



The Question of Questions

Live Interactive Planetarium Symposium — LIPS 2011

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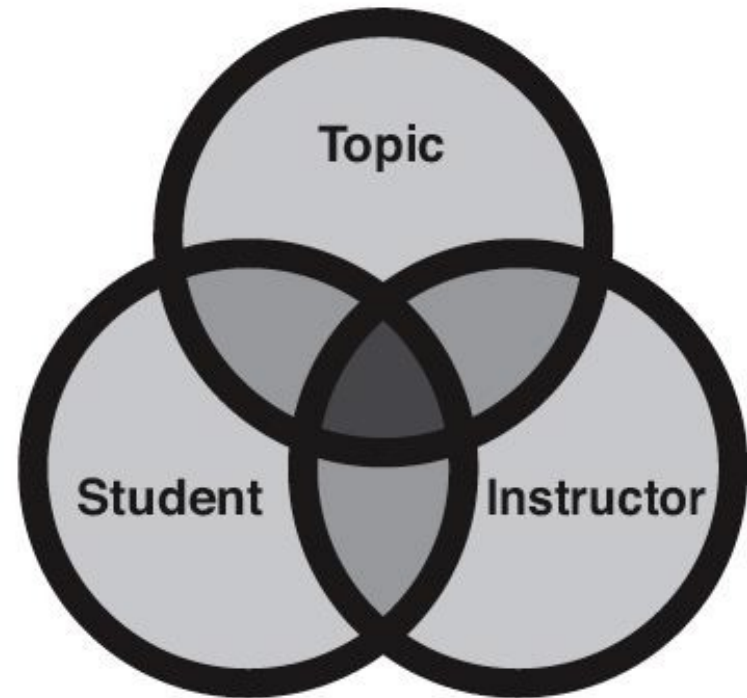
Three factors to consider
when designing
planetarium shows:

Subject

Audience

Presenter

Planetarium Educator's Workshop Guide



Third Edition, Revised and Updated

***by Alan J. Friedman, Lawrence F. Lowery,
Steven Pulos, Dennis Schatz, and Cary I. Sneider
Illustrated by Budd Wentz***

Jointly published by
the Lawrence Hall of Science, University of California, Berkeley, California
and the New York Hall of Science, Flushing Meadows Corona Park, New York



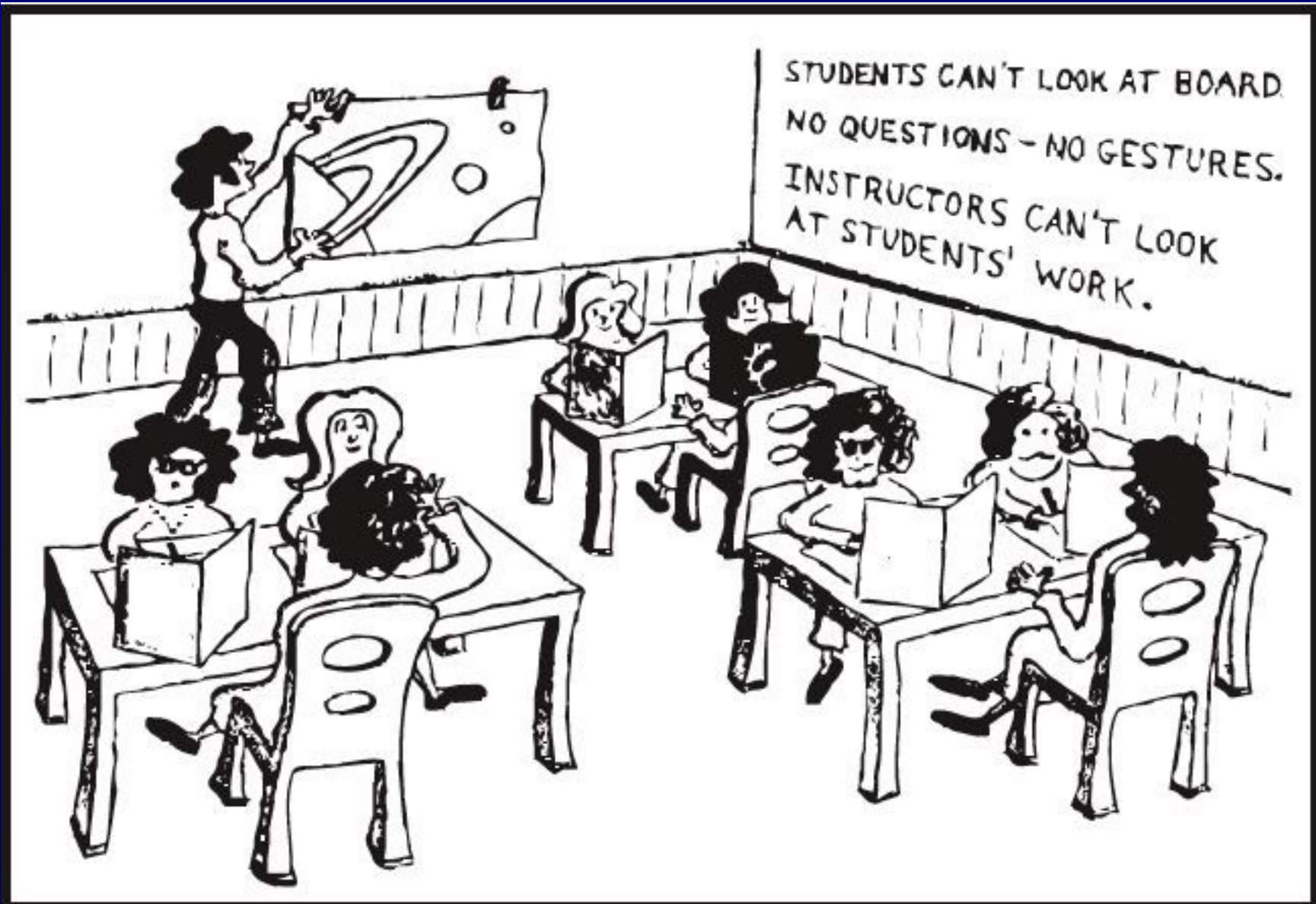
Planetarium Educator's Workshop Guide

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Rogetian Mirror





Module 1: Communication

Rules for round #1:

