Do two-stage exams help improve metacognition?

Sarah Bean Sherman (STLF) and Sara Harris,
Department of Earth, Ocean & Atmospheric Sciences (EOAS)

Metacognition-Thinking about thinking

- What is it?
  - Refers to awareness of one's own knowledge
  - Thinking about one's own thinking
- Learning about how people learn
- Developing an awareness of one's own learning process
- Monitoring and assessing one's own learning
- Making adjustments to one's learning process
- Managing one's motivation and attitudes

Metacognition involves Reflection

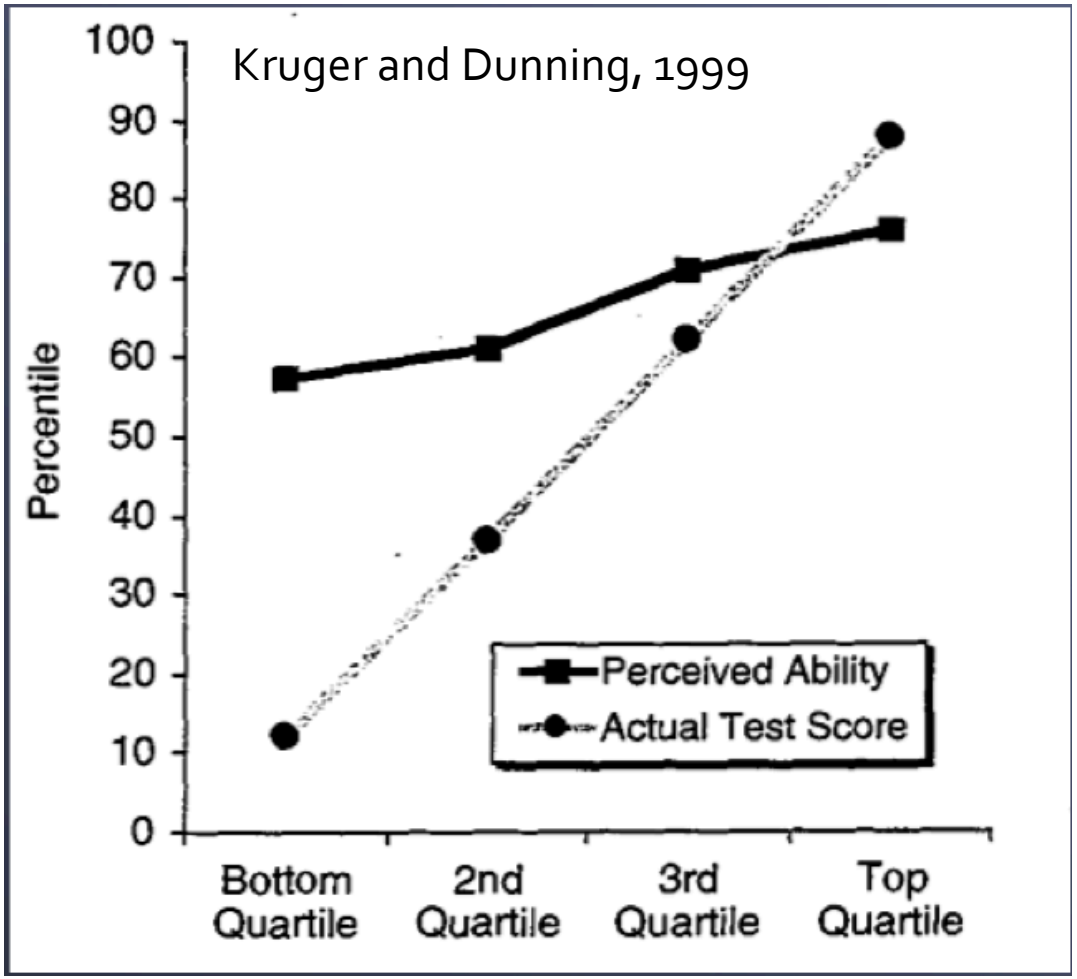
- What kind of problem is this?
- What is the best strategy for solving it?
- How will I know if I solved it?
- How could I do it better next time?
- What additional information do I need?
- What use is this new information?
- How can I use my new understanding to solve different kinds of problems?

Modified from Perkins and Wirth, 2011

What are the benefits of well-developed metacognitive skills?

