



SCIENCE IS ALL AROUND US

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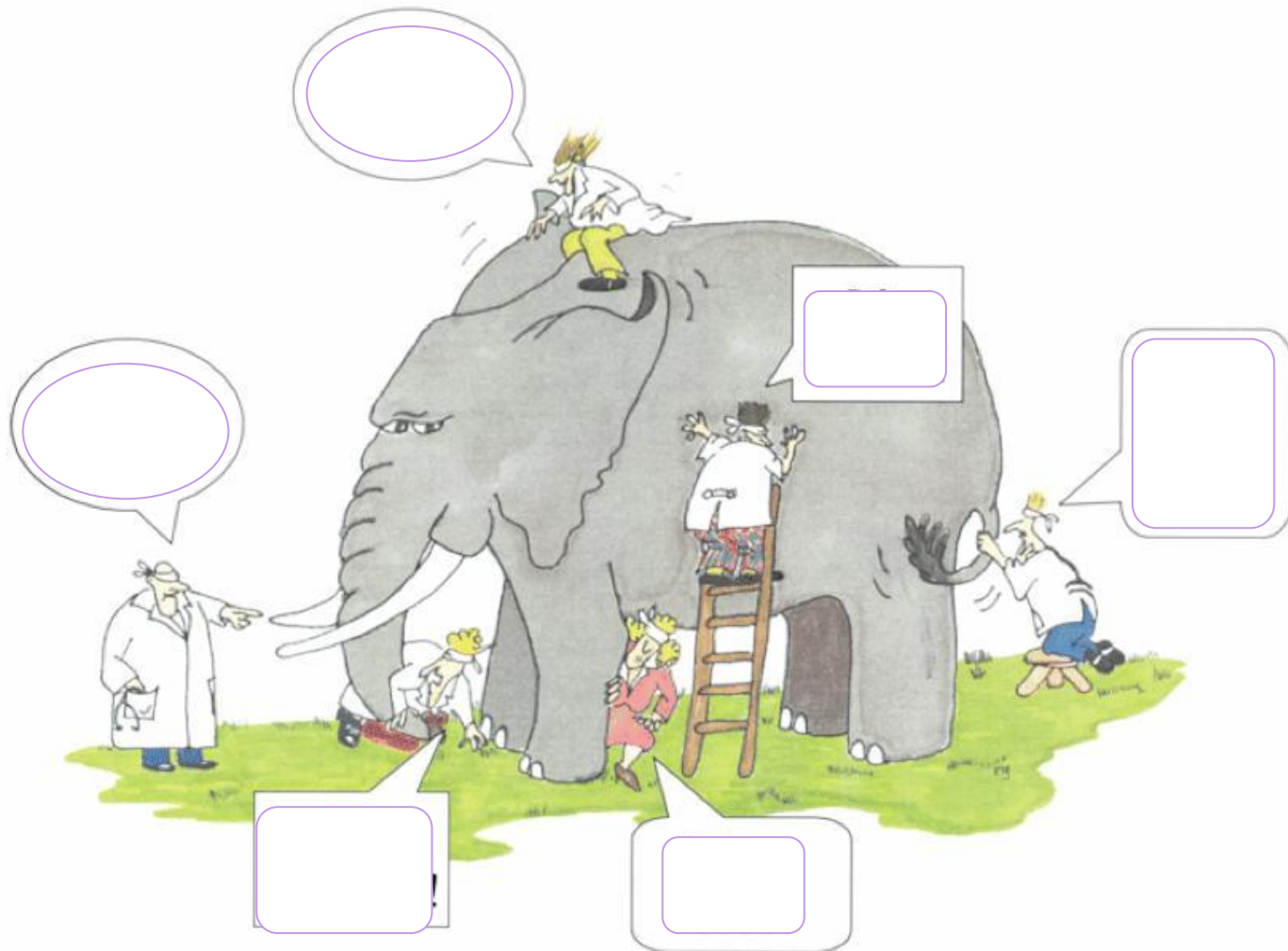
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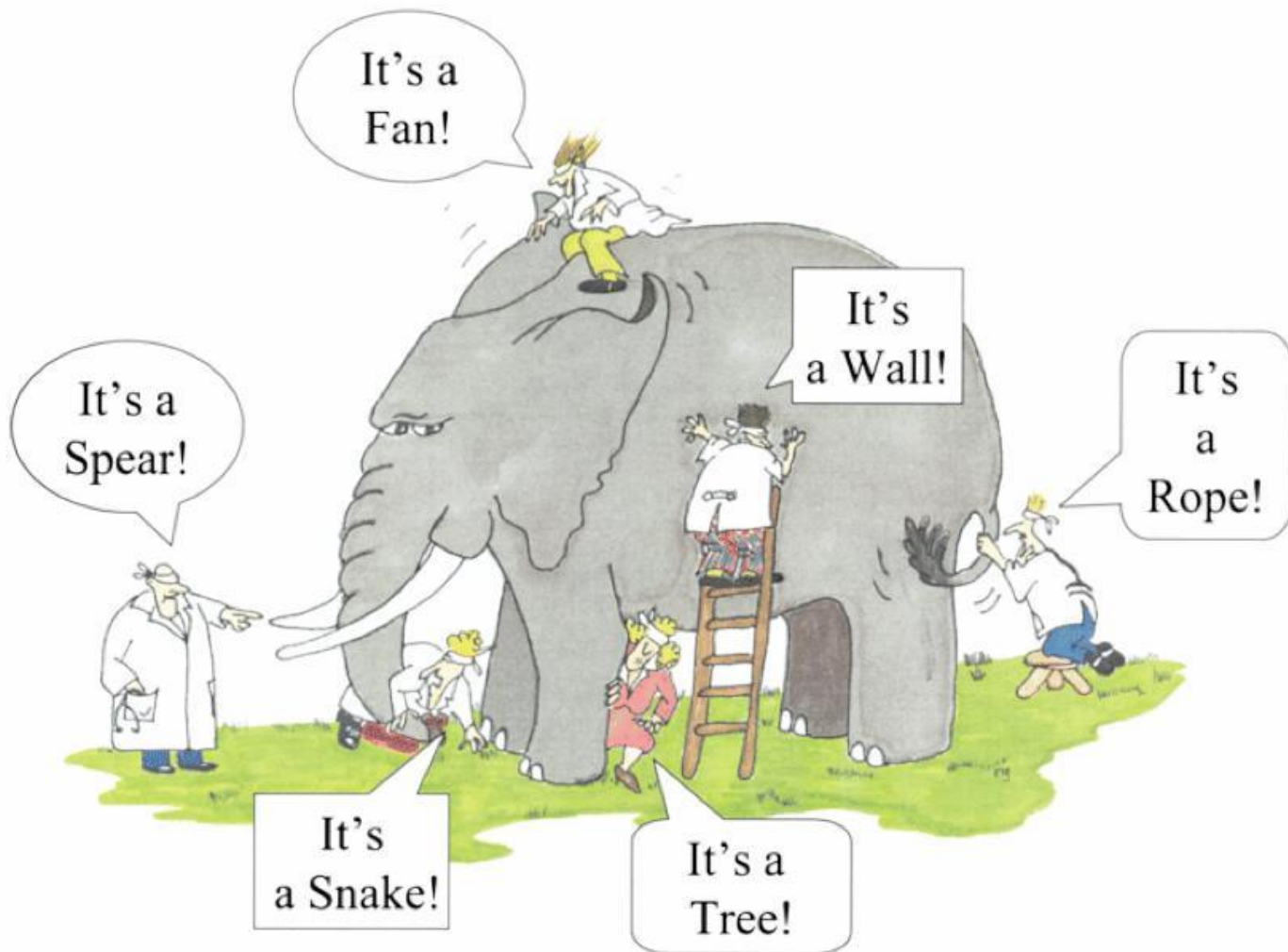
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*Using Inquiry to Promote Autonomy
and Enhance Student Engagement
and Learning
Effective Classroom Practices*





