

Measuring novices' field mapping abilities using an in-class exercise based on expert task analysis



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Outline:

- 1) Overview of study
 - A) Objectives
 - B) Oliver Field School
- 2) Study design and methods
 - A) Expert task analysis
 - B) Student modeling exercise
 - C) Exercise solutions
- 3) Results and Implications
- 4) Conclusions



Oliver Field School May 2010

Study Objectives:

1. Develop a model of expert-like behavior: use it to improve field teaching methods.
2. Based on expert-model, design and implement an in-class exercise to assess expertise in students.
3. Assist students in mastering the process of field mapping more effectively and think creatively in 3D in the field.



Oliver Field School May 2010

Oliver Field School:

- Two-week field school
- Numerous bedrock mapping exercises



- Most importantly:
 - Captive audience!
 Let's study how the students think!

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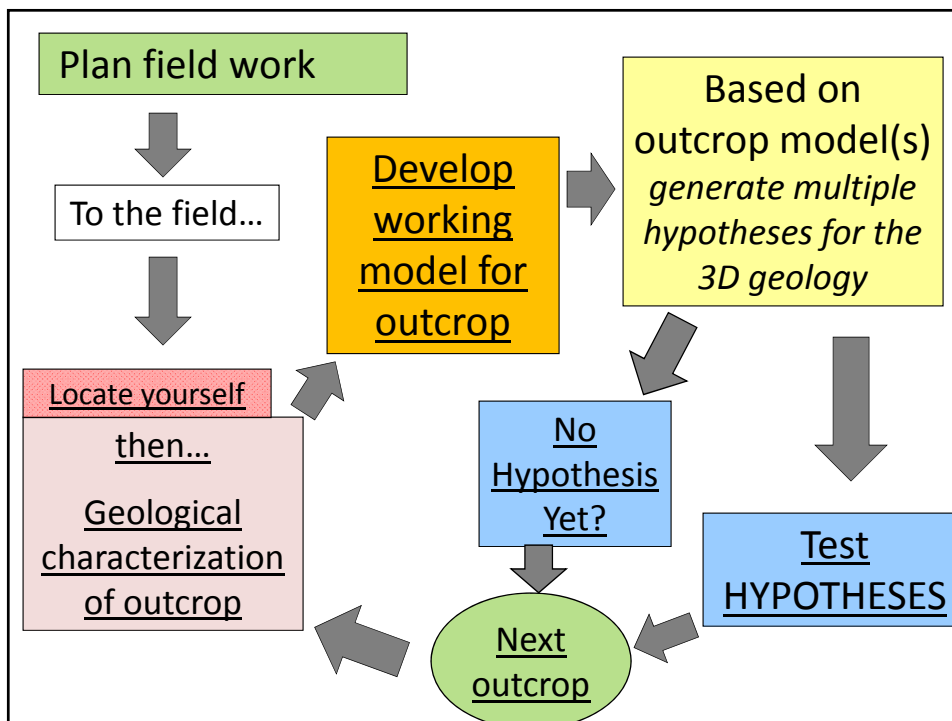
B) Student modeling
exercise

C) Exercise solutions

3) Results and Implications

4) Conclusions

What does an
expert
geologic
mapper DO?





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Does model development exercise show expert-like behavior in students?

- 45-minute paper-based exercise (on bus up to field school!)
- Paired students up
- Instruction: Develop as many "possible" models as you can.

<p>Day 1 – two outcrops</p> <p>Key MS – Mudstone SS – Sandstone ☉ Fossil Clam 🐚 Marine Fossil</p> <p>↑ N 30 m</p> <p>Name 1: Name 2:</p>	<p>Brief (1-2 words) Explanation:</p> <p>Sketch possible relationship:</p>	<p>Brief (1-2 words) Explanation:</p> <p>Sketch possible relationship:</p>
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<p>Day 2 – four outcrops</p> <p>Key MS – Mudstone SS – Sandstone ☉ Fossil Clam 🐚 Marine Fossil U Burrow cast (up ↑) ↑ Dip Direction</p> <p>↑ N 30 m</p> <p>Name 1: Name 2:</p>	<p>Brief (1-2 words) Explanation:</p> <p>Sketch possible relationship:</p>	<p>Brief (1-2 words) Explanation:</p> <p>Sketch possible relationship:</p>
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Day 3 – five outcrops

Key
 MS – Mudstone
 SS – Sandstone
 ☉ Fossil Clam
 🐚 Marine Fossil
 U Burrow cast (up ↑)
 ↗ Dip Direction

Name 1:
 Name 2:

Brief (1-2 words) Explanation: Sketch possible relationship:	Brief (1-2 words) Explanation: Sketch possible relationship:
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Example Student Model

Key
 MS – Mudstone
 SS – Sandstone
 ☉ Fossil Clam
 🐚 Marine Fossil
 U Burrow cast (up ↑)
 ↗ Dip Direction

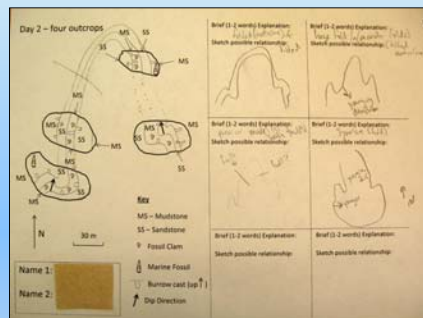
Name 1:
 Name 2:

Brief (1-2 words) Explanation: Sketch possible relationship:	Brief (1-2 words) Explanation: Sketch possible relationship:
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How do we assess students on a scale from novice to expert via this exercise?

