a semantic error.

A single miscue may represent more than one type of error.
At the bottom of the table, we calculate the percentage of errors that were graphophonetic, syntactic, or semantic. Normally, the formula for calculating percentage is:

\[
\text{Percentage} = \frac{100 \times \text{number observed}}{\text{total possible}}
\]

For each error type column:

\[
\text{Percentage} = \frac{100 \times \text{number "yes"}}{10 \text{ total miscues}} = 10 \times \text{number "yes"}
\]

In this case, with a maximum of 10 possible for each error type, 100 divided by 10 reduces to 10, so we can simply multiply the number of “yes” responses for each error type by 10.

As an example, if eight of the ten errors were graphophonetic, then we would say that 80% of the student miscues were graphophonetic errors (because 10×8=80%). If one error type occurred for all 10 miscues, the percentage would be 10×10=100%.
The image on the right shows a sample Passage Reading Fluency (PRF) passage. This type of reading CBM may also be known as Oral Reading Fluency (ORF).

Janet’s teacher followed standard PRF administration procedures. Additionally, she wrote the word Jamie actually said above the “/” marking each miscue. Although Janet made 15 errors during the assessment, her teacher will only analyze the first 10.
Janet’s teacher recorded and analyzed the first 10 mistakes on the Quick Miscue Analysis Table. For example, Janet’s first error was saying “extra” instead of “exciting.” This is a graphophonetic error because both words start with the same sound, “ex.” It is also a syntactic error because grammar is preserved—“extra” can be an adjective like the written word “exciting.” However, this is not a semantic error because the meaning is changed.

The percentage of the time Janet’s errors were graphophonetic, syntactic, or semantic error is calculated at the bottom of the table. Every error was graphophonetic, so 10*10 = 100%. In the Syntactic column, 9 “yes” answers represent 90% of the 10 errors. In the last column, 2 “yes” answers indicates that 20% of the errors were semantic. Calculating the percentages allows teachers to glance at the various types of miscues and spot trends in student errors.

What patterns do you see in Janet’s miscues?
From the miscue analysis, the teacher gains insight into the strengths and weaknesses of the student's reading. Janet appears to rely on graphophonetic cues (especially at the beginning and ending of words) and knowledge of syntax for identifying unknown words. However, her reading does not make sense. Her errors generally do not have the same meaning of the written word and often do not make sense in the context of the story.
While Janet always includes at least one sound from the written word, especially the first, she often ignores the middle portion of unknown words. Her teacher could help her learn to sound out entire words, perhaps reading some words in isolation. This practice also might allow the teacher to identify any sounds that Janet struggles with.

Because Janet’s reading does not make sense, her teacher should help her learn to self-monitor and self-correct. Janet should ask herself whether the word makes sense given the context. Practice with the cloze procedure (similar to CBM Maze Fluency) may also assist her in focusing on comprehension. Recording Janet’s reading and having her listen to the recording also may help alert her to inaccuracies that do not make sense.
Now let’s practice with another sample PRF passage using the *Reading Miscue Analysis* handout. The examiner copy of this sample PRF passage is found under the Practice Activity on page 3. Use this to fill out the Quick Miscue Analysis Table on page 2 of the handout. We’ll check our answers on the next slide before discussing what they might tell us about this student’s reading.

*Give participants time to complete the table before moving to the next slide.*
Your miscue analysis table should look like this. Were any of your answers different?

Give participants time to check their answers. Clarify any misunderstandings.

Now, take a few minutes to think about what miscue analysis tells us about this student’s reading skills and needs.

Give students time to work in pairs or small groups before moving to the next slide.
Based on the first 10 miscues, the student inconsistently preserves the sounds of words. However, the spoken word or words always preserved the grammar of the written words and almost always preserved their meaning.

What can the teacher do about this? Based on the Quick Miscue Analysis Table, do you have any instructional recommendations for the teacher?