Inquiry Guided Learning



“promotes the acquisition of new knowledge, abilities, and attitudes through students’ increasingly independent investigation of questions, problems and issues, for which there often is no single

The Inquiry Cube

- ⌘ What is on the bottom?
- ⌘ Only Rule: Do not pick up the cube.



The Inquiry Cube: Debrief

- ⌘ How did you figure out what was on the bottom of the cube?
- ⌘ Were you 100% certain that you were right?
- ⌘ What does this activity say about:
 - Where knowledge comes from?
 - How humans acquire new knowledge?
 - What inquiry is?

Inquiry Process

1. Asking questions,
 2. Selecting methods for answering questions,
 3. Collecting and analysing information to answer the questions,
 4. Linking evidence to explanation, and
 5. Communicating valid conclusions.
- (from Fowler, Matthews, Schielack, Webb, & Wu, 2012)*



An Inquiry Continuum

- ✘ Structured – teacher driven, closely structured inquiry.
- ✘ Guided – teacher guides students through inquiry. Provides question and resources but allows students to structure rest.
- ✘ Open Ended – independent student inquiry. Student chooses topic, questions, methods, etc.



Essential Aspects of Inquiry

- ✘ Place experience before direct instruction.
- ✘ Students construct their own explanations.
- ✘ Provides a cognitive anchor for students to attach subsequent learning and information.
- ✘ Teacher then builds upon this foundation.



Types of Inquiry

- ⌘ Problem-based Learning – uses cases that have no right answer
- ⌘ Model-based Instruction – <http://tools4teachingscience.org/>
- ⌘ Argument-Driven Inquiry
- ⌘ Place-based Education
- ⌘ Undergraduate Research



An Example: Model- based Inquiry

Crushing the Can
Experiment

- [crushing the can
experiment-video](#)

Model Creation

- ✘ Come up with a model that explains the phenomenon.

- ✘ Model should be a diagram including, arrows, labels, text, captions, mathematical formulas, terminology, etc.

- ✘ The model needs to focus on:

- The molecular level
- The mechanisms behind the phenomenon, not rules.

- ✘ Each person use a different coloured marker. Make a key by writing your names in your colour in one corner of the paper.

- ✘ Write at least one thing on your poster in your native language.

- ✘ Use the rubric provided.

Model Sharing

GALLERY WALK METHOD

- ✂ Choose one person to remain at your poster and present to others.
- ✂ Other group members rotate from poster.
- ✂ Your job is to come up with 2 things to add to your poster that you learned from the other models.



Model Revision

What did we just do?
Model-based Inquiry

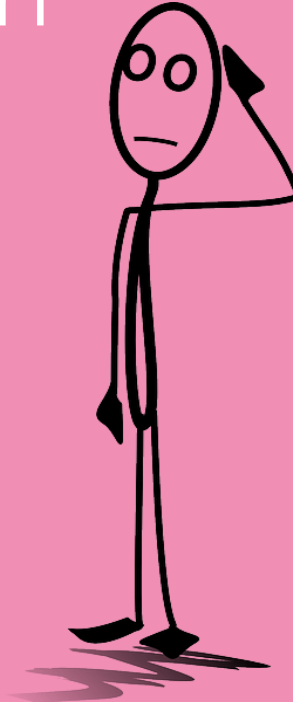
- ✂ Return to your poster.
- ✂ Discuss what you learned from the other groups.
- ✂ Add at least two things to improve your model.



- ✘ Start with a “big idea” from your discipline that you want to teach.
- ✘ Present a “puzzling phenomenon” or “anchoring event” to the students that connects to the big idea.
- ✘ Challenge students to explain it in small groups.
- ✘ Groups share explanations. Present convincing *evidence-based arguments*.
- ✘ Teacher identifies competing theories.
- ✘ Teacher adds information so that students can evaluate models, revise their models, and arrive at consensus.
- ✘ Connect models and explanations to big ideas and facts/concepts.



Model-based Instruction



Teacher's Role

Final thought

Teachers are important school-based factors in impacting student achievement. Hence, the development of education reforms relies heavily on teacher's capacity, perspective, motivation, commitment and their belief systems.(Leithwood et al, 2009)

Teachers are key actors who shape students' learning and have a critical role in implementing new approaches to learning.

It is our duty , as educators, to do whatever we can to help our students connect learning with real life and to provide them with the necessary skills to prepare them for success.



REFERENCES

- Fowler, Matthews, Schielack, Webb, & Wu (2012). The power of inquiry as a way of learning in undergraduate education at a large research university, *New Directions for Teaching and Learning*, 129, pp. 5-14.
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THANK YOU

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The pattern of the cube

Please note:
For best results,
print or reproduce
cubes in color. Colors
of words and numbers
are used in the
process.

