

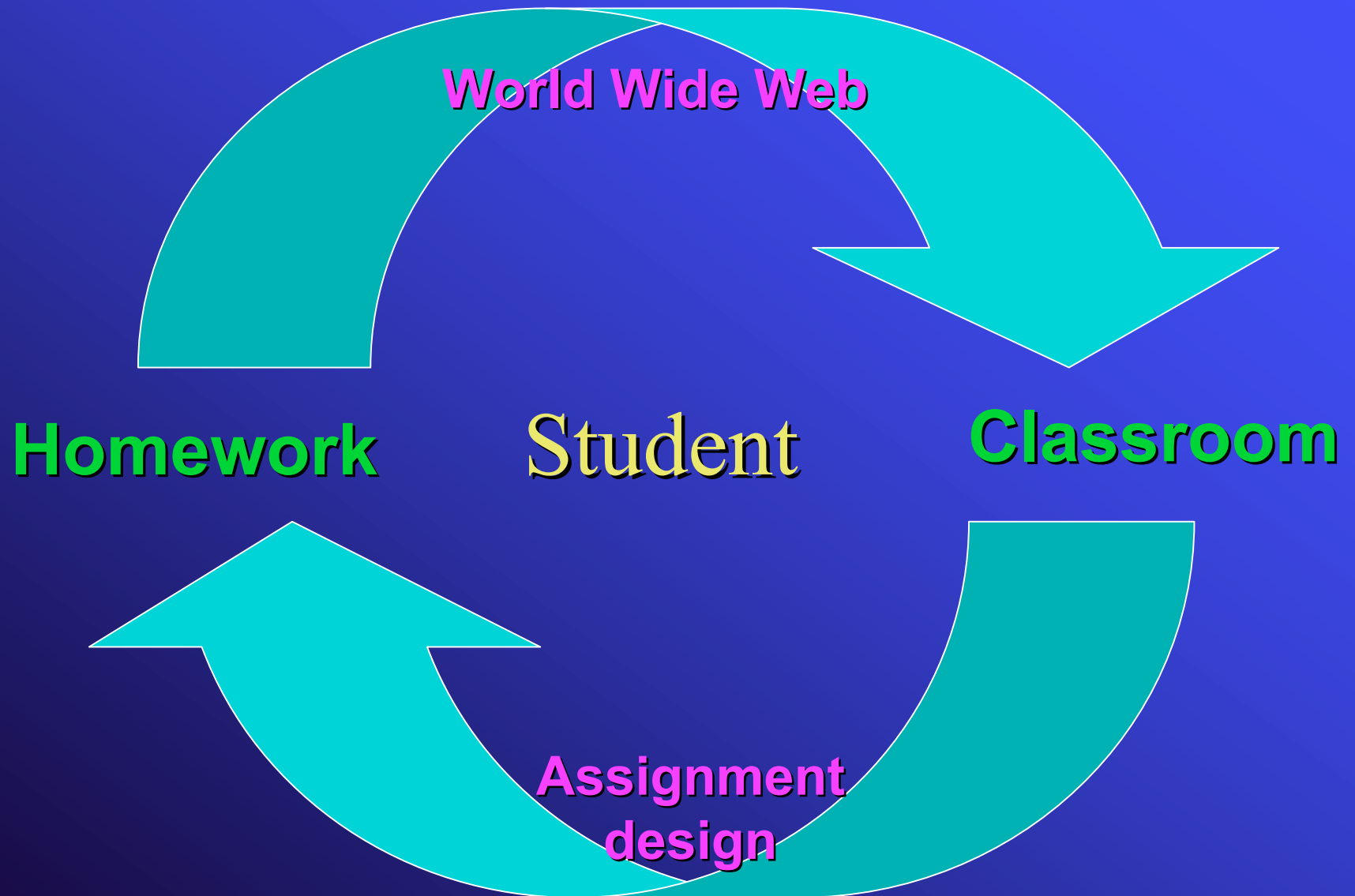
Implementing Just-in-Time Teaching:

The What, How, and When
of JiTT

Outline

- Using WarmUps - The Interactive Lecture
- Developing Questions
- Grading Options
- Assessment - How can this improve?
- Time Commitment
- Technology Options

Review of JiTT



Everything else is an option

WarmUp Exercises (one option)

- Due 2 hours before class
 - Cover that day's material
 - 3 (somewhat ambiguous) short essay questions
 - An online, pre-class reading quiz
-
- Students better prepared for class
 - Faculty better prepared for students
 - Class is student-centered and interactive

Question:

- What do you already do that accomplishes some or all of the same things?

