Asking Questions to Guide Thinking

[Description]

Asking thoughtful questions to guide students' thinking encourages deeper understanding and helps students develop problem-solving skills. In this lesson, you will practice asking questions that prompt students to reflect on their reasoning.

- **Explain** why guiding with questions enhances student reasoning and problem-solving skills.
- **Identify** effective questioning strategies that focus on process, reflection, and exploration.

[Use this green color for any comments that should not be included in the generated lesson.]

[Text]

Scenario 1

You're tutoring a student named Matthias, who is working on solving the algebraic equation:

$4(x + 3) - 2 = 18$

Matthias attempts to solve the equation by incorrectly dividing both sides of the equation by 4.

Matthias pauses as he is unsure of his approach.

[Image]

[image link]
Description: student working on a math problem

[Question - Open Ended]

1. What specific questions would you ask the student to help guide their thinking?

[Question - MCQ]

2. Which of the following questions would best guide a student's thinking?

    A) *"Matthias, that's not quite right. What do you think about adding 2 to both sides first?"*

    B) ***"Matthias, what is another operation we should do first before dividing?"***

    C) *"Don't worry, you'll understand if you just practice more problems like this one. Do you want an easier problem to solve?"*

    D) *"It's fine. Let's skip this question and move to the next problem. What do you think?"*

[Question - Open Ended]

3. Why do you think the strategy you selected in the previous question will best guide the student's thinking and encourage them to explore their reasoning?

[Question - MCQ]

4. Which of the following statements aligns with the rationale you chose and explained in the previous two questions?

    A) It's okay if students don't fully understand the method as long as they can repeat the steps.

    B) **Asking questions to guide students to reflect on their reasoning and become better problem-solvers.**

    C) Using simpler problems first builds the student's confidence to do harder problems later and guides them in the right direction.

    D) Guiding students to the correct steps right away ensures they learn the method without struggling.

[Text]

Research shows that asking questions to guide thinking promotes **deeper understanding and problem-solving skills**. Questions that encourage students to explain their reasoning or explore alternatives foster **metacognition**—thinking about their own thinking. This process helps them identify gaps, strengthen knowledge, and develop flexible strategies (Chi et al., 1997; Dillon, 1975).

For these reasons, In the scenario above, the most effective strategy is:

"Matthias, what is another operation we should do first before dividing?"

A recent study of *Tutor CoPilot*, a human–AI system that provides tutors with real-time, expert-like guidance during live tutoring sessions, offers further evidence on effective tutor

actions. Tutors who guided with reflective questions and prompts were more likely to use high-quality teaching practices that engaged students productively. Importantly, less-experienced tutors using these strategies helped their students achieve up to 9 percentage points higher mastery rates compared to those in the control group (Wang et al., 2024).

Effective guiding questions should:

- Be open-ended to encourage detailed responses.
- Focus on the process, not just the answer.
- Be non-judgmental to create a safe space for students to share their thoughts.
- Encourage students to reflect on their reasoning and explore alternative methods.

Here are some examples of effective questions:

- *Why did you choose this approach to solve the problem?*
- *What would happen if you tried a different method?*
- *How does this step connect to the overall solution?*
- *What would you do differently if you encountered a similar problem?*

[Question - Open Ended]

5. In your own words, explain why asking questions to guide students' thinking is important for their learning.

[Question - Likert]

6.How much do you agree or disagree with the expert belief that "Asking questions to guide students' thinking enhances their problem-solving skills and deepens their understanding"?

- Strongly disagree
- Somewhat disagree
- No opinion
- Somewhat agree
- Strongly agree

[Question - Open Ended]

7. Explain why you agree or disagree.

[Question - MCQ]

8. To confirm you're paying attention, please select "Somewhat agree" below.
   A) Strongly disagree
   B) Somewhat disagree
   C) No opinion
   D) Somewhat agree

[Text]

Scenario 2

You're tutoring a student named Tvisha. She is solving a geometry problem involving determining the width of a rectangle. The rectangle has a length of 10 units and an unknown width. The total area of the rectangle is 100 square units.

Tvisha correctly explains how to solve the problem:

Tvisha: "I divided the area by the length to find the width. So, I divided 100 by 10 and found the width to be 10."

However, Tvisha hesitates and appears uncertain.

[Image]

[image link]
Description: student working on a math problem

[Question - Open Ended]

9. What specific questions would you ask the student to help guide their thinking?

10. Which of the following questions would best guide a student's thinking?

A. *"Tvisha, you got the answer right, so why don't we just move on?"*
B. *"Tvisha, you already know how to do this. In that case, can you guide me to a problem you need help on?"*
C. **"Tvisha, if the total area was 120 square units with the same length, what would be the width?"**
D. *"Tvisha, can you just memorize that area divided by length always gives the width?"*

11. Why do you think the strategy you selected in the previous question will best guide the student's thinking and encourage them to explore their reasoning?

12. Which of the following statements aligns with the rationale you chose and explained in the previous two questions?

A. **Asking questions to guide thinking helps students reflect on their reasoning and expand their thinking.**
B. If a student gets the right answer, we can assume mastery and don't need to explore their reasoning further.
C. Correcting students immediately when they are wrong ensures they learn the right method.
D. Focusing on memorization is the most effective way for students to succeed, even if they don't fully understand why the formula works.

Conclusion & Feedback

Research supports the use of thoughtful, open-ended questions to guide students' thinking. This approach not only deepens understanding but also fosters confidence, flexibility, and persistence. By consistently asking reflective questions, tutors help students see that learning is about process as much as answers, setting them up for long-term success in problem-solving (Chi et al., 1997; Dillon, 1975).

For this reason, the best response to the above scenario is:

"Tvisha, if the total area was 120 square units with the same length, what would be the width?"

This type of question is effective because it encourages the student to reflect on their reasoning, expand their thinking, and explore alternative approaches. Over time, consistently guiding students with questions like these helps them become more independent learners who can monitor their own thinking, catch errors, and adapt strategies when needed.

Feedback

Please provide any feedback or comments related to this training module.

References:

1. Chi, M. T. H., Bassok, M., Lewis, M. W., Reimann, P., & Glaser, R. (1997). Self-explanations: How students study and use examples in learning to solve problems. Journal of the Learning Sciences, 6(2), 1-27. https://www.tandfonline.com/doi/abs/10.1207/s15327809jls0602_3

2. Dillon, J. T. (1975). The use of questions in educational discourse. Educational Leadership, 33(1), 1-15. https://www.tandfonline.com/doi/pdf/10.1080/01619567509538021

3. Wang, R. E., Ribeiro, A. T., Robinson, C. D., Loeb, S., & Demszky, D. (2024). Tutor copilot: A human-ai approach for scaling real-time expertise. *arXiv preprint arXiv:2410.03017.*