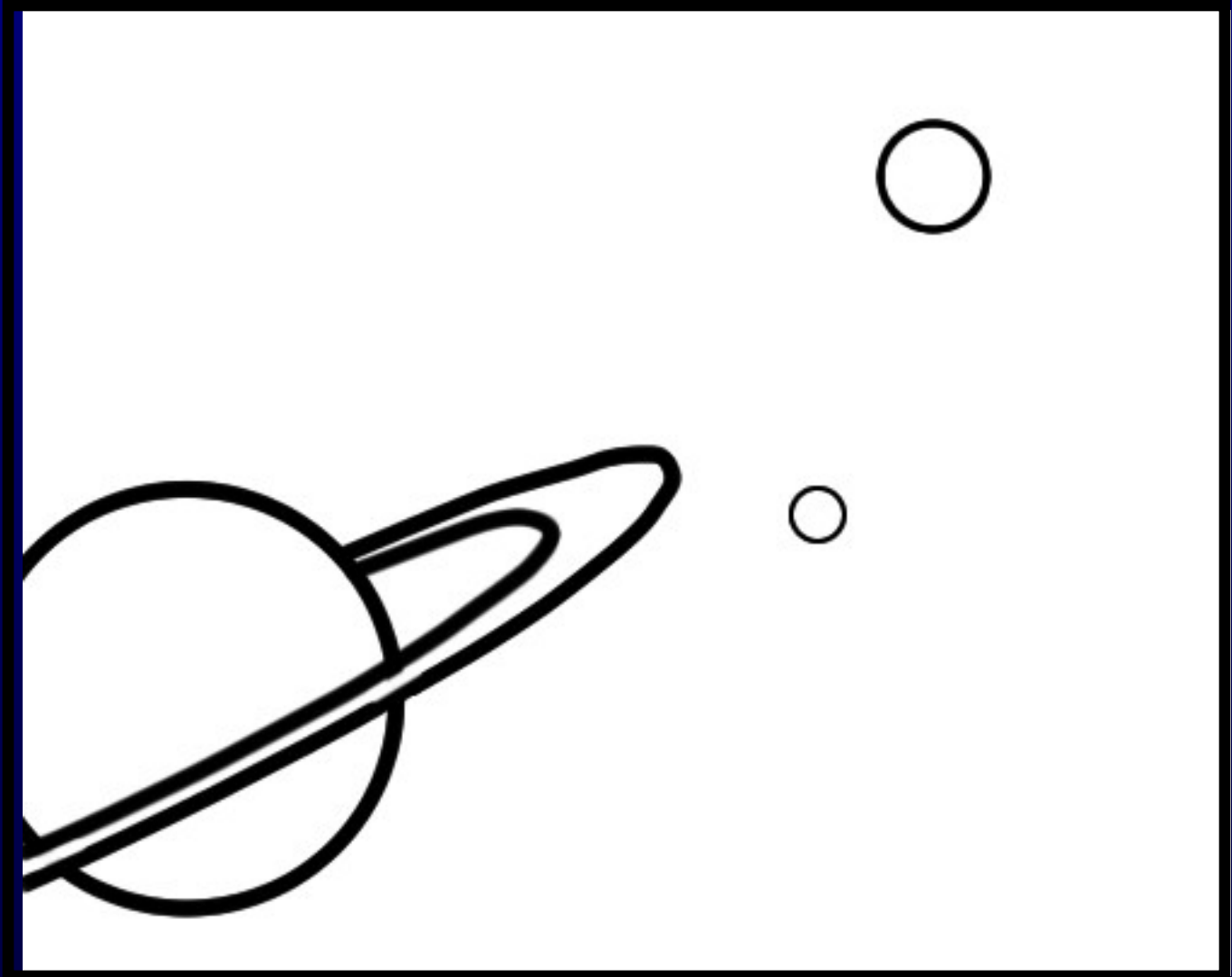
- a) Use no gestures.
- b) The students may not ask questions.
- c) The instructor cannot see what the students are doing (a barrier is placed between their papers and the instructor).



Communication round 1

Round #1 rules:

- a) Use no gestures.
- b) The students may not ask questions.
- c) The instructor cannot see what the students are doing.





Module 1: Communication

Rules for round #1:

- a) Use no gestures.
- b) The students may not ask questions.
- c) The instructor cannot see what the students are doing (a barrier is placed between their papers and the instructor).

Rules for round #2:

- a) Use no gestures.
- b) The students may not ask questions.
- c) The barriers are taken away so the instructor can see what the students are doing.

Rules for round #3:

- a) Use no gestures.
- b) The students are permitted to ask questions during the activity.
- c) The instructor can see what the students are doing.