The “Interactive Lecture” (option)

- Step 1: Synchronization

Read the students’ responses...
What do they understand?

- Step 2: Preparation

Select excerpts from students work

- Step 3: Execution

Class is a dialog based on **student excerpts and faculty notes**

Example WarmUp

- *WarmUp: Is it possible to add heat to an ideal gas without changing its temperature? If it is possible, please explain how it is done.*
 - ◆ “It is not possible because the internal energy of an ideal gas only depends on the temperature... the internal energy will increase when the temperature rises....”
 - ◆ “It is possible to add heat to an ideal gas without it changing its temperature by the gas receiving the heat, and the atoms of that gas getting excited enough to disperse that heat as fast as they receive it...”
 - ◆ “If you add heat to a system while the system is doing the corresponding amount of work, the temperature will not change.”

Choosing and using student responses

- Use a mix of “good” and “bad” responses
- Always say something positive (see last example)
 - ◆ This is true, but what if something else occurs simultaneously...
 - ◆ This makes sense, but something is missing...
 - ◆ This is a great response... how would we know how much heat to add?
- More useful phrases...
 - ◆ This is a good answer, but to a different question...
 - ◆ This has a great beginning, but more could be added...
 - ◆ This is correct, but the reasoning isn't quite right...

Creating extensions

- Ask students to extend or respond to one another's work
 - ◆ What part of this is completely correct?
 - ◆ Under what circumstances would these be correct?
 - ◆ What word or two could be changed to fix this completely?
 - ◆ What is particularly good about this response?

Expansion and Comparison

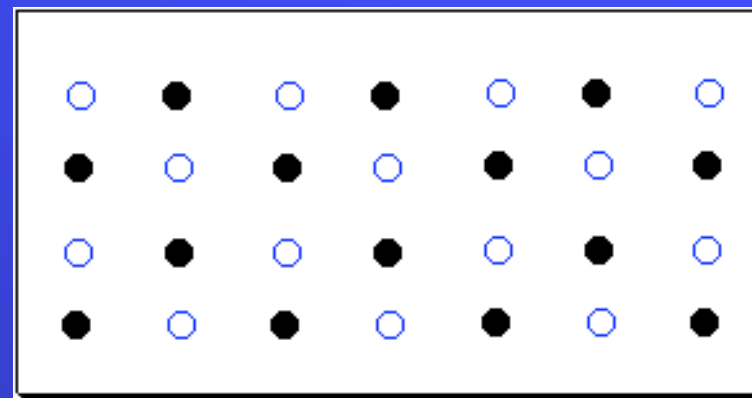
- Ask students to expand the scope of the question
 - ◆ Is this true for other cases? Which?
 - ◆ When is this statement false? What happens then?
 - ◆ Is this similar to something we have done before? What?
- Ask students to compare “Dueling Answers”
 - ◆ Show two very different answers, not obviously exclusive:
Ask if they are exclusive
 - ◆ Show two obviously exclusive answers:
 - ◆ Ask for a vote on which is correct
 - ◆ Do some analysis
 - ◆ Repeat as needed

Question:

- How else could you ask students to engage with one another's answers?

JiTT in Chemistry

This picture depicts matter at the submicroscopic level. Describe what you see and take a guess as to what the identity of the substance is.



- ◆ “The particles are well spaced out so I would guess the substance to be a gas. The substance is a gas composed of 2 elements that are in an equal ratio.”
- ◆ “After reading Chapter 1 in the book I would guess that the substance is water in the form of a solid because the atoms are in order. However, I could be wrong because I think the atoms in a solid might be closer together.”

Creating questions (options...)

1. Start with “What do you want your students to learn?” Questions should ask students to engage with the big ideas, not look up the small facts
2. Try a key phrase. I like
 - a) What is the difference between... ?
 - b) In your opinion, what does ___ mean?
 - c) In your own words, explain...
 - d) How/why do you think _____ occurs?
 - e) Is _____ possible?
 - f) What do you think happens when...?

More options for questions...

- Consider “where you are” with a topic
- Connect with Bloom’s taxonomy
 - ◆ How would you *explain* _____ to a 5th grader?
 - ◆ How would you *apply* (the reading) to the following situation?
 - ◆ How would you *break down* the following problem into sub-problems?
 - ◆ *Create* a new example of Y similar to the example of X in the book
 - ◆ Read (something) and evaluate whether the author has correctly understood _____

Activity

- Write a WarmUp question or two for any course of your choice on the cards. Indicate what course this is for.
- Pass them forward
- Discussion

Grading/evaluation options

■ How do I assign points?