- Perform better on exams
- Complete work more efficiently
- Use the right tool for the job
- modify learning strategies as needed
- Identify blocks to learning

Unskilled and Unaware effect



- Students who obtain poor exam grades dramatically underestimate number of incorrect responses
- This lack of awareness could be attributed to poor metacognitive skills

1st year university science students:

- despite being academically strong, can struggle
- (Some) have ineffective study behaviors resulting in poor exam scores
- Not used to having to work hard to learn
- Resist change: It worked in high school (but no longer works for college)

Modified from Lovett (2008)

Scenario: 2-stage exam

Individual Exam

- Before taking the exam:
  - student predicts exam score
- After completing the exam:
  - Student predicts number of incorrect answers

Group Exam

- Before taking the exam:
  - group predict exam score
- After completing the exam:
  - group predict number of incorrect answers

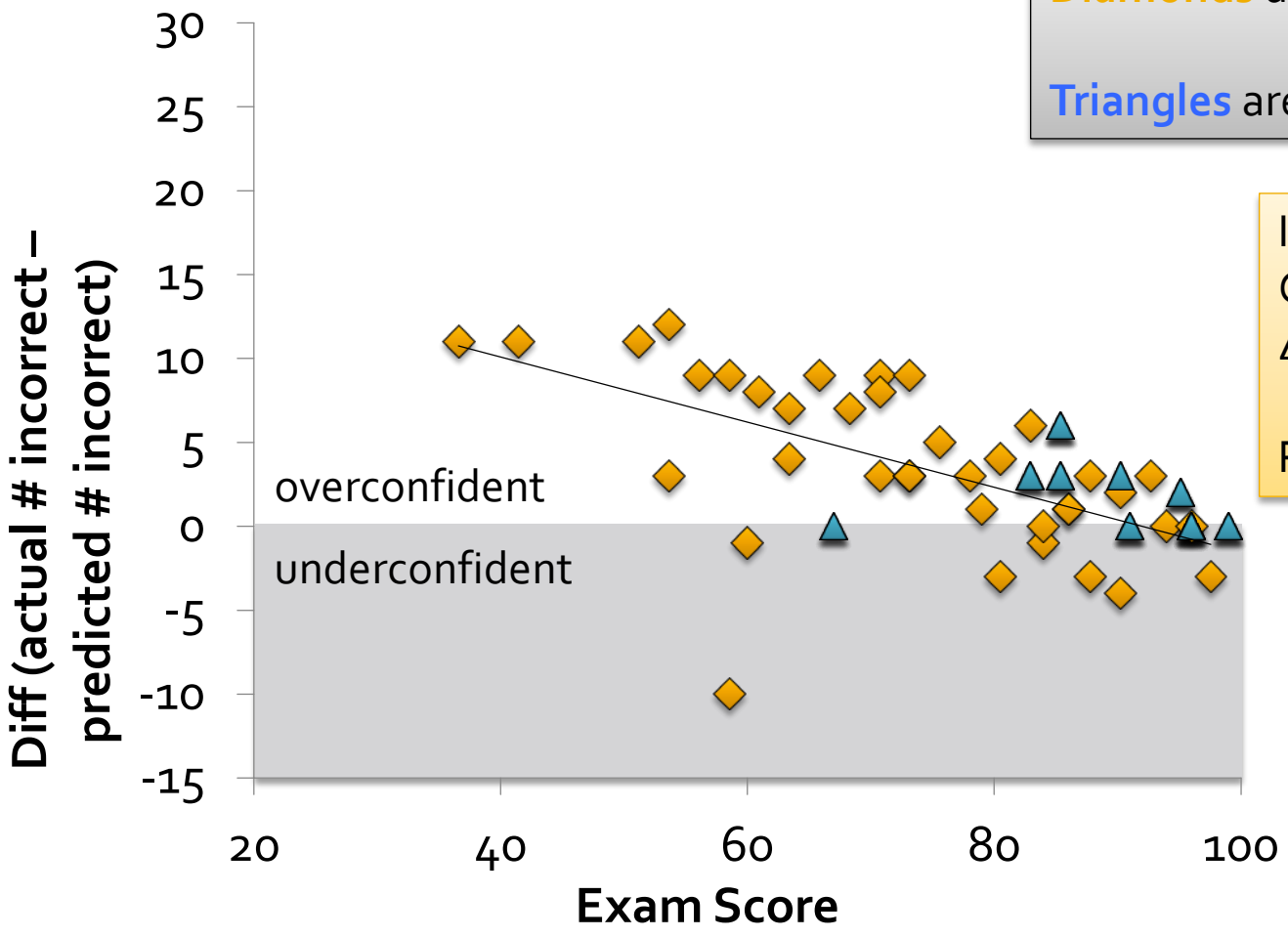
Question:

- *"Incompetent individuals fail to gain insight into their own incompetence by observing the behavior of other people"*