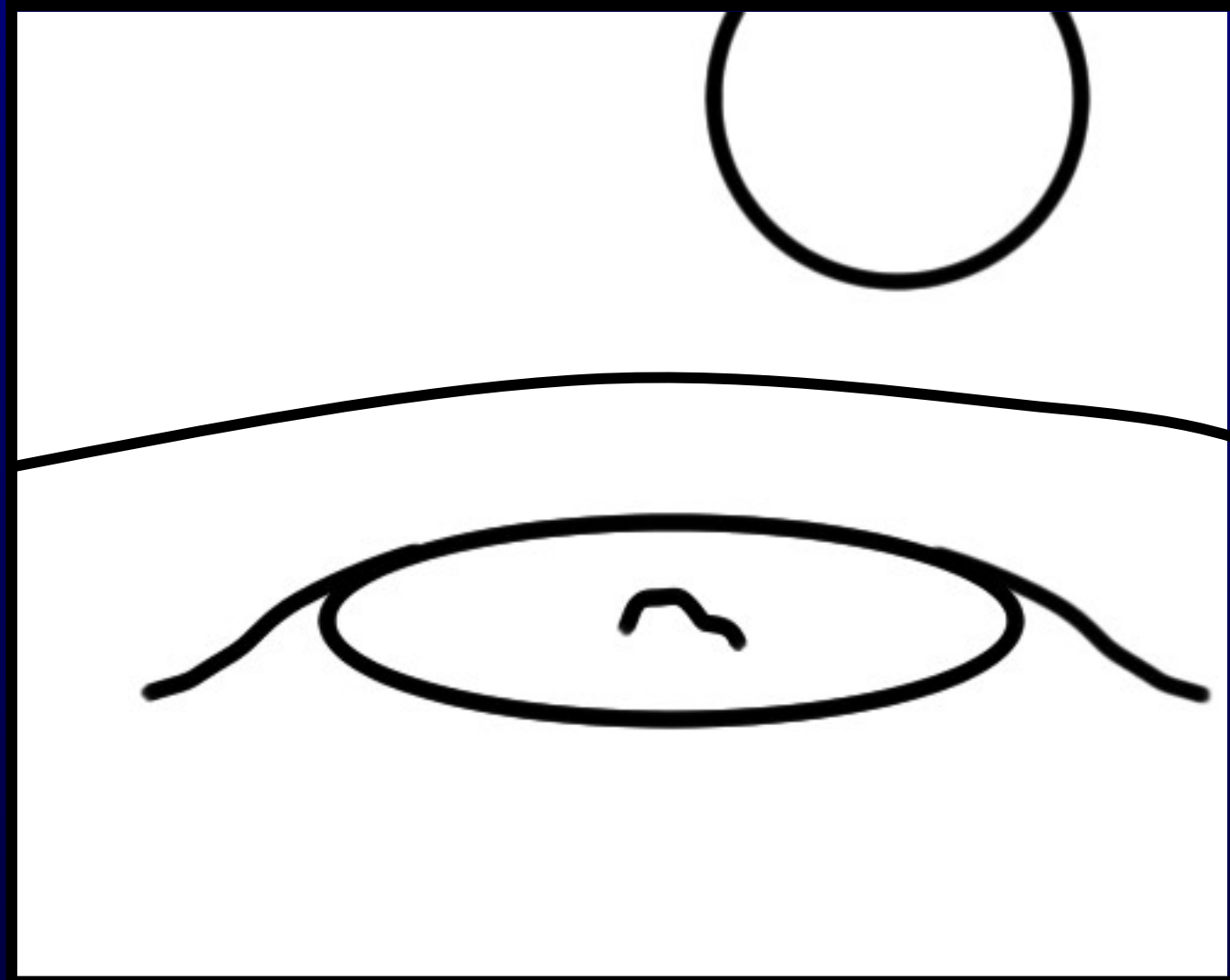
How does this activity relate to planetarium shows?



Communication round 2

Round #2 rules:

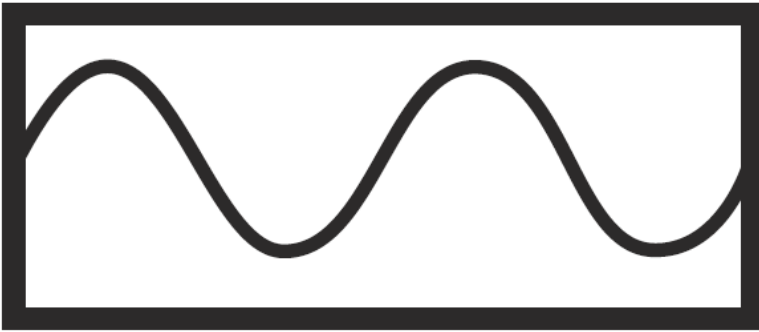
- a) Use no gestures.
- b) The students are permitted to ask questions during the activity.
- c) The instructor can see what the students are doing.



Module 4: How the student sees it.

(What you say ... may not be what they hear)

Instructor says: "A Wave."



- Questions help.
- Activities give time for deeper understanding.

Student 1 imagines: "A Wave."