- ◆ Participation only (does this show a good faith effort?)
- ◆ Rubric (see handout)
- ◆ High stakes? (No reports...)

■ I can't grade all these before class!!

- ◆ Spot check for in-class use
- ◆ Assign points later
- ◆ Use as springboard for undersatnding students

Assessment example I (N=155)

Q1 Do the WarmUps help you stay caught up?

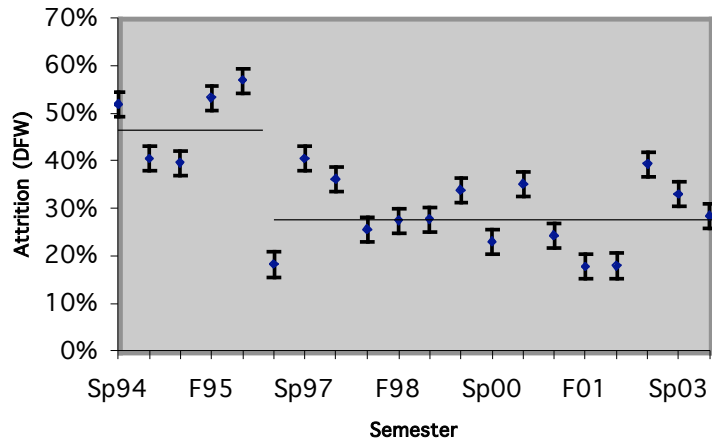
Q2 Do you “Cram” before tests in this course?

Q3 Do you “Cram” in your other courses?

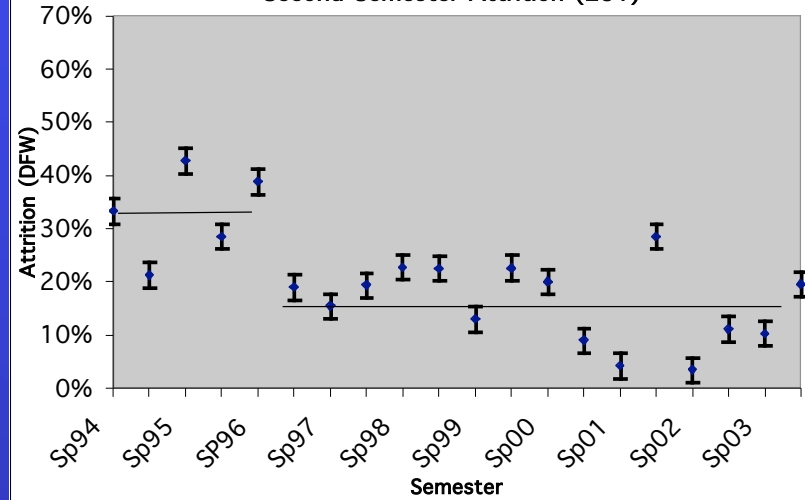
	1- Yes	2- Yes	3- Yes
“A” students	85%	14%	43%
“B” students	89 %	39%	61%
“C” students	89%	47%	68%
“D” students	84%	68%	68%
“F” students	92%	58%	58%

Assessment II: retention

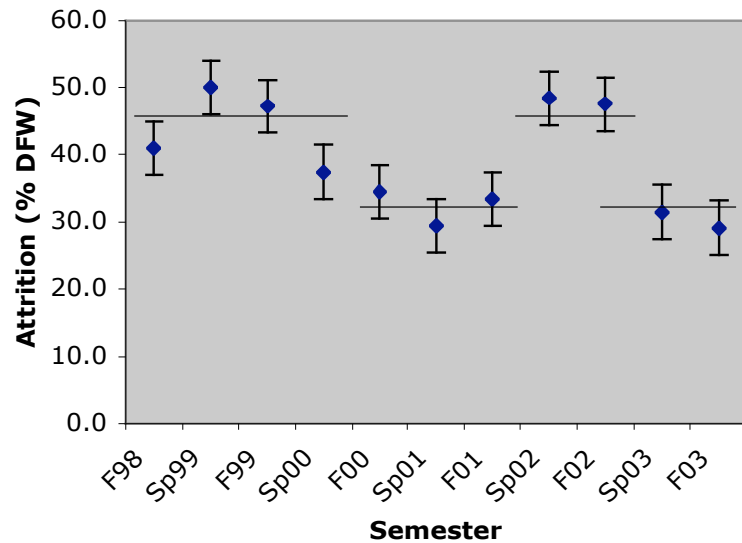
First Semester Attrition (152)



