# Leveraging Exit Tickets to Enhance Students' Self-Regulated Learning & Mathematics Knowledge

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## Introduction

Many students struggle to accurately assess their understanding. Confidence calibration—the alignment between students' confidence and actual performance—offers a window into their monitoring accuracy. (Bol & Hacker, 2001; Erickson & Heit, 2015)

- **Gap:** Existing interventions to enhance monitoring are often time-intensive for routine use.

Our approach: Add confidence calibration prompts into a routine classroom activity.

- **An exit ticket** is a common classroom activity that includes a few questions for the day's lesson. (e.g., Wylie et al., 2009)

## Research Question

Can integrating a brief intervention into students' exit tickets improve their 1) math self-efficacy, 2) mastery goal orientation, 3) metacognitive evaluation, and 4) monitoring accuracy?

## Method

Participants were 61 ninth graders (52.5% male) from 5 periods of Integrated Math I classes taught by the same teacher.

Using a between-subject pretest-posttest design, students were randomly assigned within each class period to the treatment or control group.

Content: 7 exit tickets across lessons for 1 unit on Transformations and Symmetry

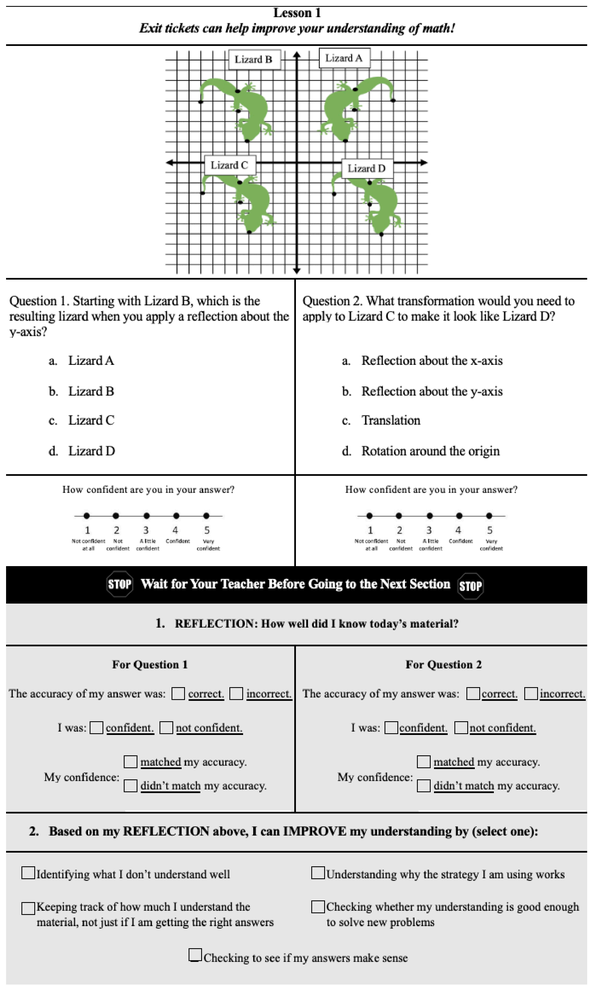
Dosage of exit tickets completed out of 7:
- <4 completed: 7% of participants
- 4-5 completed: 16%
- 6 completed: 16%
- 7 completed: 61%

## Outcomes and Design

Outcomes included:
- Pre/post surveys of students' self-efficacy, mastery goal orientation, and metacognitive strategy use (with Likert scales 1 to 5)
- Classroom unit test with confidence ratings on each item

For each exit ticket, the treatment group rated their confidence when solving problems, received accuracy feedback, and then completed reflection exercises. The control group completed business-as-usual exit tickets with accuracy feedback.

A sample treatment exit ticket is shown below:



**Lesson 1**

***Exit tickets can help improve your understanding of math!***

Lizard B | Lizard A | Lizard C | Lizard D

Question 1. Starting with Lizard B, which is the resulting lizard when you apply a reflection about the y-axis?

a. Lizard A
b. Lizard B
c. Lizard C
d. Lizard D

How confident are you in your answer? 1 (Not confident at all) 2 (Not confident) 3 (A little confident) 4 (Confident) 5 (Very confident)

Question 2. What transformation would you need to apply to Lizard C to make it look like Lizard D?

a. Reflection about the x-axis
b. Reflection about the y-axis
c. Translation
d. Rotation around the origin

How confident are you in your answer? 1 (Not confident at all) 2 (Not confident) 3 (A little confident) 4 (Confident) 5 (Very confident)

STOP Wait for Your Teacher Before Going to the Next Section STOP

1. REFLECTION: How well did I know today's material?

| For Question 1 | For Question 2 |
|---|---|
| The accuracy of my answer was: ☐ correct. ☐ incorrect. | The accuracy of my answer was: ☐ correct. ☐ incorrect. |
| I was: ☐ confident. ☐ not confident. | I was: ☐ confident. ☐ not confident. |
| My confidence: ☐ matched my accuracy. ☐ didn't match my accuracy. | My confidence: ☐ matched my accuracy. ☐ didn't match my accuracy. |

2. Based on my REFLECTION above, I can IMPROVE my understanding by (select one):

☐ Identifying what I don't understand well
☐ Understanding why the strategy I am using works
☐ Keeping track of how much I understand the material, not just if I am getting the right answers
☐ Checking whether my understanding is good enough to solve new problems
☐ Checking to see if my answers make sense

Solved each problem and rated their confidence

When students finished the problems and ratings, teacher then showed the answers

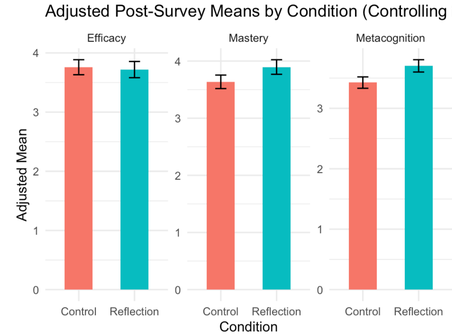
**Treatment** students reflected on their accuracy, confidence, and strategies to improve their understanding

**Control** students reflected on their accuracy and summarized one thing they learned

## Preliminary Results

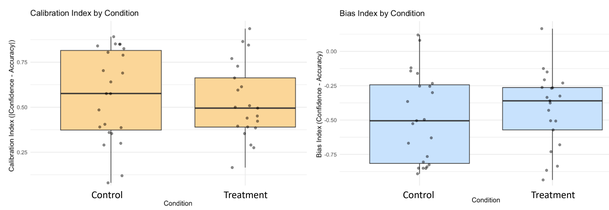
### Pre vs. Posttest Surveys

Including students who completed at least 4 exit tickets & did not answer the exact same response for all items




Self-Efficacy: **no significant effect** of condition, $F(1, 49) = 0.05$, $p = .831$, partial $\eta^2 = .01$.
Mastery Goal Orientation: **no significant effect** of condition, $F(1, 49) = 2.20$, $p = .145$, partial $\eta^2 = .07$.
Metacognitive Strategy Use: **marginally significant effect** of condition, $F(1, 49) = 3.95$, $p = .052$, partial $\eta^2 = .05$.

### Monitoring Accuracy on Unit Test




## Conclusions

Participants using the intervention showed more metacognitive strategy use than their peers who did not, but they were similar on other survey measures.

A descriptive trend suggested potential for the intervention to improve monitoring accuracy.

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