  Kruger and Dunning, 1999

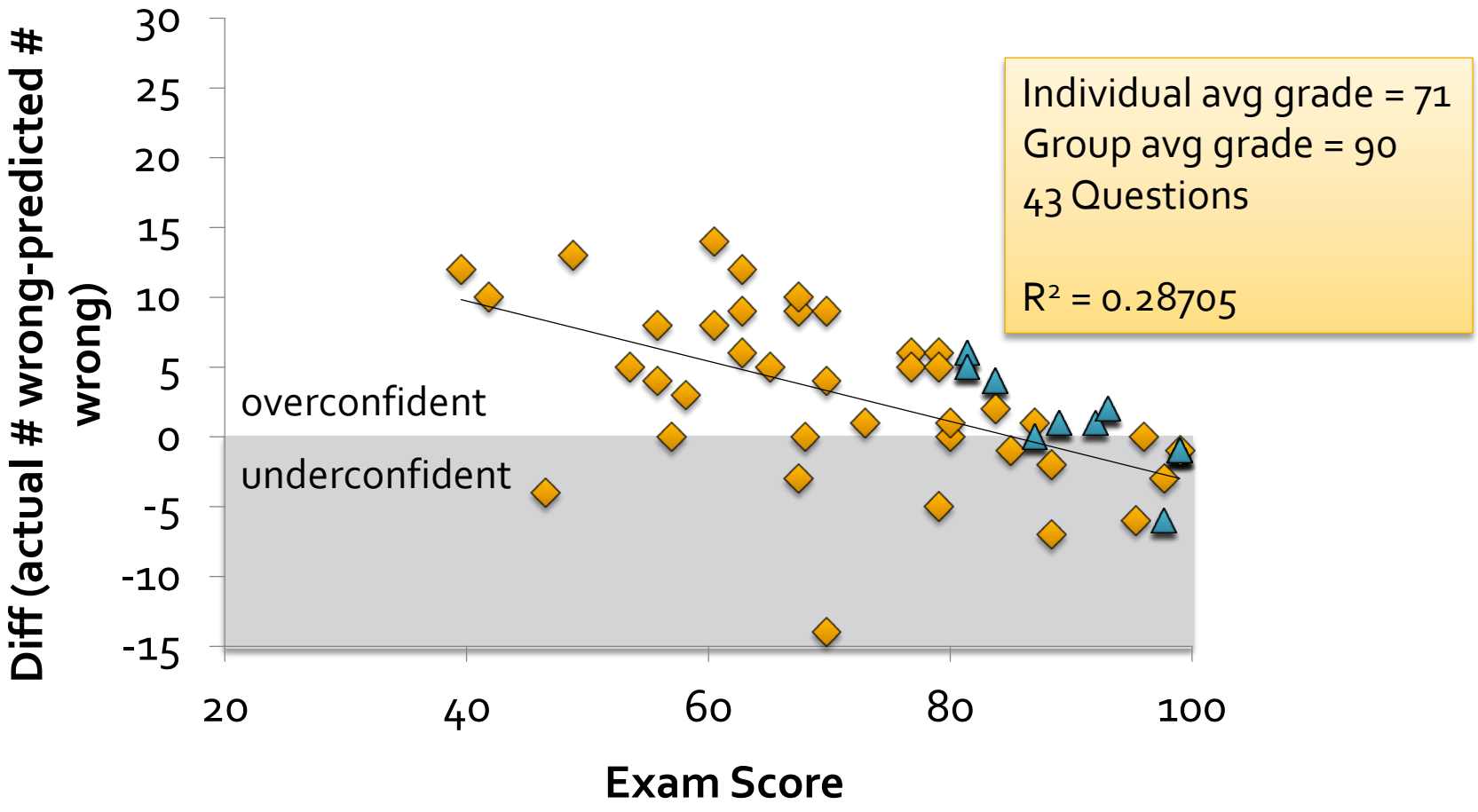
- Would a student that is poor at estimating number of incorrect responses improve after working this same problem in a group (exam)?

