

# The Elementary Mathematics Diagnostic Interview (EMDI)

## About the Tool

The **Elementary Mathematics Diagnostic Interview (EMDI)** is a collection of interview protocols and materials to be administered by teachers to students in grades pre-kindergarten to five. The interview items focus on number and rational number content from the Common Core Standards for Mathematics. This screening tool is intended to help a teacher gather information about a student's understandings and difficulties in order to plan instruction that builds on the strengths to address the difficulties. Some schools use the interview as a universal screener administered by a mathematics interventionist. Other schools use the screening interview with a subset of struggling learners. These EMDI interview protocols and materials were developed in collaboration with Maine Department of Education (DOE), Maine Mathematics and Science Alliance (MMSA) and Education Development Center (EDC) and draw on prior work of the MMSA's Early Mathematics Thinking (EMT)

## The Protocol and Materials

For each grade, there are four documents: The EMDI Screening Questions, EMDI Questions/Recording Sheet, EMDI Materials, and EMDI Scoring Guide. For Pre-K, there is an additional set of foundational questions. A description and sample of each of these three documents follow:

### 1. The EMDI Screening Questions

This document provides the grade level questions to be asked to students during the interview. Each interview includes 8-10 questions, many of these have several parts. In addition, related items from the prior grade level are also provided. Including these questions, allows teachers to ask a more foundational question if a student is struggling with the grade level item. The grade level questions are color-coded with a green bar and the prior grade items use yellow color-coding. This screening questions document also provides a list of the materials for each item. Here is a sample of this document:

EMDI Screening Questions: Grade 2	
Green = grade level prompts; Yellow = prior grade level prompts.	
<b>1_G2. Forward Number Sequence</b>	<b>Materials:</b> None needed
A. "Start at 40 and count by fives. I will tell you when to stop." (Stop at 125.) B. "Start at 7 and count by tens. I will tell you when to stop." (Stop at 77.) C. "Start at 406 and count by hundreds. I will tell when you to stop." (Stop at 1,006.)	
<b>Forward Number Sequence (1_G1)</b>	<b>Materials:</b> None needed
A. "Start at 86 and count on. I will tell you when to stop." (Stop the student at 120 or earlier if struggling) B. "When you count, what number comes right after 17?" C. "When you count, what number comes right after 39?" D. "Start at 7 and count up by 10s. I'll tell you when to stop." (Stop the student at 77)	
<b>2_G2. Backward Number Sequence</b>	<b>Materials:</b> None needed
A. "Start at 238 and count down by tens. I will tell when you to stop." (Stop at 138.) B. "Start at 512 and count down by one hundreds. I will tell when you to stop." (Stop at 112.)	
<b>Backward Number Sequence (2_G1)</b>	<b>Materials:</b> None needed
A. "Start at 50 and count down by tens." B. "Start at 68 and count down by tens. I'll tell you when to stop." (Stop the student at 18)	
<b>3_G2. Number Identification</b>	<b>Materials:</b> paper and pencil
A. "Write three hundred twenty-nine." B. "Write four-hundred fifteen." C. "Write eight hundred six." D. "Write nine hundred forty."	
<b>Number Identification (3_G1)</b>	<b>Materials:</b> paper and pencil
A. "Write the number twenty-nine." B. "Write the number sixty." C. "Write the number one hundred four." D. "Write the number one hundred fifteen."	

2. The EMDI Questions/Recording Sheet

This document provides the screening questions alongside a recording sheet for noting abilities, challenges, strategies and other notes. This will serve as a teacher’s record of the student’s responses to each interview question. Here is a sample of this document:

EMDI Questions/Recording Sheet: Grade 2

Green = Grade Level prompts; Yellow = Prior Grade Level prompts.