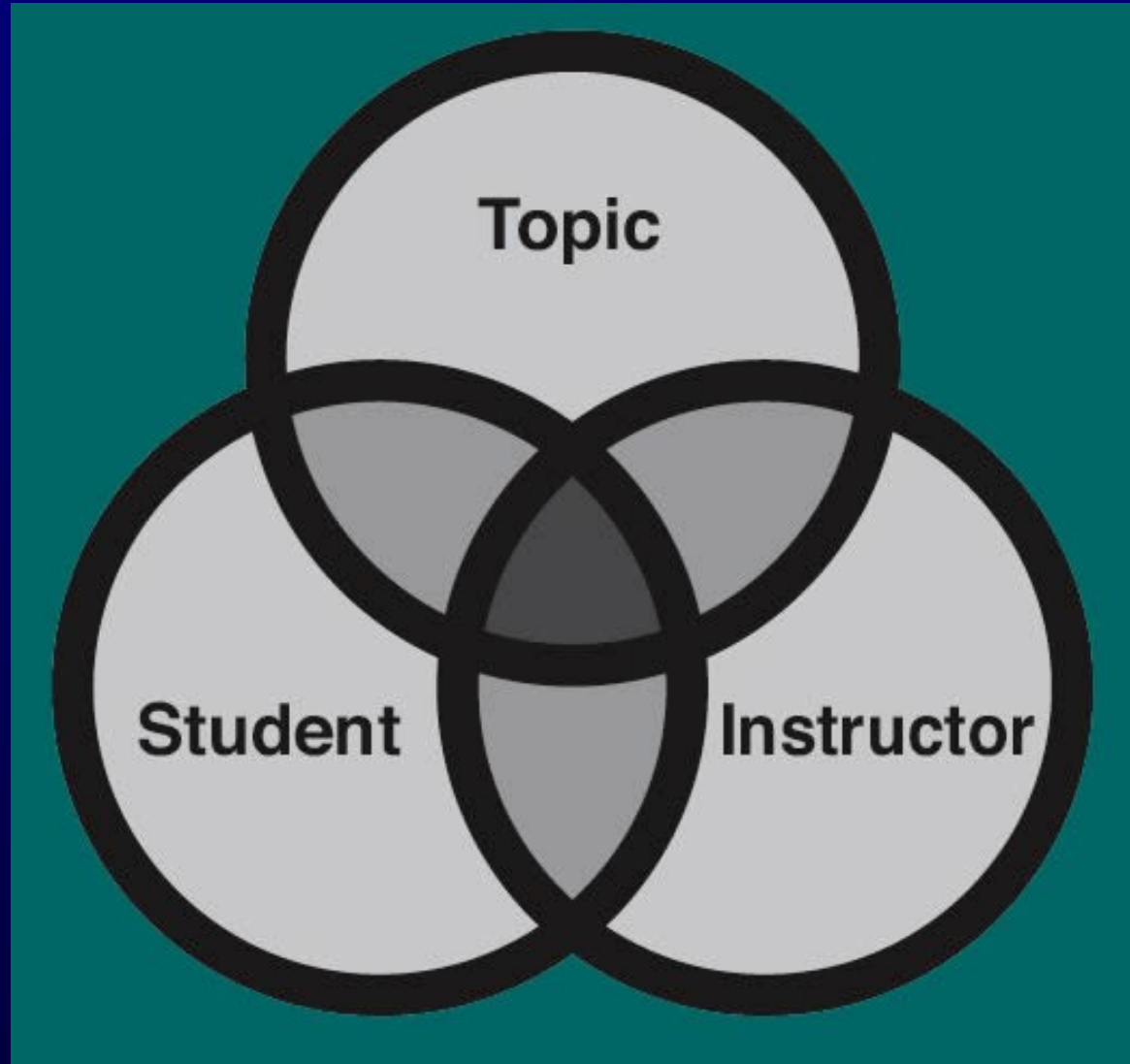
Student 2 imagines: "A Wave."