Experts: generate multiple possible models. None are impossible.

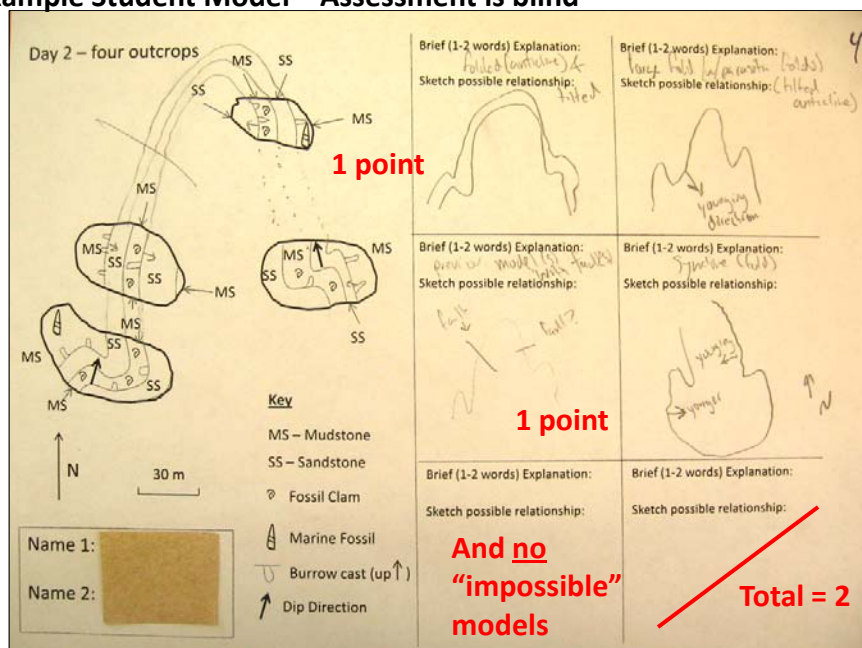
Novices: generate models but likely very few and/or include numerous impossible models.



Methods:

- Total number of possible models generated
- Ratio of Possible to Impossible Models (PM/IM+1)

Example Student Model – Assessment is blind



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Example Student Model -- Marking is blind

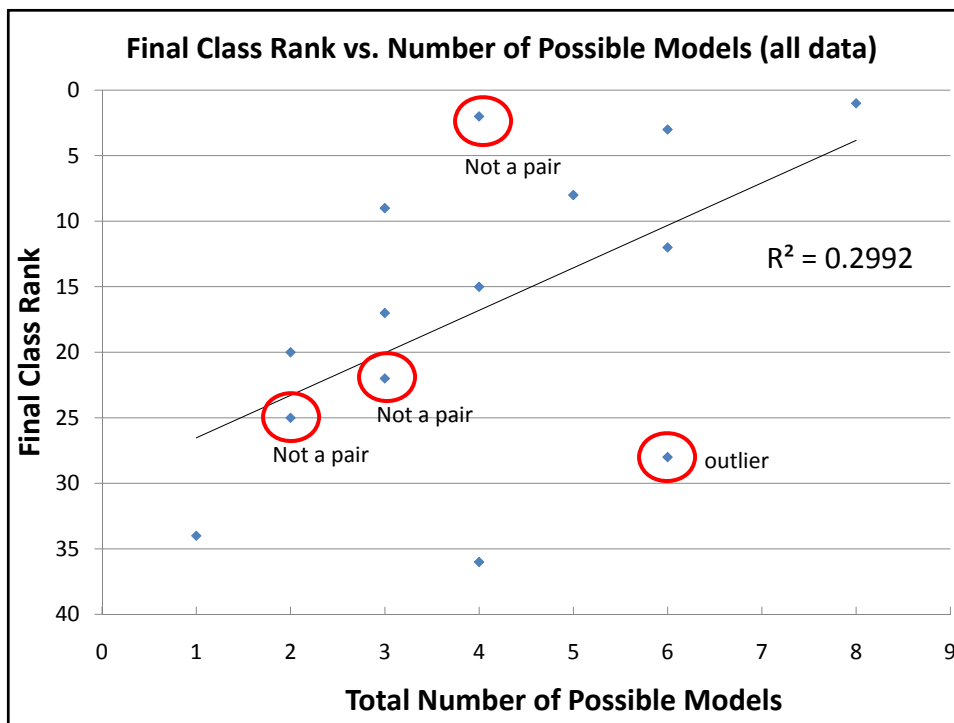
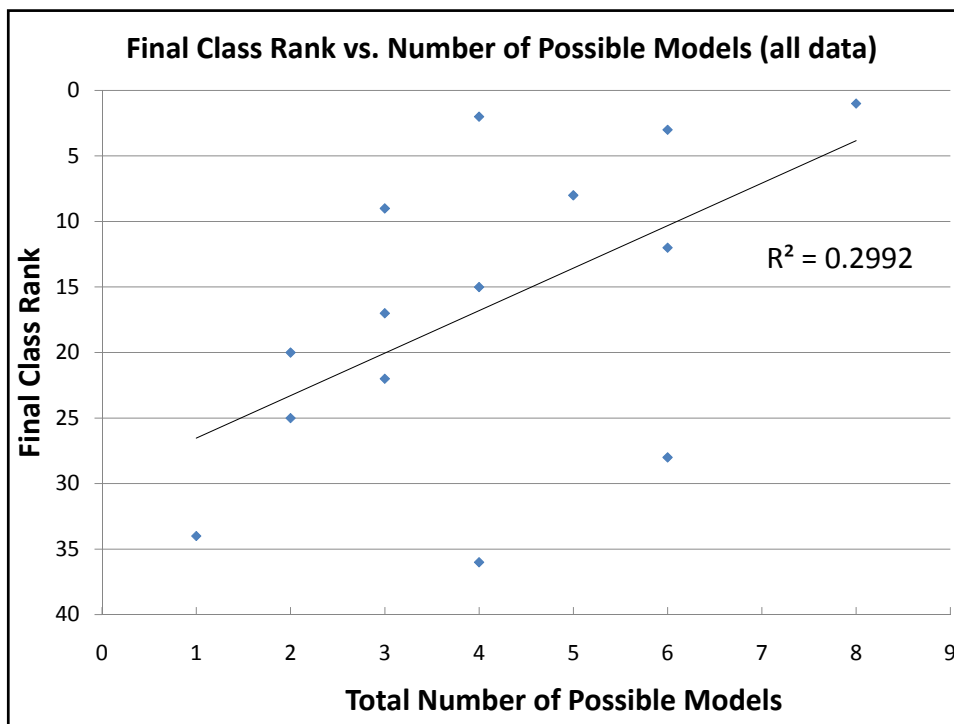
Results:

