

Assessment for Learning in Mathematics:

What should I do next?

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All scenarios used in this workshop were taken from Vallim Reis Camargo, M. M. (2018). Surveying mathematics teachers' knowledge of formative assessment: a study of teachers in the Federal District of Brazil (Doctoral thesis).

<https://doi.org/10.17863/CAM.26004>



What is Assessment for Learning?



Better next steps



An assessment functions formatively to the extent that **evidence** about student achievement is **elicited**, interpreted and used by **teachers, learners or their peers** to make decisions about the **next steps** in instruction that are likely to be **better, or better founded**, than the decisions they would have made in the absence of that evidence



Black, P.J. & Wiliam, D. (2009). Developing the theory of formative assessment. *Educational Assessment, Evaluation and Accountability*, 21(1), 5-31

Scenario 1

Teacher A was teaching their students how to solve linear inequalities. However, when looking through some worksheets, Teacher A observed that the majority of the class were making mistakes. See some examples of how they were solving them:

1. $17 - 2x > 25$

$$-2x > 25 - 17$$

$$-2x > 8$$

$$x > -4$$

2. $23 + x < 3x - 9$

$$x - 3x < -9 - 23$$

$$-2x < -32$$

$$x < 16$$

What's going on here?

- ▶ What's the mistake?
- ▶ How can we interpret it?
- ▶ Why could learners be making this mistake?

What should Teacher A do next?

What did Teacher A do next?

Teacher A decided that the best strategy would be to go over the content with the whole group. At the beginning of the next lesson, Teacher A said:

“We will begin our lesson remembering how to solve inequalities because I noticed that some students had trouble solving them in the last class activity.”

What should Teacher A do next?

What’s the best way to go over the content with the whole group?

Scenario 2

Teacher B has been teaching their students how to divide by fractions. For the next lesson, Teacher B has decided to assess whether the students know how to divide by $\frac{1}{2}$.

For that, Teacher B has developed three problems:

1. You want to split 1 pie and a half evenly between two friends. How much will each friend get?
2. You have £1.25 and may soon double your money. How much will you end up with?
3. Your mother is making cake and the recipe calls for two and a half cups of butter. How many measures of butter will she need, knowing that each measure equals half a cup?

At the beginning of the next lesson, Teacher B wrote on the board:



Scenario 2 continued

Teacher B then gave the activity to students and put them into trios so they could solve the exercises together. Meanwhile, Teacher B walked around the room answering questions and observing students.

When passing by the trio of Students 1, 2 and 3, she heard the following conversation:

Conversation

Student 1: “You want to split 1 pie and a half evenly between two friends. How much will each friend get?”

Student 2: “We just need to do $1 + \frac{1}{2}$ and divide by $\frac{1}{2}$.”

Student 1: “uhum.”

Student 3: “No, guys. I want to divide it between 2 friends. So we have to do $1 + \frac{1}{2}$ and divide by 2.”

Student 1: “But it is written on the board that the exercises are to divide by half. So we have to divide by half.”

Student 3: “But it is also written that we need to read and interpret the problems, so I think it’s a tricky one.”

Student 2: “Ok... but even though... if I want to divide into two friends, I want to divide by half, which is what I have said since the beginning.”

What should Teacher B do next?

Scenario 3

Before moving forward with the content, Teacher C has decided to use a peer-assessment strategy to assess whether the students know how to identify and apply the definitions and properties of radius and/or diameter to calculate length and area of a circle.

For that, Teacher C prepared the following activity:

Circle and circumference activity

1. A disc has a diameter of 11.8 cm. The length of the circumference is approximately:

- a) 3.6 cm
- b) 37.1 cm
- c) 74.1 cm
- d) 11.8 cm



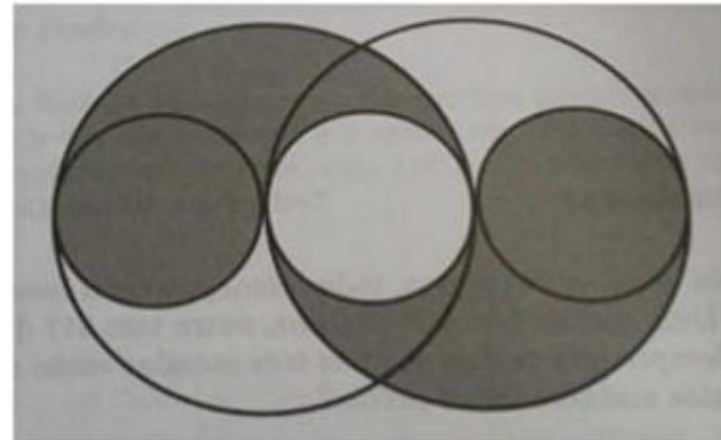
2. A pool has a circular shape. Knowing that its radius is equal to 3.5 m, it can be said that the area of the bottom of the pool is:

- a) 3.8465 m²
- b) 38.465 m²
- c) 384.65 m²
- d) 3846.5 m²



Use $\pi = 3.14$

3. Below, we have large and small circles. The large circles have radius 2, and the small radius 1. What is the area of the region painted dark grey?