UHWO* F2013 exam 1

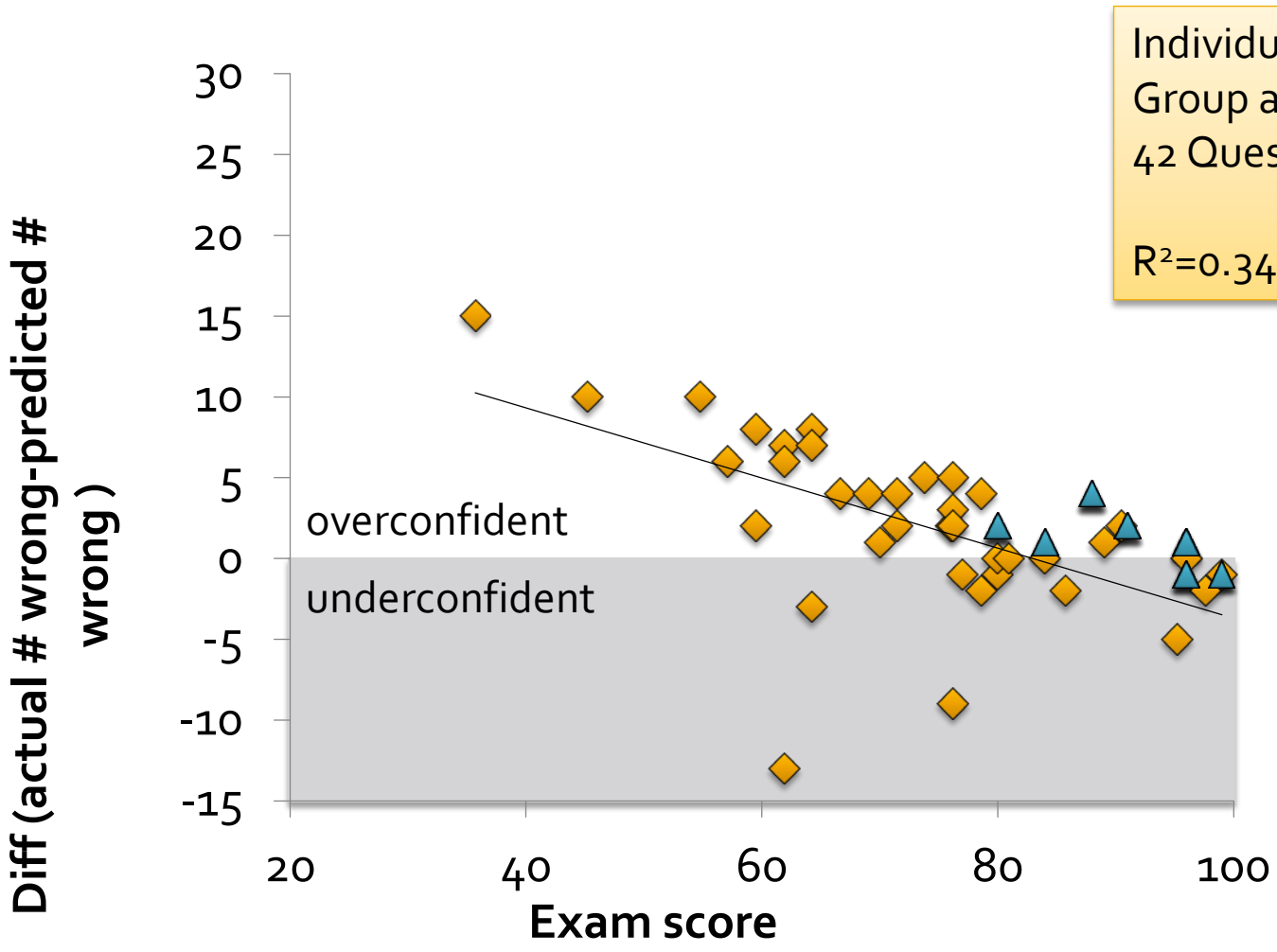


*UHWO (University of Hawaii West Oahu)