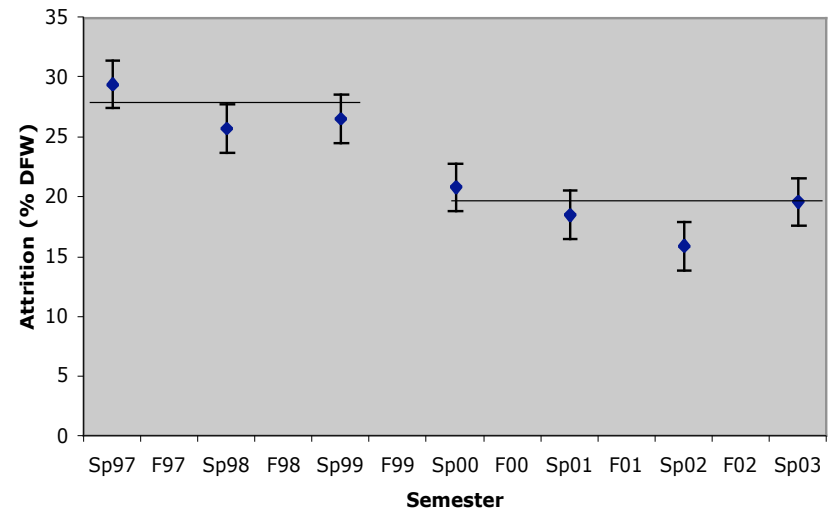
Second Semester Attrition (251)



Attrition in Calculus 164



Attrition in Biology N100



Assessment III (Biology, N=200)

N~200, 4 questions each category	% Gain (Post%-pre%)	Average Nor- malized Gain
Questions with no in- terventions	$\%G = 15\%$ (25%-10%)	$\langle g \rangle = 0.167$
Questions tied to ad- ditional homework problems	$\%G = 17\%$ (35%-18%)	$\langle g \rangle = 0.207$
Questions tied to WarmUp or coopera- tive learning ques- tions	$\%G = 45\%$ (59%-14%)	$\langle g \rangle = 0.511$
Questions tied to WarmUp and coop- erative learning ques- tions	$\%G = 56\%$ (68%-12%)	$\langle g \rangle = 0.636$

Assessment IV (affective, N=56)

1. Do you feel that the warm-up assignments helped your professor make good use of the classroom time?	Yes 47 87%	No 7 13%
2. Do other professors have better ways to determine how class time should be used?	Yes 14 26%	No 40 74%
3. Do you feel that the warm-up assignments helped your professor focus on important topics in class?	Yes 49 91%	No 7 13%
4. Do your other professors have effective methods for focusing on important topics in class?	Yes 33 61%	No 21 39%
5. Did the warm-up assignments help your professor get a good feel for what the students know?	Yes 42 81%	No 10 19%
6. Do your other professors have effective methods for getting a feel for what their students know?	Yes 20 38%	No 33 62%
7. Do you think the warm-up assignments help your professor get students involved during the lecture?	Yes 37 70%	No 16 30%
8. Do your other professors have effective methods for getting their students involved in lecture?	Yes 23 43%	No 31 57%

Student Comments

- “This was a fantastic course. It was the hardest course I’ve taken yet, but also the most fun.”
- I think the WarmUps are a good idea because they give students a chance to think about the material prior to lecture.
- “This course was very well structured. It was obvious that a lot of time was spent in preparation for it.”
- “152 & 251 have made me reach more than any courses I have taken.”
- Don’t tell anyone, but I think I will greatly miss my physics class.

How long is this going to take?

■ One time investments

- ◆ Identifying technology support and methods: ? (depends on IT)
- ◆ Writing questions: 10-20 hours/course

■ Ongoing time commitments

- ◆ Posting the questions: 0.5-1 hour/week
- ◆ Reviewing them before class
~ 0.5 hour/class
- ◆ Grading: 30 sec/student-class

When do I begin?

- This fall, in just one course!
- Start in first week. Students develop habits early on
- Stay consistent: do not change system in mid semester (without explaining)
- 2 times/week is best

Other JiTT Components

- Weekly Puzzle
Opposite “Bookend” to WarmUp
- “What is Physics Good For”
- Student-Faculty and Student-Student
Communication tools
- Collaborative Recitation