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**Using Student Response Systems for
Peer Instruction and Active Learning in
the Classroom**

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The College Lecture-1



The College Lecture-2



Getting to Know You

- What is your position in the field of education?
 - A. Ministry of Education
 - B. Administrator
 - C. Faculty
 - D. Other

Getting to Know You

- Are you currently using some kind of audience response system?
 - A. Yes
 - B. No

Getting to Know You

- How much do you know about astronomy?
 - A. A great deal
 - B. Have some understanding
 - C. Don't know much about it
 - D. Know nothing about astronomy

Getting to Know You

- How much do you know about “flipping” a classroom?
 - A. Have already flipped my classroom
 - B. I have read about it and am planning to flip my classroom in the near future
 - C. I have heard about it
 - D. I have never heard about flipping a classroom

The Flipped Classroom

- Course lectures are posted online
- Students are told to read the lectures in preparation for class
- During class, students engage in conceptual questions and group projects
- No long lectures!

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Optional Weekly Quiz

(to make sure students read the lecture)

- At the end of my paper, how many conceptual questions are there?
 - A. One
 - B. Two
 - C. Three
 - D. Four

Technique-1

- According to Newton's law of gravity, the force of gravity between two objects is given by:

$$F = G \frac{m_1 m_2}{r^2}$$

- Where F is the force of gravity, G is a constant, m1 is the mass of the first object, m2 is the mass of the second object, and r is the distance between them.

Technique-1

- Diameter
 - Moon – 5.5 cm (2 inches)
 - Earth – 20 cm (8 inches)
- Mass
 - Moon – 1 unit of mass
 - Earth – 81 units of mass



Technique-1

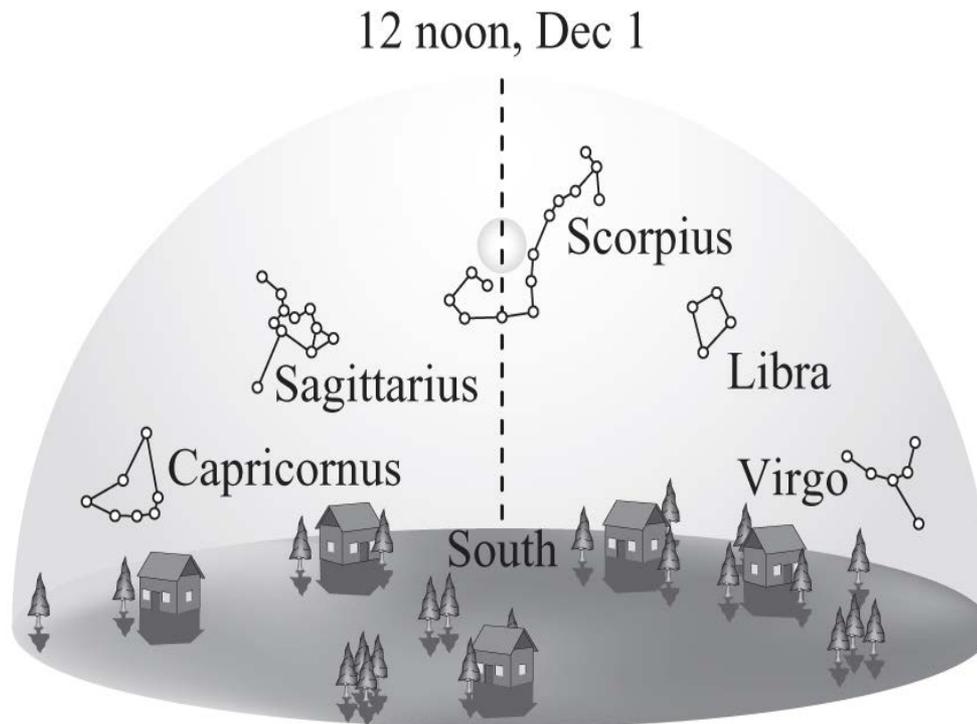
- Given that Earth is much larger and more massive than the moon, which of the following is true?
 - A. The force of gravity of the earth on the moon is larger
 - B. The force of gravity of the moon on the earth is larger
 - C. The force of gravity of the earth on the moon is equal to the force of gravity of the moon on the earth
 - D. None of the above are true

Technique-1

- Why is this technique so effective?
 - A. Students must actively work with the concepts until they understand it
 - B. Students can explain the concepts to each other more effectively than the teacher can
 - C. Students understand concepts better if they can explain them to someone else
 - D. Because students are talking in the classroom, they are much more likely to ask questions and engage with the professor

Technique-2

- On December 1st, at noon, the sun appears to be in the constellation Scorpius. (If you could see the stars in the middle of the day.)