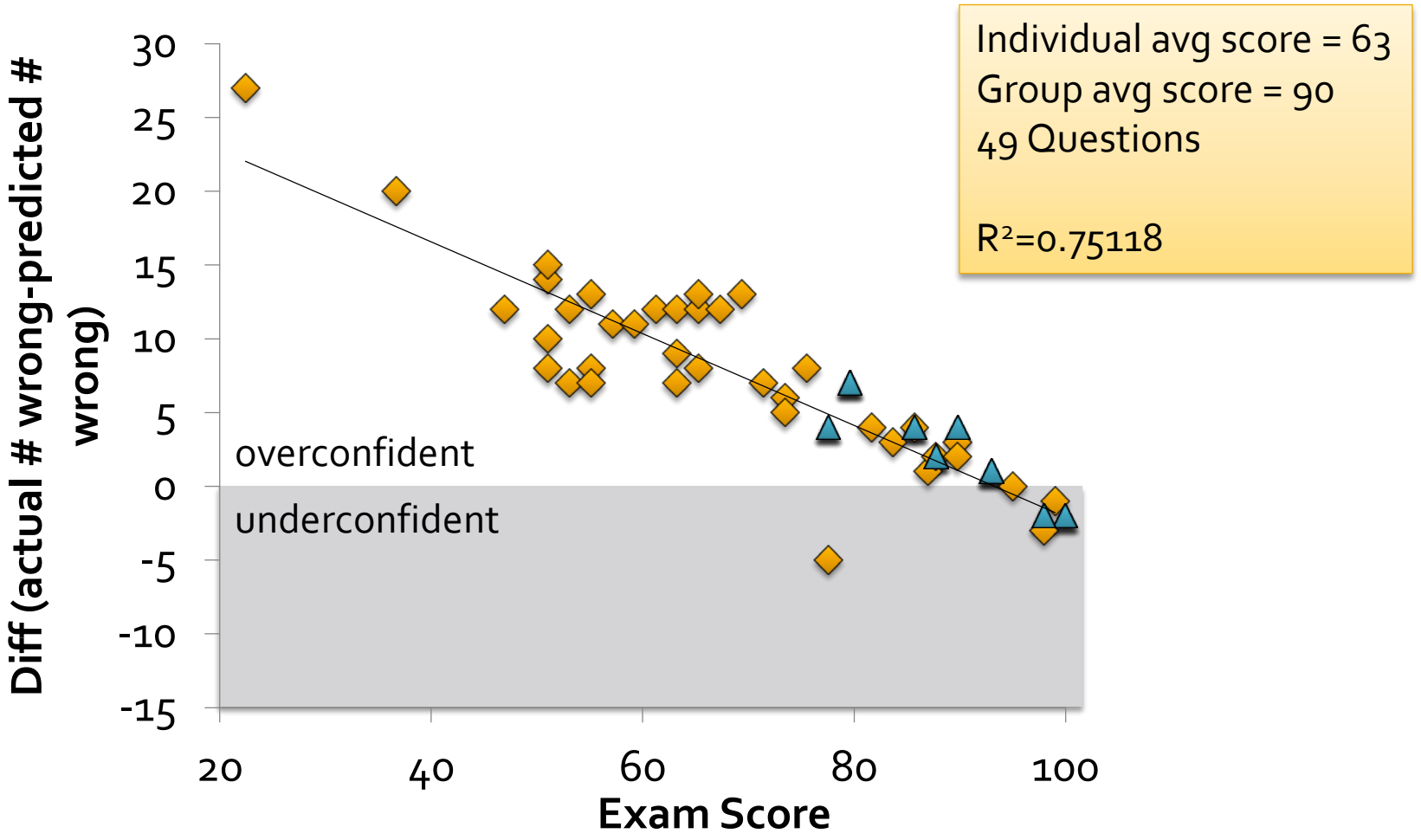
UHWO F2013 exam 2



UHWO F2013 exam 3

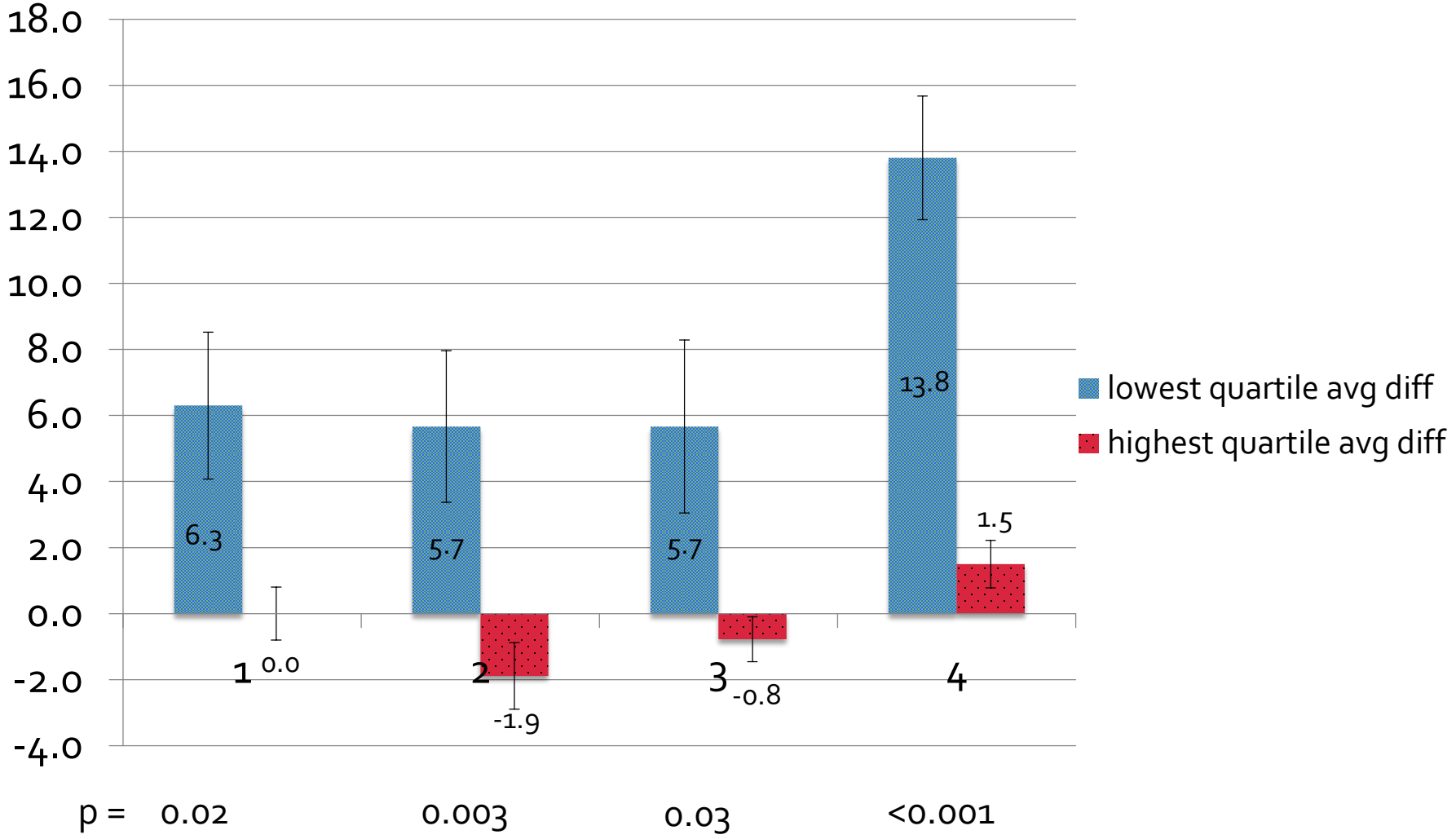


UHWO F2013 exam 4



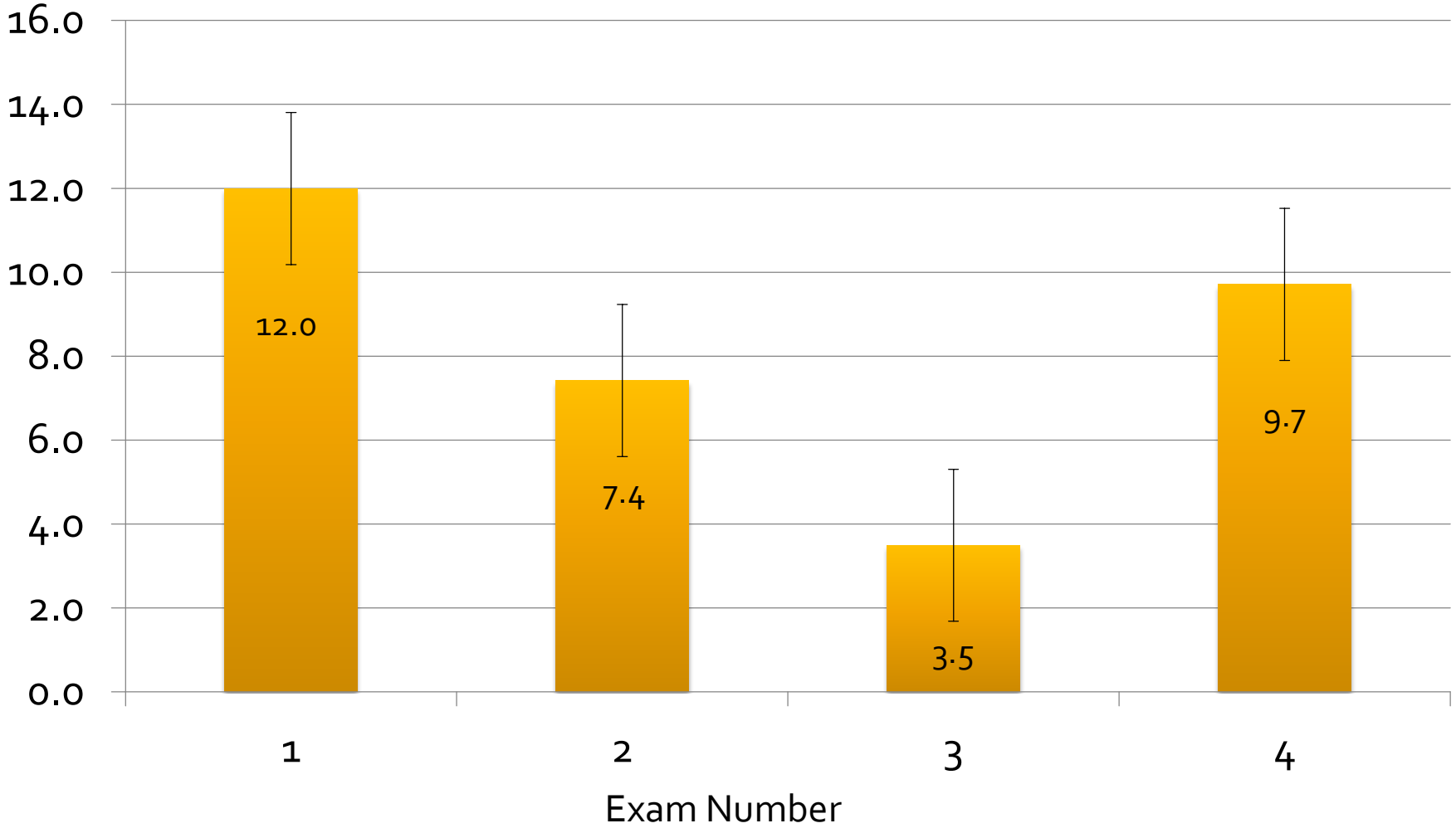
F2013 individual exam

1st and 4th quartile diff (# incorrect – predicted # incorrect)



F2013 individual exam

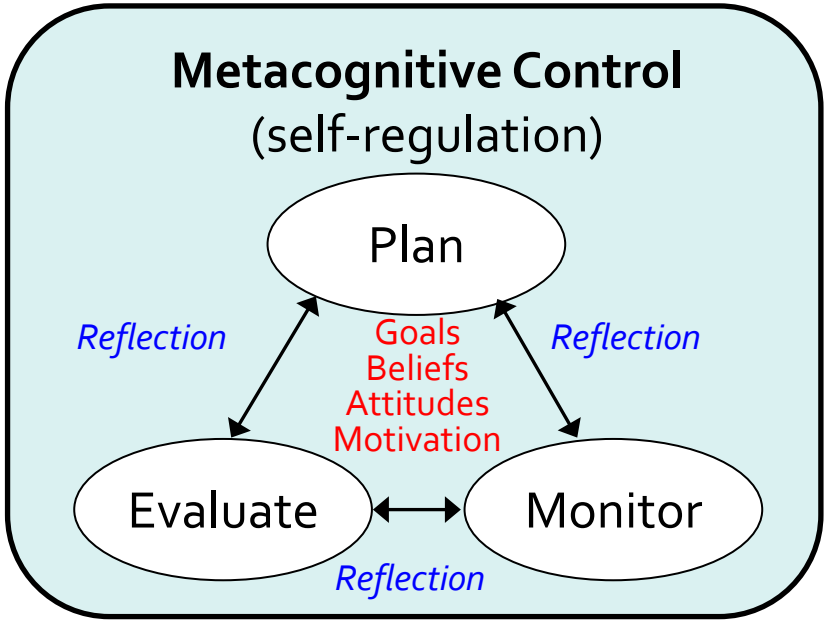
Avg Diff (predicted score – exam score) for class



Observations

- Majority of students underestimate # of incorrect responses
  - Especially true for lowest performing students
- May slightly improve their assessment of test performance
- Still lots of room for improvement
  - How to promote improvement?

Expert Learners - Reflection



Modified from Perkins & Wirth (2011) and Lovett (2008)

Wrappers: Tool to teach self-monitoring

- an activity that surrounds an existing assignment or activity and encourages metacognition.
- require just a few extra minutes of time, but can have a big impact.
- **Be explicit**: spend time discussing how exam wrappers help them learn
- effective because they integrate metacognitive behavior where it is needed
- require minimal faculty time