Module 2: A Framework for Examining Planetarium Programs

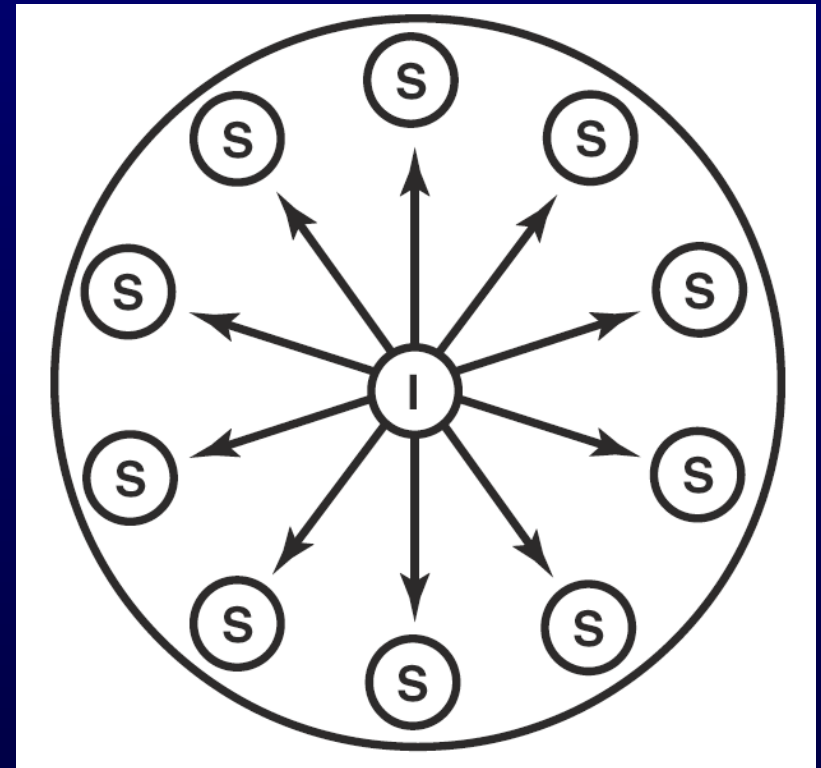
- Subject
- Audience
- Presenter



Module 3: Organizational Patterns

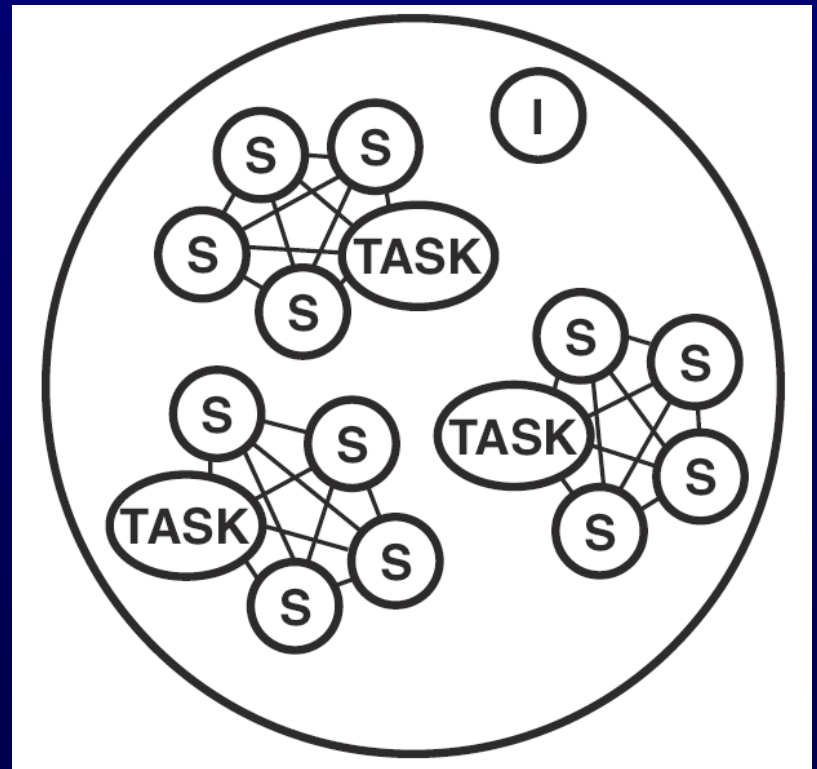
Didactic

- telling constellation mythology, or
- describing to students how to find the Big Dipper.



Small Group Task

- Small groups of students cooperate to find constellations in the planetarium sky.
- Example from “Constellations Tonight” (Vol. 5 - PASS series)
- Students learn to use a star map through didactic approach, before working in groups to find assigned constellations.



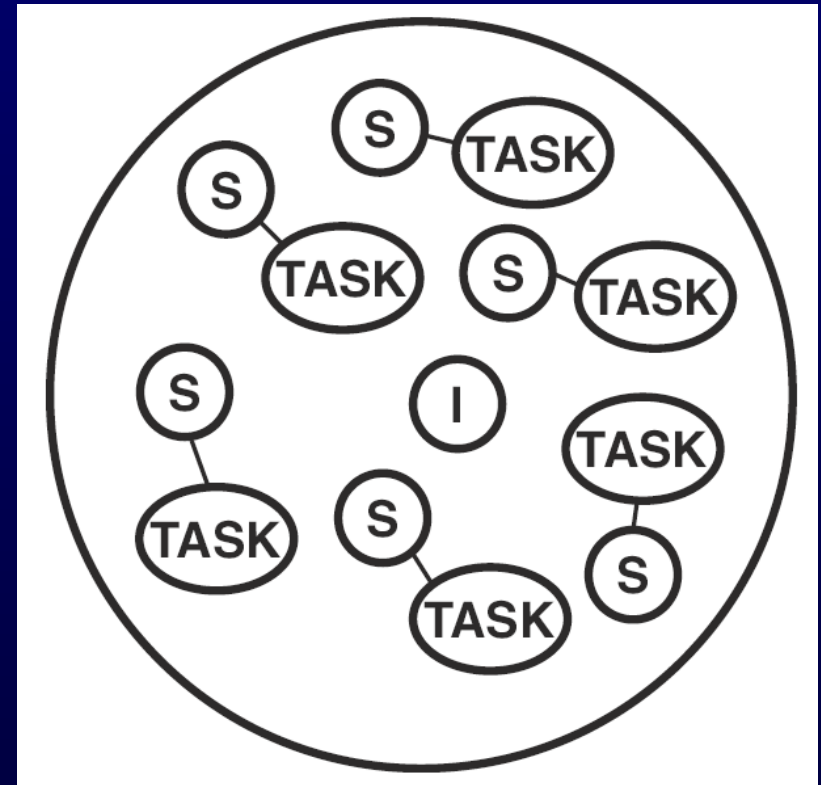


To Make Small Group Approach Successful...

1. Be sure the task is clearly defined and understood.
2. Provide the necessary materials in advance.
3. Check on the progress of each group.
4. Hold to a realistic time schedule.
5. If possible, keep each group small, not more than five members.
6. Provide reports to the larger group when tasks are completed.