*Give participants time to generate a few recommendations. This may be done individually or in small groups.*
Based on the table, we can see that the student’s problem is mistakes on short, functional words rather than content words. The teacher might choose to practice discrimination between similar words (e.g., can/could, a/the) and similar phrases (e.g., my bus/ the bus, a wind/ the wind). The teacher might also choose to have the student echo read and complete writing and spelling exercises to master common short, functional words.
Now, let’s discuss analyzing computation errors to better understand math skills and needs. This section includes—

• A review of scoring correct digits in computation CBMs
• Examples of analyzing computation errors to make instructional recommendations
• A practice activity
Computation probes can tell us more than if an answer is right or wrong. We want to know what types of errors are made, and why. Was this a one-time miscalculation, or is it a persistent error that indicates an important misunderstanding of a math concept or operation?

Marking an answer as simply incorrect may mask the steps the student can perform correctly. We gain more information when we evaluate each numeral in every answer. Identifying patterns in correct and incorrect digits can help identify target skills for instruction.

When the student has worked out the problem step by step, additional analysis is possible. You may be able to identify a particular step where the student made a mistake.

Note: the next four slides review scoring digits correct. This review may not be necessary if participants have already gone through Part 1 of this module, “Administering Academic Progress Monitoring Measures.”
Correct digits are underlined in the table.

Correct digits must have the correct numeral in the correct position, scoring left to right. In the example, the last two answers both have 2 correct numerals, 4 and 1, but the last answer is only awarded one correct digit because the 4 is out of place.

For more detailed instructions on administering and scoring computation CBMs, see Part 1 of this module, “Administering Academic Progress Monitoring Measures.” The handout “Computation Scoring Rules” provides a summary and practice problems with answers.
The whole number part of the answer is scored left to right. This means that both students have one correct digit from this section, although they are in different places. While both students have a numeral correct in the remainder, only the second student is awarded an additional correct digit because the remainder is scored right to left.
Even though the first student has two correct numerals, one on each side of the decimal point, no correct digits are awarded because they are not in the correct position.
Student answers are color coded so that green digits are correct and red digits are incorrect.

Both students scored correct digits, but in different parts of the answer.
Look at this addition problem. The correct answer is 218, which has a maximum of 3 correct digits. On the right, we have Jim’s solution. Two of the three digits are correct. What does this tell us that that we would not have learned if we only marked the answer as wrong?

Give participants time to analyze Jim’s answer and answer the question. Discuss as a group.

The digit in the ones place is correct, so the student knows that 5+3 = 8. He may have memorized this specific fact or he may more generally know how to add single digit numbers without regrouping. Examining other addition problems Jim has completed will let us know. The next digit in the center is also correct. This could mean that he knows that 2+9=11. However, he missed the first digit because he did not carry the 1 to the hundreds place. Let’s look at a similar problem to see if he made a similar mistake.
Here’s another addition problem. The correct answer is 475, which has a maximum of 3 correct digits. On the right, we have Jim’s solution. How many correct digits did Jim get this time? How does this compare to the problem we saw on the previous slide?

Give participants time to score and discuss in small groups.

Two of the three digits are correct. The ones place is correct, suggesting that he knows that 6+9=15. However, because he once again forgot to carry the 1, the middle digit is incorrect even though 5+1=6. What implications does this have for Jim’s mathematics instruction?

Give participants time to think and discuss in small groups.

In both multi-digit addition problems, when Jim added two single digit numbers that resulted in a two-digit sum, he forgot to carry the 1 to the next place value. Jim will likely benefit from explicit instruction, practice, and corrective feedback in multi-digit addition with regrouping.
Three students answered the same question in three different ways. Although Student B and Student C both got the answer wrong, Student B answered 3 digits correctly compared to 2 digits for Student C. Could this difference reflect different math knowledge for the two students? Take a moment to analyze both answers. Does Student B know something that student C does not? Give participants time to review these solutions and think about the question. Discuss as a group.

The solutions at the center and the right are both wrong, but for different reasons. Student B seems to know that in the 10s column, 0 – 4 becomes 10 – 4 = 6. However, the student forgot to regroup from the 5 in the hundreds column (which Student A did correctly). For Student C, it is unclear if he approached the tens column by adding 0 and 4 or by subtracting 0 from 4. This is where follow-up questioning on strategies can be useful.

