Beyond the content: Improving student problem-solving in genetics

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Overview

Problem solving is a valued skill but it is often **not explicitly taught or assessed** in our undergraduate genetics courses.

Experts problem solve automatically, novices need to learn how to do it through teaching, practice, and feedback.

Research Questions & Methods

What processes/procedures do students use to solve genetics problems, and how does this compare to experts?

Can we improve student problem solving by making it an explicit part of our course curriculum?

Think-aloud sessions: how do students solve problems? How do experts solve them?

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Integrated problem solving into the curriculum

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Used written work and interviews to assess problem solving behaviour before and after "intervention". Rewarded problem solving behaviour with marks

	Control	Treatment
Pre-test mean (s.d.) Class	47 ± 20% N=180	46 ± 23% N=74
CI Pre-test mean Interviewed group	48 ± 19% N=21	54 ± 16 % N=11

No significant difference between means

Interviews with Novices & Experts: Problem Solving Process

Organize: What does the question tell you?

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Hypothesis: What is an explanation that might be consistent with the data?

↓ Solve

Check: Does your result (based on your hypothesis) support or explain the data given in the question?

How will you check your work?

Evaluate

NO → Checking revealed errors or inconsistencies → Modify hypothesis & try again

YES → Checking validated hypothesis. **Consider alternatives.** → You're done!
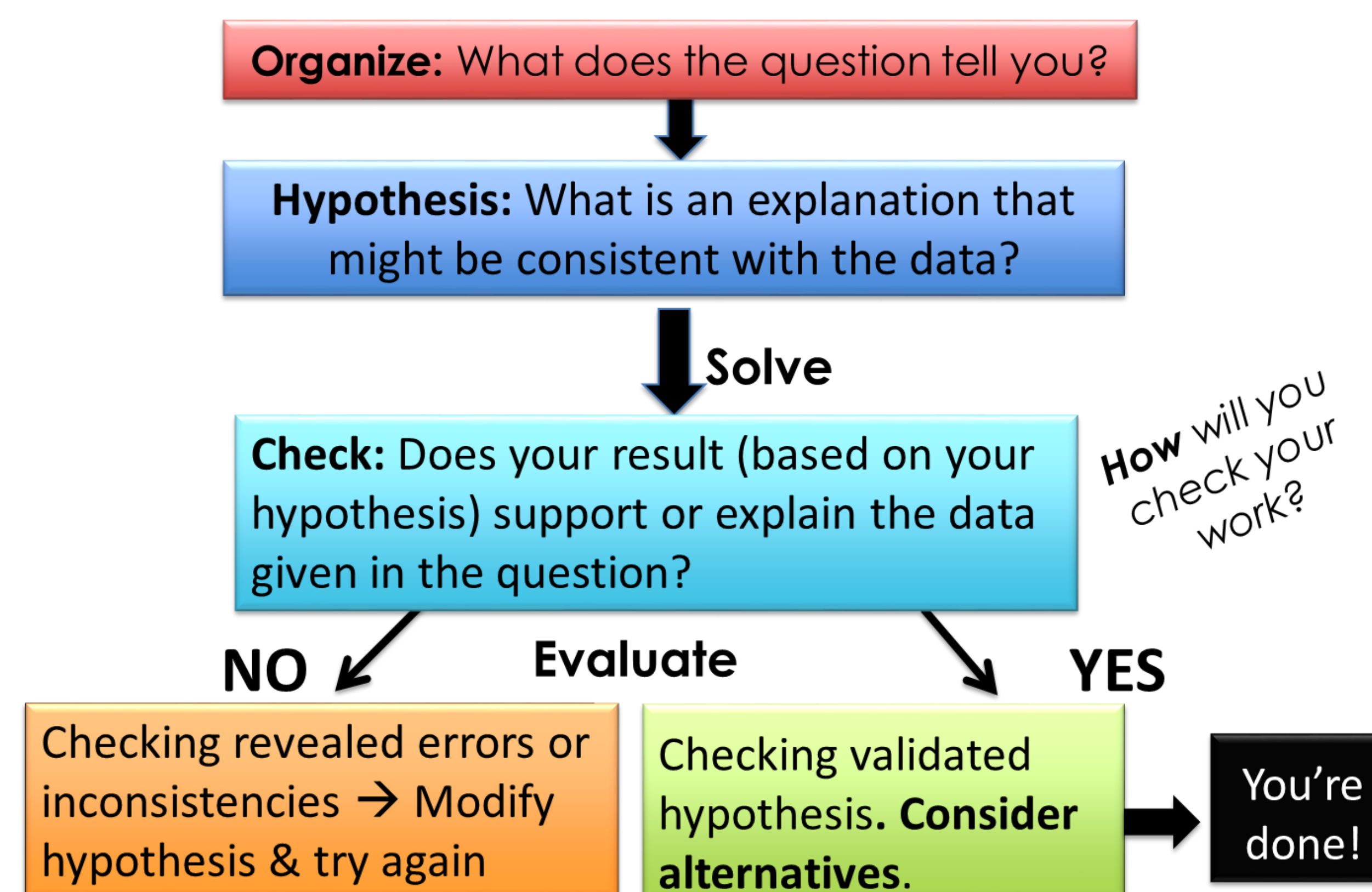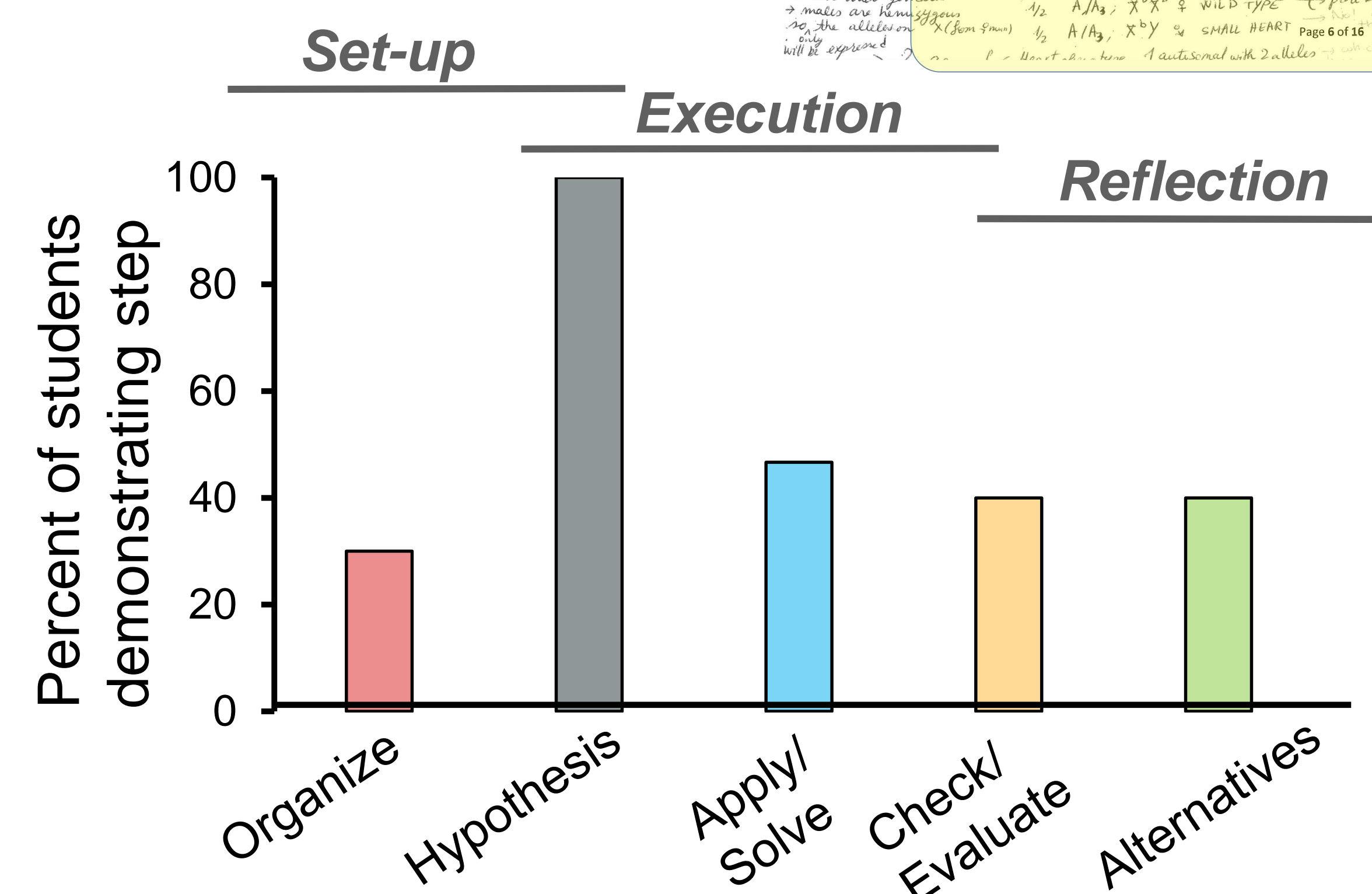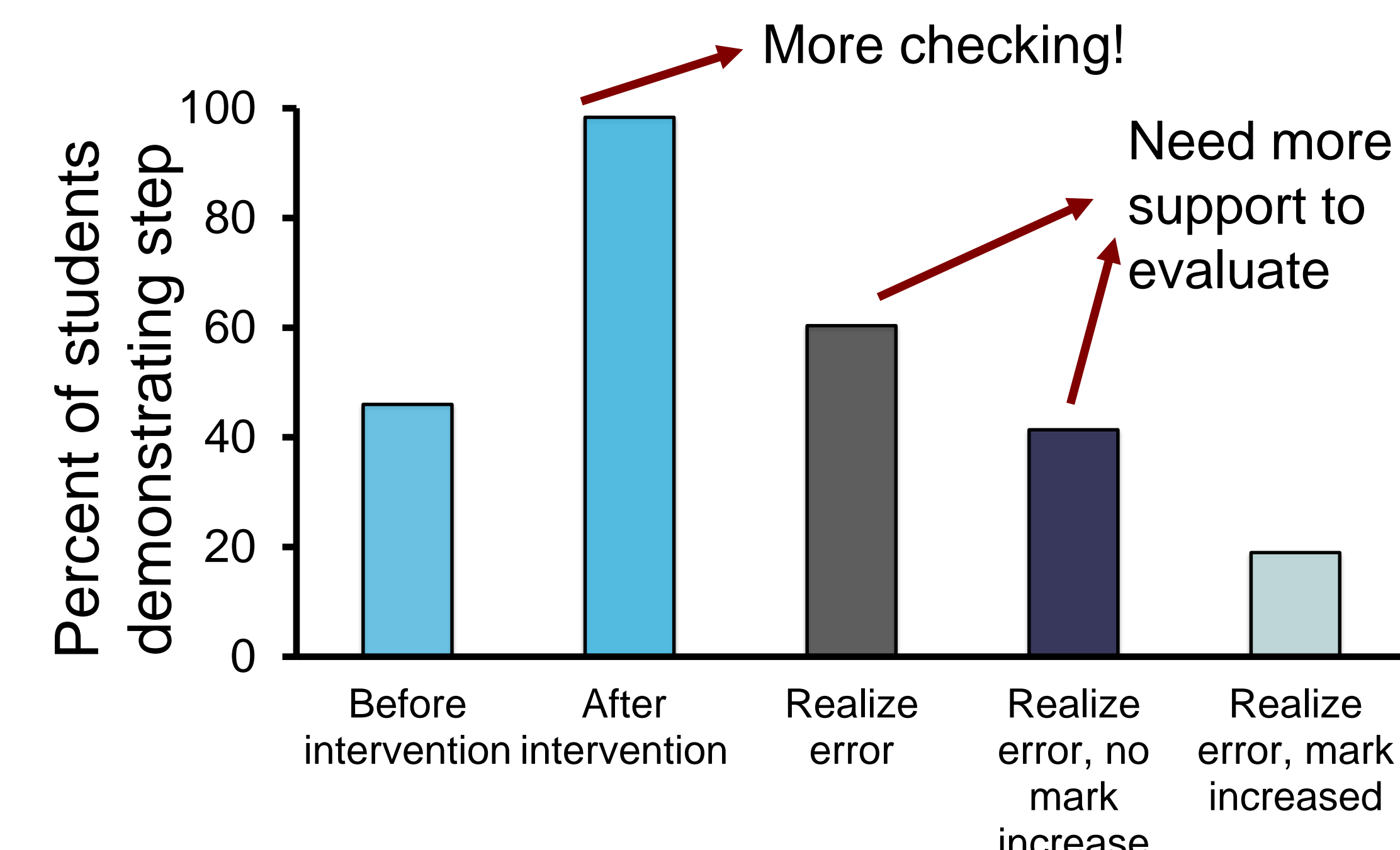
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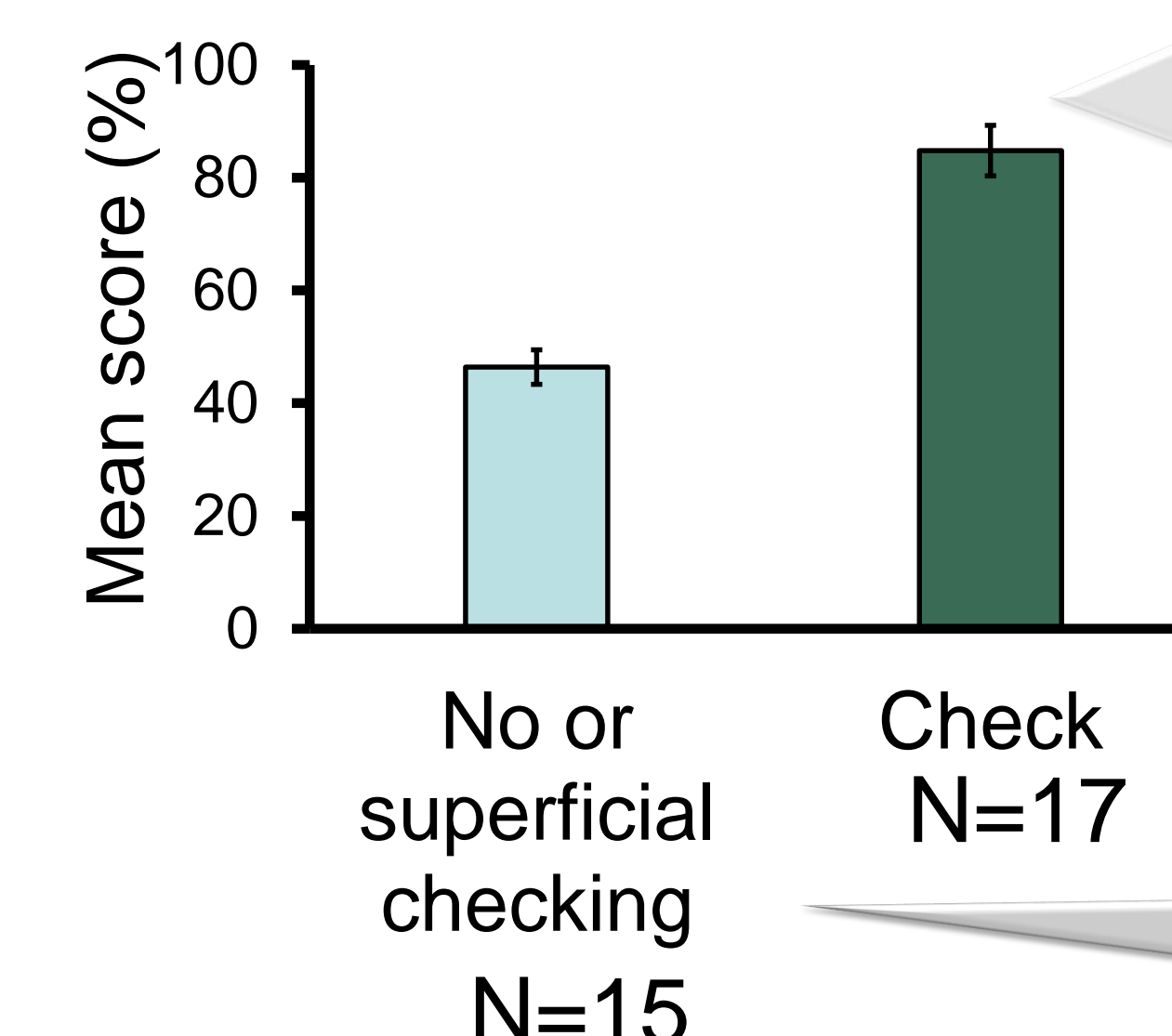
An example of student checking

From Think Aloud Interviews (control group): Students rarely check their work or consider alternative solutions. Interviews revealed that many students don't know *how* to check their work.

Teaching & Assessing Problem Solving

More checking!

Need more support to evaluate

Intervention: Students were taught and practiced problem solving and then asked to demonstrate checking on a quiz the next day.

Final Exam:

Treatment group, unprompted checking correlates with higher grade.

Both groups had the same pre-test scores

No or superficial checking N=15

Check N=17

Beyond the content

➤ More class time & feed-back on problem-solving required for students to develop this skill

➤ Students have trouble realizing errors, further interventions could focus on this aspect of problem-solving

➤ How much do they transfer these skills?

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