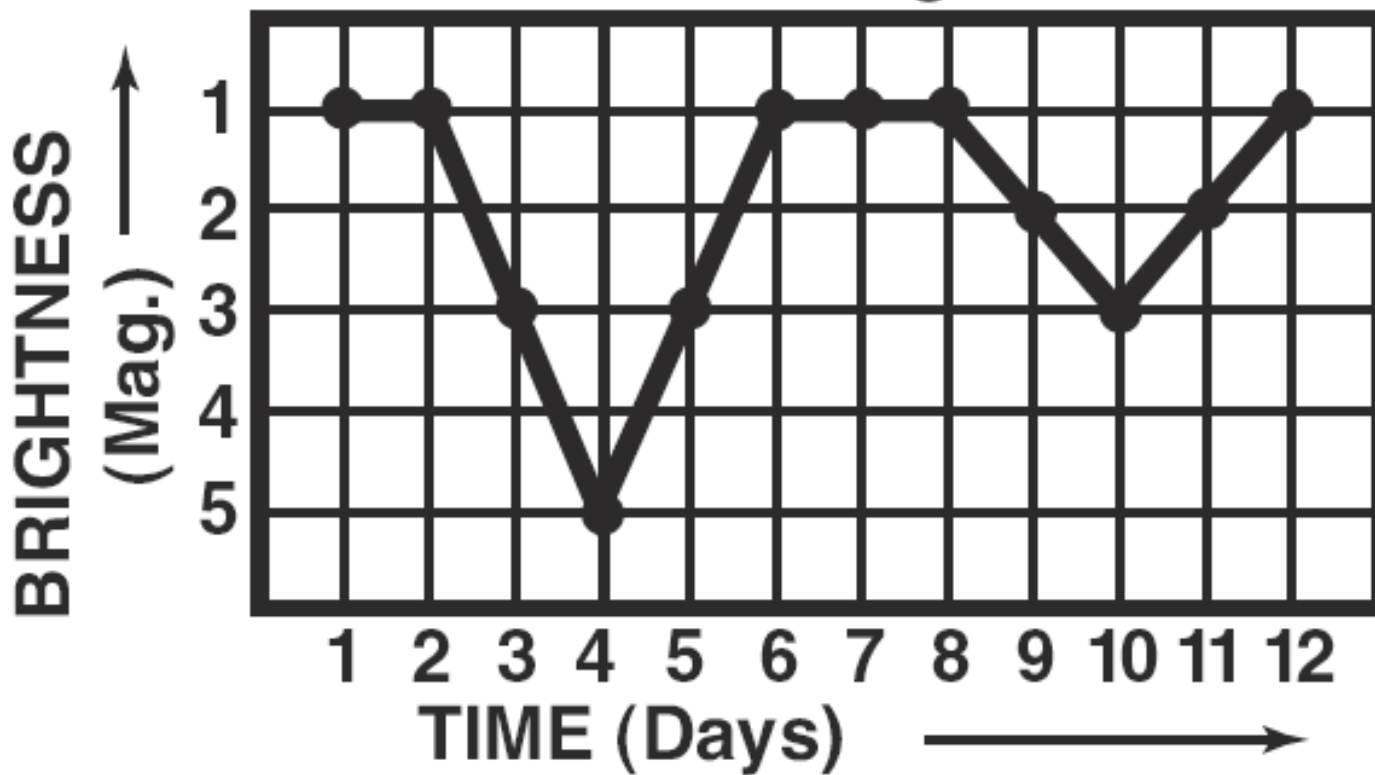
Individual Task

- Example: Observing an eclipsing binary star.





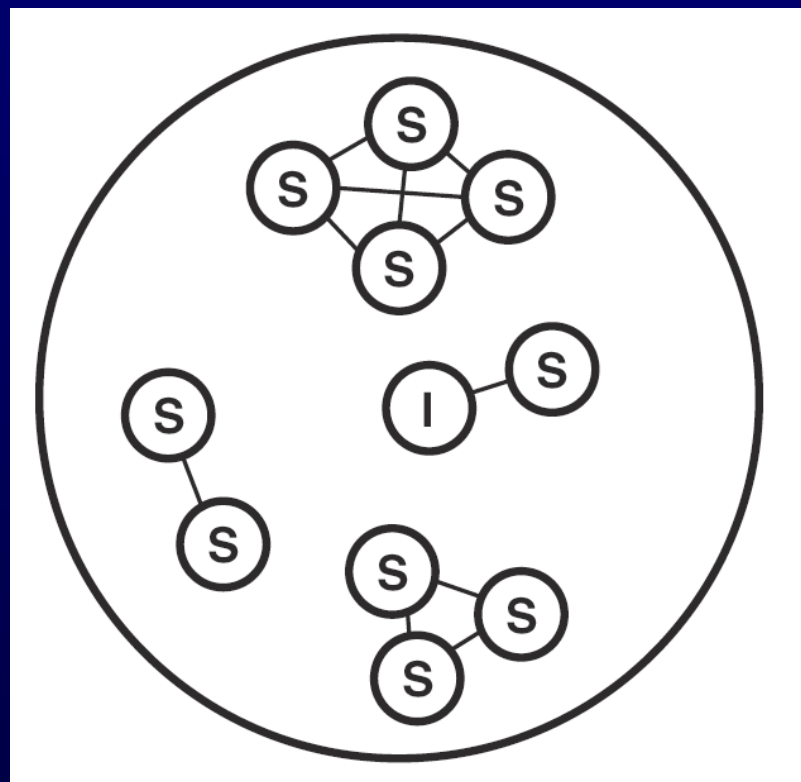
Students' Data Sheet Variable Star Light Curve



Informal Discussion

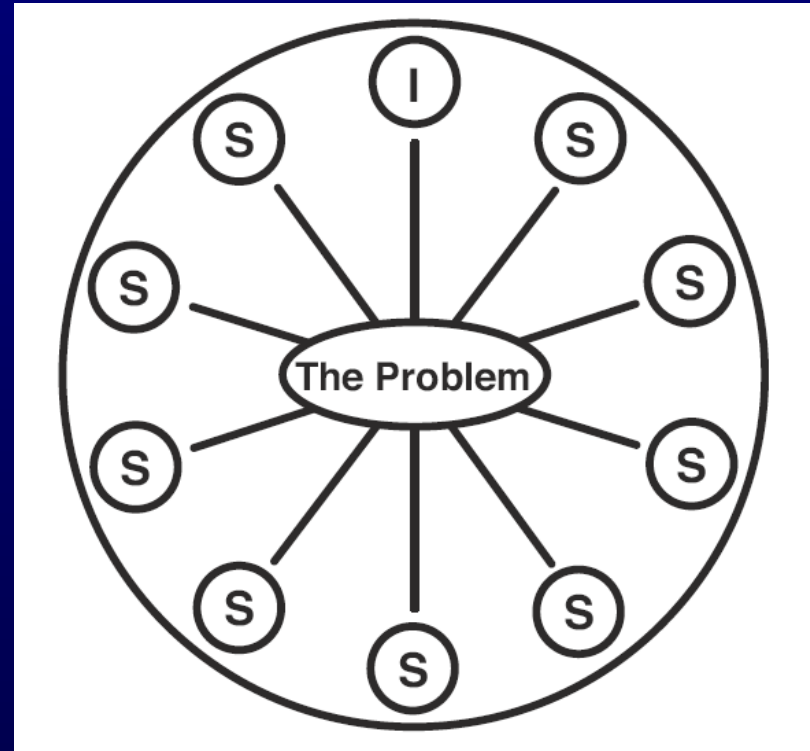
Example:

After the variable star task, students see if they made the same estimates as their neighbors.



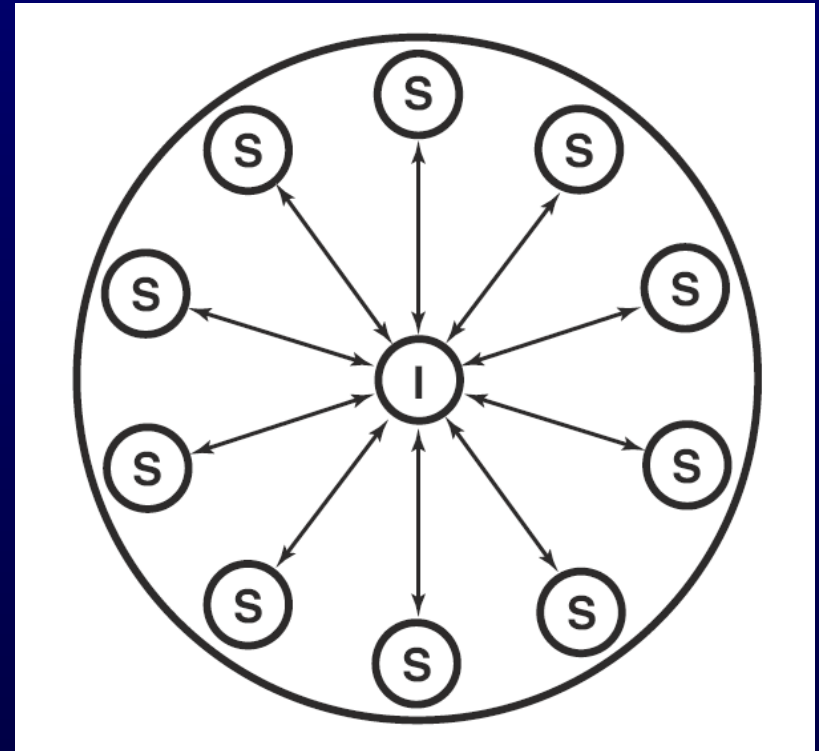
Group Meeting

- Problem-centered. Not instructor-centered.
- Problem initiated by presenter or students.
- Instructor role: facilitate discussion, not direct it (listen, call on individuals to speak, make suggestions, even appoint audience member to lead discussion).
- Example, after variable star activity, lead a discussion
 1. How many dips in the brightness occurred?
 2. When?
 3. What was the minimum brightness?



Socratic

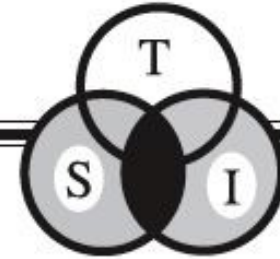
- Ask questions of individual students to lead them step-by-step to the particular ideas.
- Must be conscious of how your questions affect the students.
- Example:
In eclipsing binary star model...
 - “What might have caused these dips in brightness?”
 - “Let’s take those possibilities one at a time. If haze is blocking light from the star, what would happen to the comparison stars?”
 - “Now suppose I tell you both dips repeat every twelve days. Which model works best now?”





Module 5: Questioning Strategies

- Classifying questions
- Identify types of questions
- Sequences of questions
- Better dialog with students



The goals of this module are to introduce you to a scheme for classifying questions, to provide practice in identifying types of questions, and to illustrate how to draw profiles of types and sequences of questions that you ask during a planetarium program. These tools can help you increase the value of your dialog with students.



Module 5: Questioning Strategies

1. *What does a light-year measure?*
2. *What topics would you like me to cover in our next planetarium show?*
3. *Did you hear my last question?*
4. *Based on your observations of the setting sun during the last two weeks, where do you predict it will set one week from now?*
5. *What do you think your life would be like if you were an astronomer?*
6. *Planets certainly aren't as hot as stars, are they?*

Suggest categories for these questions...

Please make a table like this:

Categories	Example Numbers



Module 5: Questioning Strategies

Types of Questions					
Narrow		Broad		Other	
Direct Info.	Synthesizing	Open-ended	Feeling	Rhetorical	Managerial

What does a light-year measure?

Do you know how many exoplanets have been discovered?



Module 5: Questioning Strategies

Types of Questions					
Narrow		Broad		Other	
Direct Info.	Synthesizing	Open-ended	Feeling	Rhetorical	Managerial

Based on your observations of the setting Sun during the last two weeks, where do you predict it will set one week from now?

When studying these wobbles, we look for two features—the size of the wobble, and the speed of the wobble.

What might cause a really big wobble?

[A big massive planet, ...or planet very close to the star.]

If an alien astronomer were watching the spectrum of our Sun, which planet do you think would create the biggest wobble?



Module 5: Questioning Strategies

Types of Questions					
Narrow		Broad		Other	
Direct Info.	Synthesizing	Open-ended	Feeling	Rhetorical	Managerial

Why do you think ancient civilizations created their own systems of constellations?