Given these different errors, how might your instructional recommendations differ for these students? Give participants time to think of possible recommendations. Discuss as a group.

Student B forgot to borrow. Was this a one-time mistake, or does he not know this rule? Look for other problems of the same type and see if there is a pattern. If needed, administer more examples of this problem type. If this is a recurring error, we need to reteach and practice borrowing. For Student C, we want to start with augmenting questions. Did he misread the 10s column as 4-0 instead of 0-4? Does he always subtract the smaller number from the larger number regardless of order? If this is a consistent problem, Student C may need support with the basics of multidigit subtraction, including the order in which the numbers are subtracted and borrowing.
Let’s see how Martha solved a multiplication problem with decimals. The correct answer is on the left. What is the maximum number of correct digits? Give participants time to answer.

This problem has 4 correct digits. The decimal point does not count as a digit, but it does determine the place numerals need to be in to be scored correct. (See Part 1). Now let’s look at Martha’s answer. How did she do? Give participants time to score Martha’s answer.

While she got all numerals correct, they were in the wrong place relative to the decimal point, so she scored 0 correct digits. Compare the two answers and think about what kind of math supports Martha might need. Give participants time discuss in small groups.

The score of 0 CD might suggest Martha didn’t understand the problem at all, but the correct numerals suggest that she got the basic multiplication right. She even carried the 1 for 3*4=12, adding it to the 24 for 6*4. Instead, her problem was with the decimal point. She only included the tenths place in her answer, perhaps to match the factors (or the multiplicand and multiplier), which both had only one numeral to the right of the decimal point. Martha needs to know the rule for moving the decimal point over to reflect both factors, and the reason for the rule so she can check future work to see if it makes sense. Instruction should also address number sense for decimals. Because .4 is less than 1, multiplying 63.2 by .4 will result in a smaller number, but Martha’s answer was larger.
Let’s Practice

- Score the correct digits in each student response to complete the table on page 1 of the handout.
- Answer the questions on page 2 of the handout.

See handout: Computation Error Analysis Practice.

Alternatively or additionally, have participants analyze a real student’s work sample.

For the handout activity, give participants time to complete the worksheet individually or in small groups, then move to the answers and discussions on the following slides.
First, let’s review your scoring for each item in the table.

*Clarify scoring as needed.*

Possible correct digits per item:
1. 4 correct digits
2. 4 correct digits
3. 2 correct digits
Clarify scoring as needed.

Possible correct digits per item:

4. 3 correct digits (one for the whole number, one for the numerator, one for the denominator)

5. 3 correct digits (two for the whole number, one for the remainder; the R serves as a placeholder, not a correct digit)

6. 2 correct digits (one to left of the decimal point and one to the right; the decimal point serves as a placeholder, not a correct digit)
What does this analysis tell us?

- Whose errors were more significant?
- What would be your instructional recommendations for each student?
- What additional data would help plan instruction?

Animated slide. Click at underlined text

How did you answer question 1 on the handout? What made you think one student struggled more than another?

Give participants time to share.

A simple first step to answering this questions is comparing the number of correct digits for each student. Student 1 scored fewer digits on almost every problem.

Next, we ask what these data tell us about the student’s math skills and understanding, and if we need more data to plan instruction. Did any of you move beyond correct digits and analyze individual problems?

Give participants time to share. Discuss as a group. As time allows, review each item on the following slides.

Let’s look at each problem one at a time to see if we can find where the student made the error and what that might mean for instruction.
As time allows, give participants time to discuss their thoughts about each item in terms of instructional recommendations or additional data needed.

Student 1’s answer is what we’d expect if the student forgot to carry the 1 when adding 8+8=16. This single error made the student miss the two digits in the tens and hundreds places. If this is a consistent error, the student will likely need explicit instruction and practice in multidigit addition with regrouping.