Technique-2

- Three hours later, at 3:00 PM, where will the sun appear?
 - A. In Capricornus
 - B. In Sagittarius
 - C. In Scorpius
 - D. In Libra
 - E. In Virgo (raise one hand)
 - F. You cannot tell from the diagram (raise both hands)

Technique-2

- With this technique, the discussion has already taken place, so there is no point of further discussion.
 - If most groups get the right answer, give praise and encouragement
 - If most groups get the wrong answer, give a short explanation about the concept
 - Ask for questions and give clarification as needed
 - Optional: Keep track of the answers and, at the end of class, recognize the group who got the most correct

Group Discussion

- One of the most earth-like planets discovered to date is Kepler 438b, which is about 470 light years away from Earth. You and your group have been selected by the United Nations to prepare a message to send to Kepler 438b. You can send any digital message you want (pictures, audio, movies) and there is no limit on the size of the message. What will your group send and why?
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Group Discussion

- For this discussion, groups must consider
 - It will take 470 years for your message to reach Kepler 438b and another 470 for a return message (What kind of dialogue is possible?)
 - We don't know if there is any life, let alone intelligent life, on Kepler 438b
 - What language do you use for the message?
 - What are the implications of choosing some information over others?

Grading

- The flipped, active learning classroom gives us the opportunity to reconsider how we grade our students
- There is nothing wrong with continuing to administer tests, but other options are now possible

My Class

- Introductory astronomy
 - Optional laboratory
- Nearly all students are non-science majors
- General education physical science
 - Meets graduation and transfer physical science requirements
- Permanent groups at the start of class
 - Groups would decide on an astronomy-related name for their group (The Plutoids, The Big Bangers, etc.)

My Class

- Attendance: 100 points
 - Minus 10 points per week missed
 - Drop if 20% of classes are missed
- Weekly quizzes: 100 points
 - 10 questions each week
- Term paper: 100 points
- Group presentation: 100 points
 - Times a participation factor—by group vote
- Field trip: 100 points
 - Proof and half-page report required
- TOTAL 500 points
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My Class

- 451 to 500 points = A
- 401 to 450 points = B
- 351 to 400 points = C
- 301 to 350 points = D
- 300 points or below = F

- Extra credit: additional field trip, additional term paper

My 3-Hour Class

- [Astronomy picture of the day](#)
- Weekly quiz (10 questions) - attendance
- Astronomy news of the week
- Astronomer of the week
- Conceptual questions (Prather, 2012)
- Break
- Student group presentation
- Conceptual questions
- Group discussion problem
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Clickers

- iClickers, Turning Technologies
 - Student cost: \$30 to \$40 each
 - Adopt campus-wide and use for all classes
- eClicker in the Apple App Store
 - Use iPhones or web-enabled devices
- Capture student ID for
 - Attendance
 - Quizzes
- Use anonymously for
 - Opinions
 - Pretest/post test learning outcomes

Flexibility is the Key

- Some things will work and others, not so well
 - Be willing to experiment and modify
- Some exercises will go fast with some classes and slow with others
- Some days you may run out of things to do, other days, you may not get to everything you had planned



The Importance of Engagement

- Dr. Carter tells us, as part of her remarks how important it is to work alongside students
- Student engagement is a key to retention and success
- Most engagement programs are limited in scope
- Student engagement at the level of the classroom has the potential to affect all of the students at the institution



For Those of You Who Are Still Awake

- This presentation was:
 - A. The best ever!! I can't wait to implement these ideas.
 - B. Very interesting! I am going to try some of these ideas.
 - C. Interesting, but I am going to think about it.
 - D. Not interesting at all.

Thank you and enjoy your new classroom!

- Questions, comments?