1_G2. Forward Number Sequence			Materials: None needed		
A. "Start at 40 and count by fives. I will tell you when to stop." (Stop at 125.)					
B. "Start at 7 and count by tens. I will tell you when to stop." (Stop at 77.)					
C. "Start at 406 and count by hundreds. I will tell when you to stop." (Stop at 1,006.)					
Abilities		Challenges/Strategies		Notes	
<input type="checkbox"/> Counts from 40 to 125 by 5s fluently.		<input type="checkbox"/> Correctly counts by 5s from 40 to _____			
<input type="checkbox"/> Counts from 7 to 77 by 10s fluently.		Switches to tens - Drops back to count. - Other			
<input type="checkbox"/> Counts from 406 to 1006 by 100s fluently.		<input type="checkbox"/> Correctly counts by 10s from 7 to _____			
		Drops back to count. - Uses fingers to count. - Other			
<input type="checkbox"/> Correctly counts by 100s from 406 to _____		<input type="checkbox"/> Correctly counts by 100s from 406 to _____			
Forward Number Sequence (1_G1)			Materials: None needed		
A. "Start at 86 and count on. I will tell you when to stop." (Stop at 120.)					
B. "When you count, what number comes right after 17?"					
C. "When you count, what number comes right after 39?"					
D. "Start at 7 and count up by 10s. I'll tell you when to stop." (Stop at 77.)					
Abilities		Challenges/Strategies		Notes	
<input type="checkbox"/> Counts from 86 to 120 fluently.		<input type="checkbox"/> Correctly counts from 86 to _____			
<input type="checkbox"/> After 17 is 18.		Drops back to count. - Uses fingers to count. - Other			
<input type="checkbox"/> After 39 is 40.		<input type="checkbox"/> After 17 is _____			
<input type="checkbox"/> Counts from 7 to 77 by 10s fluently.		<input type="checkbox"/> After 39 is _____			
		<input type="checkbox"/> Correctly counts by 10s from 7 to _____			
		Drops back to count. - Uses fingers to count. - Other			
2_G2. Backward Number Sequence			Materials: None needed		
A. "Start at 238 and count down by tens. I will tell when you to stop." (Stop at 138.)					
B. "Start at 512 and count down by one hundreds. I will tell when you to stop." (Stop at 112.)					
Abilities		Challenges/Strategies		Notes	
<input type="checkbox"/> Correctly counts back from 238 by 10s fluently.		<input type="checkbox"/> Counts back from 238 to _____			
<input type="checkbox"/> Correctly counts back from 512 by 100s fluently.		<input type="checkbox"/> Unable to count back by 10s.			
		<input type="checkbox"/> Counts back from 512 to _____			
		<input type="checkbox"/> Unable to count back by 100s.			

3. The EMDI Materials

This document provides the screening cards needed for the interview. Teachers should print this document back-to-back on card stock and cut the cards. If copied properly, the back of the card will have a code to show which question the card pertains to. The first number is the code is the item number and the second code is the grade. For example, a card marked 1\_G4 is to be used with item #1 from the Grade 4 screener. In addition to the screening cards, teachers should collect and organize other materials and manipulatives required for the interview that are listed on the screening questions. Here is a sample of this document:

503

235

416

875

509

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## **Why an interview?**

The EMDI screening tool was designed as an interview protocol to provide an opportunity for teachers to listen to and see student thinking and work while it is underway. Many of the interview items also include follow-up prompts designed to gather more evidence of student thinking. Below is some information and suggestions for conducting screening interviews.

### **Interview Goals**

- To gather information about the student's strengths and difficulties with number content
- To inform plans for future instruction and interventions that are targeted to the student's strengths and difficulties.
- The immediate goal of the interview is to elicit the student's thinking and *NOT* to provide instruction in response to what you hear or to help the student get a correct answer.

### **A. Selecting Items**

Each interview protocol has been limited to ensure it can be administered by teachers and completed by students in a reasonable amount of time. Teachers should avoid screening sessions that become too long. For students who work slowly, or for longer protocols, teachers might select a subset of priority items or plan for multiple sittings to complete the interview. If a student is struggling significantly on an item, the teacher may choose to skip that item and use a related item, if provided, from the prior grade. In preparation for conducting the interview, teachers should complete the items themselves and think about what students will need to do to answer each question.

### **B. Follow-Up Prompts**

The goal of the screening interview is to support and encourage the student to share his/her thinking, but *not* to provide instruction. Encourage the student to "think aloud" as he/she works. Ask the follow-up questions that are provided (How did you figure out the answer?) when necessary if a student's strategy is unclear to your and/or to get the student to elaborate on his/her thinking.

### **C. Suggestions for Conducting Interviews**

- Set a relaxed environment and pace. If students feel stressed, they will not do their best thinking.
- Allow time for the student to work on the problems individually and respond to your follow-up questions.
- Encourage the student to explain his/her thinking as he/she is working.
- Reassure the student that it's fine to stop working on a problem when he/she has done all she can do. If he/she seems finished, ask: Are you ready to move on to the next problem?
- Avoid giving students feedback about whether their work is correct or not, reassuring them that being correct or incorrect is not what is important. What is important is that they are trying and sharing their thinking and be sure to thank them for doing that.

- Be flexible: move through the interview questions sequentially, but be open to using the prior grade level item as needed.
- Make students aware of the accompanying materials for each item and invite them to use them should they wish.
- Try not to give instruction so that you can see what the student can do independently.

#### **D. Suggestions for Starting the Screening Interview**

Here's an example of a way to introduce the screening interview to students:

"I would like to learn more about how you are thinking about some math topics. I will use this information to help me plan our next lessons. I would like for you to solve some problems while I watch and listen. Since I want to learn about your thinking I am hoping you will talk aloud your thinking as you go. It's ok if you have difficulties with the problem. When you've gotten as far as you can, you can just tell me that you have done as much as you can. I might ask you some questions to be sure that I have followed your thinking. You are helping me by telling me about your approach to the problem."

#### **E. Suggestions for Ending the Interview**

Here's an example of a way to close the interview.

"Thank you for sharing your work and thinking with me during this interview. It was very interesting to hear what you were thinking as you worked on the problems. I noticed that you [say something positive about what the student did on the problem.] I also noticed that [say something about a difficulty the student had] and I can help you with this. You did a nice job on this work today. Thank you."