Exam Wrapper

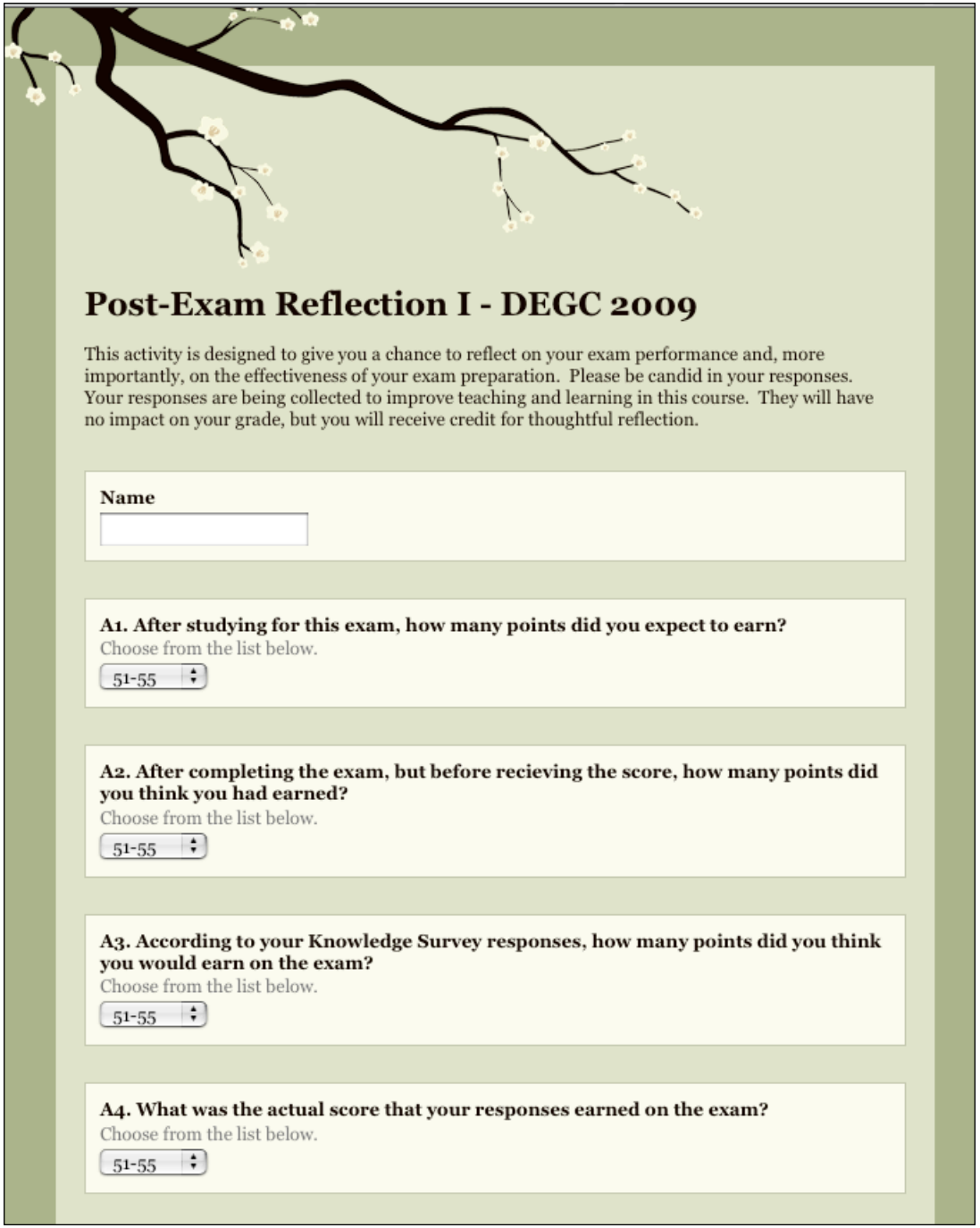
Students complete an exam reflection sheet when graded exams are returned:

- Describe study strategies used
- Analyze mistakes made
- Plan (new & more effective) study strategies
- Reflection sheets returned before next exam

Exam "Wrapper"

- Self Evaluation
- Preparation Strategies
- Performance Analysis
- Planning

Achacoso (2004)
Lovett (2008)



Post-Exam Reflection I - DEGC 2009

This activity is designed to give you a chance to reflect on your exam performance and, more importantly, on the effectiveness of your exam preparation. Please be candid in your responses. Your responses are being collected to improve teaching and learning in this course. They will have no impact on your grade, but you will receive credit for thoughtful reflection.

Name

A1. After studying for this exam, how many points did you expect to earn?
Choose from the list below.
51-55

A2. After completing the exam, but before recieving the score, how many points did you think you had earned?
Choose from the list below.
51-55

A3. According to your Knowledge Survey responses, how many points did you think you would earn on the exam?
Choose from the list below.
51-55

A4. What was the actual score that your responses earned on the exam?
Choose from the list below.
51-55

Conclusion

- "Metacognitive skills and beliefs about learning have consequences for students' learning and performance.
- Teaching metacognition improves students' learning.
- Give students practice at applying metacognition
  - Exam, homework, and lecture wrappers
- Low-cost interventions but can have large impact

Lovett, 2008

References

- Lovett, 2008. Teaching Metacognition: Presentation to the Educause Learning Initiative Annual Meeting, 29 January 2008.
- Kruger and Dunning, 1999, *Unskilled and Unaware of it: How difficulties in recognizing one's own incompetence lead to inflated self-assessments*, Journal of Personality and Social Psychology, vol. 77, No. 6, 1121-1134