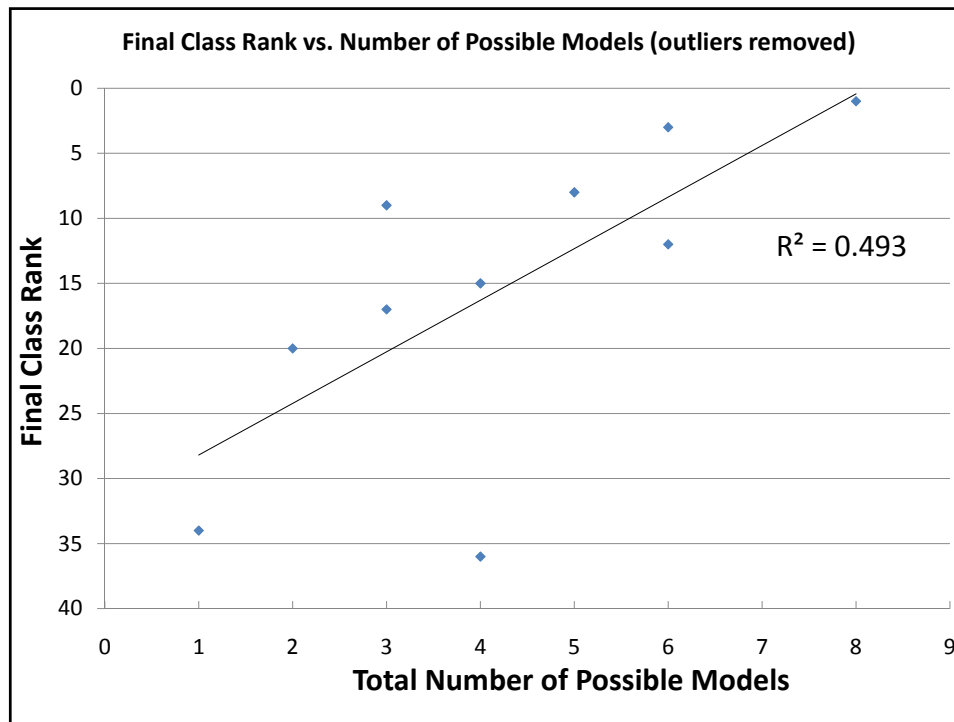
Plotted Student Class Rank against Number of Possible Models

1 point

And no impossible models

Total = 2





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Conclusions:

- The exercise is one measure of expertise in one aspect of field mapping (model creation) and it appears to predict which students will have more trouble with field camp and which will have less.
- Can use this information to target parts of mapping expertise and provide to students focused, appropriate feedback and opportunities to practice.

Next Year:

- Will use exercise as an individual (not paired) pre- and post-assessment and associate it with a lesson on model creation. Post-test will have isomorphic data.