Student 2 carried the 1 from the ones column, so the first three digits are correct. However, the student incorrectly added 8+8. If this was not a one-time error, the student may need to practice basic addition facts with error correction.
To answer this problem, you need to regroup from the 3 in the hundreds place to convert 2-6 to 12-6. Student 2 correctly subtracted 12-6=6 for the tens place but did not borrow, resulting in an error in the hundreds place. The student should receive corrective feedback on this error. If it is a recurring problem, the student may need additional instruction and practice with borrowing.

Student 1, however, did not appear to regroup. It seems the student instead subtracted the smaller number from the larger, regardless of the order. In this case, for the tens place, the student solved for 6-2 instead of 2-6. This student will need more basic instruction in how to approach subtraction problems.
Student 1 appears to have added instead of multiplying. We should check if this reflects a problem with attention, the symbol, or the concept of multiplication.

Student 2 may simply have mis-remembered this specific multiplication fact, since the answer was close. This student may benefit from additional fluency-focused fact practice with corrective feedback.
Student 1 added the digits in each place—whole number, numerator, and denominator—instead of only adding the numerators of the fractions. This student appears to need explicit instruction in adding fractions with the same denominator.

Student 2 added correctly but did not reduce the answer. This student may need instruction on how to convert improper fractions to mixed numbers.
Student 1’s solution is close to the correct answer (the whole number digits are correct), so s/he appears to understand the basic concept of division. However, s/he did not provide a remainder or show any steps towards finding the remainder.

Student 2 attempted to find the remainder and knew to work across the place values. However, the student worked right to left instead of left to right.

Both students need explicit instruction in how to divide with remainders. Student 2 may also need help with estimation skills and checking work so that s/he can realize that his or her original solution did not make sense (21*3 =63, which is not close to 83).
Neither student carried over to the ones column after adding 9+3 in the tenths column. Student 1 seems to know 9+3=12, but putting 12 after the decimal point suggests the student does not understand decimal place values and the need to regroup. Student 2 put the 2 digit in the correct place but did not carry to the ones place. We’d want to confirm the student knew 9+3=12 and then find out why he/she wrote the 2 in the correct place without carrying the 1. This is a situation where we could use augmenting questions to investigate the student’s strategy for solving this problem (e.g., How did you get this answer?).

Before we make instructional recommendations, is there anything else we need to know? Give participants time to share thoughts on useful additional data then click to bring up bullets.

Rather than planning intervention based on one occurrence of a specific error, we first want to ask, “Is this error type consistent?” We can analyze other CBM probes that include this problem type to see if the student regularly makes this error. If so, the student needs support in this area.

Next, we might ask, “Why does the student make this type of error?” If error analysis of the computation problems does not suggest a clear skill deficit, we might want to ask augmenting questions to find out how the student approaches this problem, including when they decide to use a specific strategy and each step they use. It may be that the problem reflects only one small component within the broader strategy. When this is not enough to identify specific needs, we may consider more formal diagnostic assessment. Our error analysis can guide our selection of a diagnostic tool.
What instruction would you plan for each student? How are your recommendations similar and different for each student?

*Give participants time to share their thoughts.*

If these are consistent errors, the students may benefit from the following.

*Click to bring up recommendations.*

The students need instruction in some of the same skills. In general, however, Student 2 had a basic understanding of the basic strategy for solving most problem types. Student 1 needs much more foundational instruction in how to approach these computation problems, as well as understanding of fractions and decimals.
For more information on intensifying academic intervention, see “Designing and Delivering Intervention for Students with Severe and Persistent Academic Needs (DBI Training Series Module 7),” at http://www.intensiveintervention.org/resource/designing-and-delivering-intervention-students-severe-and-persistent-academic-needs-dbi
Analyzing CBM miscues may help us identify skill deficits by revealing error patterns or by suggesting the need for more formal diagnostic assessment in a specific area. Once we know the student’s needs, we can plan instruction that addresses those needs. This will be addressed in the next part of this module, “Part 4: Identifying Target Skills.”
Disclaimer

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