## Frequently Asked Questions

Below are some responses to questions that users of the EMDI screening tools have asked us.

### ***How long will it take to administer the screening with a student?***

The developers are aiming for no more than 20 minutes to administer the screening with a child. The kindergarten screener may go more quickly. We are aware that the third and fourth grade screeners are probably too long and are pursuing a solution to that. We may scale back the number of items or provide guidance to teachers on how they might choose only a subset of items to administer. If you have clearly stated a question to a student and he or she is really struggling, it is probably an indication that the student has not learned or does not recall the content. After some appropriate wait time, it is fine to move on to the next sub-question or question on the screener, reassuring the student that it's okay if he or she does not answer each item.

### ***When should I give the screening interview?***

There are different ways that the screener can be used. Many teachers like to use the interview early in the school year to assess student understanding/retention of the prior grade's content in advance of planning their instruction or intervention. In this case, they use the screener from the prior grade level. Teachers often use a subset of screening items after instruction on that topic. Many teachers also choose to give the screening later in the year to assess grade level content understandings and difficulties.

### ***Is it okay to switch the sequence of the cards around within a question?***

In most cases the cards have been intentionally sequenced and should be administered in the order indicated on the screener. If you have suggestions about re-sequencing any of the items, we would love to hear from you.

### ***Is it okay to change the wording or add additional questions to the screening items?***

While the screeners are being revised based on your experiences with them, many of these items have been widely field tested and a lot of consideration has gone into wording choice. Please try to use them as they are and share feedback and suggestions for changes. We caution you not to add too many additional follow up (probing questions), keeping in mind that this is an assessment, not an instructional tool. You will have more opportunities to learn about and respond to student thinking through your classroom activities. Staying to the script as much as possible will help to ensure that the screening can be completed in a reasonable amount of time.

***Can I have students read the story problems themselves instead of reading the problems to them?***

The story problems are intended to assess a student's ability to make sense of a problem and solve it. Though students can certainly read along with you or reread the problem after you have read it aloud, the teacher should read the story problems to each student.

***Does every item include a follow up "How do you know?" question?***

While some do, not every question has a "How do you know?" or a "How did you figure out the answer?" question. With fact fluency items, asking how do you know is unnecessary and potentially confusing since it may be a learned fact. For questions that include the follow up prompt, you should try to get an explanation from the student. First allow students to share their answer, and ask the follow up prompt when the student's approach or reasoning is not revealed in their explanation.

***What responses should I expect a student to give to the follow up "how do you know" questions?***

We plan to develop teacher support materials to guide teachers in interpreting student responses and look forward to your input in order to develop these. As questions arise, we would be glad if you shared them. For example, on the kindergarten screener, teachers wondered what kind of response is expected from students on an item in which students are asked to compare two dot cards and answer which is greater. Students often say that "this one is three and this one is five." and they wondered if this is ample. This response supports some understanding and you know the student has not just guessed. As you administer the screener more, you will gain experience with common student responses and varying levels of sophistication in responses.

***Why is there such little paper and pencil work since it is expected in the higher grade levels?***

The screener is intended to be fairly quickly administered while allowing for time for follow up questions to the student. This assessment is focused on eliciting students' thinking about problems rather than their ability to show or express their thinking in writing. When indicated on the materials list of each item, paper and pencil can be a tool that is available to students.

***Why does the grade 3 (grade level) screener not have whole numbers only fractions in the number ID section?***

There are no whole numbers on the grade level screener because the Common Core Standards shifts focus to fractions at this grade level:

CCSS.MATH.CONTENT.3.NF.A.1

Understand a fraction  $\frac{1}{b}$  as the quantity formed by 1 part when a whole is

partitioned into  $b$  equal parts; understand a fraction  $a/b$  as the quantity formed by  $a$  parts of size  $1/b$ .

CCSS.MATH.CONTENT.3.NF.A.2

Understand a fraction as a number on the number line; represent fractions on a number line diagram.

It would be fine to use screening questions from prior grades with students who struggle with grade level fraction items. A guiding principle in each collection of screening questions is limiting the number of items included in order to keep administration of the screener manageable for you and your students.

***Do you use base-ten blocks if students have never used these before?***

For the tasks that use the base-ten blocks, this is a tool to check understanding of tens and ones (unitizing). If it becomes clear that the student may not be experienced with them, you do not necessarily have to ask all four questions but it is possible they may be able to answer some and not others.

***Do you tell students if they are correct or incorrect?***

It's understandable that students will seek feedback on how they are doing. This may be more common with older students who have grown accustomed to it. Before beginning the screening it is helpful to share with students that the purpose is for them to share their thinking about these problems so that you can plan activities and lessons for math class. Tell them that you are not recording or grading whether they are right or wrong but rather you are taking notes on their approaches so you can remember when planning. Avoid telling students whether they are correct or incorrect on an item, but thank them for sharing their thinking.