Are there places other than Earth that could have life?

Why do you think finding exoplanets is hard?



Module 5: Questioning Strategies

Types of Questions					
Narrow		Broad		Other	
Direct Info.	Synthesizing	Open-ended	Feelling	Rhetorical	Managerial

How did you feel when you first looked at the rings of Saturn through a telescope?

How do you feel about the amount of money being spent on space exploration?

If we do find Earth-sized planets, it will be a tremendous discovery. Equally exciting is that the Kepler mission is designed to settle the age old question of whether planets like ours are common or not.



Module 5: Questioning Strategies

Types of Questions					
Narrow		Broad		Other	
Direct Info.	Synthesizing	Open-ended	Feeling	Rhetorical	Managerial

- *Planets certainly aren't as hot as stars, are they?*
- *Earlier, I told you that a light-year is a measure of distance and not time, right?*



Module 5: Questioning Strategies

Types of Questions					
Narrow		Broad		Other	
Direct Info.	Synthesizing	Open-ended	Feeling	Rhetorical	Managerial

- *“Can everyone hear?”*
- *“Who has the pointer?”*



Module 5: Questioning Strategies

Classify each of the questions by checking the appropriate column. Then draw a line between the check marks. This line is a visual representation of one questioning strategy. Do the same for the sets of questions on the next two pages.

	Direct Info.	Synthesizing	Open-ended	Feeling
1. What was the main color that you observed in the hydrogen gas? What colors do you recall from the helium gas tube?				
2. How do the colors of helium differ from those of hydrogen?				
3. What colors do you see in this artificial star?				
4. From your own observations, what kind of gas do you think this star is made of? How did you determine that?				
5. How might this technique of studying stars help astronomers learn more about the universe?				



Module 5: Questioning Strategies

A series of questions from an actual show:

- Are the types of questions and the kinds of thinking they stimulated satisfactory?
How would you change the mix?
- What specific parts of this series of questions could be improved?
- What other general comments or suggestions for improvement can be offered to the instructor in this case?



Module 5: Questioning Strategies

Types of Questions						
	Narrow		Broad		Other	
	Direct Info	Synthesizing	Open-ended	Feeling	Rhetorical	Managerial
1	✓					
2						✓
3						
4						
5						
6						
7						
8						
9						
10						

I: “Good evening. As our planetarium sky darkens, can anyone recognize the Big Dipper?” (1)

S: “Oh, I see it.” “Yeah, I see it too.”

I: “Okay, will you please take this light pointer and show the rest of us where the Big Dipper is?” (2)



Module 5: Questioning Strategies

Types of Questions					
Narrow		Broad		Other	
Direct Info.	Synthesizing	Open-ended	Feeling	Rhetorical	Managerial

I: *“Thank you. Well, that’s the Big Dipper. Just about all of the stars that we can see in the sky belong to groups like the Big Dipper; and people have been naming the constellations for just about as long as there have been people. Why do you think people do that?” (3)*

S: *“Worship.”*

I: *“Okay, worship; that’s a good possibility. What’s another?” (4)*

S: *“To go places.”*

I: *“How would knowing the constellations help you to go places?” (5)*



Module 5: Questioning Strategies

Types of Questions					
Narrow		Broad		Other	
Direct Info.	Synthesizing	Open-ended	Feeling	Rhetorical	Managerial

S: *“You’d like to know which way to go from the stars. Directions.”*

I: *“Yes, knowing the constellations does help you find your way.
Does anyone know how to use the Big Dipper to find which way
is north?” (6)*

S: *“I do, I think.”*

I: *“Okay, will you show us please?” (7)*

S: *“It’s this bright one at the end of the handle of the big dipper, the
North Star.”*



Module 5: Questioning Strategies

Types of Questions					
Narrow		Broad		Other	
Direct Info.	Synthesizing	Open-ended	Feeling	Rhetorical	Managerial

I: *“You’ve got the right idea, but the wrong star.*

These two stars at the end of the bowl point to the North Star, right here. Then, once you’ve found the North Star, look down at the horizon just below it. That direction is north. Okay?” (8)

I: *“We’ve discussed at least two reasons that ancient people might have named the constellations: for worship, or religious reasons, and to find directions. How do you feel when you locate something you’re familiar with, like the Big Dipper in the sky?” (9)*

S: *“Like I just saw a friend. Good.”*

I: *“I’ll tell you what. I will give each of you a star map and let you find the constellations right here in the planetarium. Is there anyone who has not yet received a star map?” (10)*



Responding Strategies

Research by Mary Budd Rowe:

Most instructors wait only 1 or 2 sec after asking a question before they either:

- 1) call on another person;
- 2) ask another question; or
- 3) give the answer to the question themselves.

Wait 1–2 seconds—one-word student responses result.

Wait 4–6 sec:

- students tend to respond in whole sentences,
- complete thoughts,
- increased speculation in the students' thinking,
- they tend to justify answers more fully.



Responding

4–6 sec waiting period seems like an eternity, but wait-time research suggests great value in adjusting to this pattern.

How you react and respond to their ideas early in the program is crucial to participation you can expect in the remainder of the program.



Module 6: Activities for the Planetarium

What do you think would work in your planetarium?

Got any ideas for a new planetarium activity?

A new audience participation show?



The Question of Questions

THANKS!

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Planetarium Activities for Student Success:

<http://www.lawrencehallofscience/pass>

[this is where you'll find Strange Planets show]

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Lawrence Hall of Science
Berkeley, CA 94720-5200



The Question of Questions

What planet is Uncle Al from?

<http://uncleal.org>