At the beginning of the lesson...

Teacher C handed the activity to the students and asked them to solve individually. When they finished, Teacher C said:

“Now, you will exchange the activity with a colleague. You will analyse their answers, decide whether they are correct, incomplete or wrong and write a comment explaining your rationale. After that, I will collect the activities so I can analyse them myself.”

Whilst analysing, Teacher C read interesting comments, like [Chloe's and Derek's](#).

What's going on here?

Scenario 3 continued

In the next lesson, Teacher C brought all the activities back. Before returning them to the students, Teacher C said:

“Yesterday, I had the opportunity to review all activities from our last lesson and I found very interesting solutions and comments. Now, I will pass them back so you can re-do them using your partner’s comments. If you do not understand or do not agree with something, please discuss it with your partner.”

When they had concluded this step, Teacher C observed that students focussed their discussions around question 3 only.

Why?

Scenario 4

Student 4 typically does very well in mathematics. However, they have a tendency to start slowly because Student 4 is often somewhat overwhelmed by new concepts.

Student 4 received a 5 on the first quiz of the term and 6 in the second one. Their father approached them because he was a little concerned as Student 4 usually gets more than that.

Father: “I noticed that your marks in the last maths quizzes were not as high as they usually are. How can I help you?”

Student 4: “Don’t worry, dad. Teacher D explained that soon we will have an end-of-term test. The teacher will divide the test into sections with each section representing a previous quiz. If I do better in a particular section than I did in the corresponding quiz, my grade for that section will replace the grade from the quiz.”

Scenario 4 continued...

Student 4's father was happy with their confidence but was not very sure why Teacher D would replace the grades. The father then decided to go to school to talk to Teacher D.

How would you answer Student 4's dad?

How would you advise students on how to use the quizzes to improve their learning?

Scenario 5

Teacher E wanted to revise fractions and percentages with one of their classes. For that, Teacher E decided to ask students to develop some problems so they could solve them together in the classroom.

However, for students to be able to do the activity it was necessary to establish some criteria that the questions should meet.

How should Teacher E establish the criteria?

The criteria

Together with the students, they defined the following criteria:

The students should develop, in pairs, 4 questions meeting the following criteria:

1. The questions should approach the content of fractions and/or percentages;
2. The questions should be contextualised;
3. The question can be either open-ended or multiple-choice;
4. You should present at least one solution for each question.

In the next lesson, Teacher E decided to select some of those questions to solve with the students on the board.

Teacher E started with the following:

The question

Julie wasn't behaving very well and her father decided to decrease her allowance by 7% each month successively, for three months. If she used to get £50, how much will she get in the third month?



Scenario 5 continued...

Student 5 began participating:

Student 5: “We need to find 7% of 50 and then multiply by 3.”

Teacher E: “And what do you need to do first?”

Student 5: “Take it away from 50.”

What’s going on here?

Teacher E records the two steps on the board saying:

“This gives the amount after the first month of decrease. We would need to do the same process again and again to get the amount after three months.”

After that, Student 6 engaged in the discussion:

“Instead of timesing by 0.07 loads of times, we could times by 0.21.”

What should Teacher E do next?

And the dialogue continued...

Teacher E: “Can you show me how you came up with 0.21, **Student 6**? Tell me why you think this may work in this case.”

Student 6: “The problem says three months. 3 times 0.07 is 0.21.”

Teacher E: “Yes, I agree with you: 0.21 is 3 times 0.07, but do you think this is what the problem is asking?”

Student 6: “Well... the problem says 3 months, that’s why I thought I had to multiply by 3.”

Teacher E: “It says 3 months, **Student 6**, but it’s 7% in each month, and not all in the end of the third month, ok?”

Student 6: “Ah ... I get it. So we need first to take away 7% and then 7% again and 7% again.”

What should Teacher E do next?

What would you do differently in your classroom as a result of today?



If you want to learn more...

- ▶ Assessment for Learning Enrichment workshop
- ▶ Metacognition Enrichment workshop
- ▶ <https://www.cambridgeinternational.org/support-and-training-for-schools/training/enrichment-professional-development/>
- ▶ <https://www.cambridgeinternational.org/support-and-training-for-schools/teaching-cambridge-at-your-school/education-briefs/>
- ▶ <https://www.cambridgeinternational.org/support-and-training-for-schools/teaching-cambridge-at-your-school/getting-started-with/>



Any questions?

THANK YOU

