Students at the Center

Vincent Lakey  
Physics

David Jeffcoat  
Chemistry
Typical Lecture Class

Talk, talk, talk

Power Point or writing on a board non stop

iClicker question posed to the class

Move on without taking answers into account

Formal assessments happen during quizzes or exams
Instructor or Institution Based Teaching

Generalized

Getting through a list of topics in the semester

Standardized Testing

Lecturer does 99% of the talking

Teaching to pass the class

Requires initiative from students to work outside the class
Pros and Cons of a Regular Lecture

Pros

● Very easy to develop the class, syllabus and assessments
● Every class period is very similar and familiar
● Flow is controllable with less disruption
● Portable to future semesters

Cons

● Students left behind or not setup to succeed
● Misconceptions not addressed
● Students cannot express individualism
● Difficult to keep student attention
Experiences in a Large Lecture Class

Reading the book and making notecards doesn’t translate to good grades?

Come to giant lecture and are afraid to stop class to ask a “dumb question”?

Only come to class because attendance is part of the grade?

Going to crowded office hours but not getting the attention you need to understand something?
Whose job is it to make sure students understand the material?
**Student Centered Approach**

**Student-centered learning** is a teaching methodology that shifts the focus of instruction from the instructor to the student. In this mindset, the instructor designs their course to promote learner autonomy and allows students to take control of their own education. This type of class focuses on skills and practices that develop critical thinking by utilizing tools that allow students to be active in the classroom.
Four Principles of Student Centered Learning

1. Learning is personalized
2. Learning is competency based
3. Learning takes place anytime and anywhere
4. Students exert ownership over their learning
Learning By Doing

Shift from passive listener to active participant

Focus on problem solving or analyzing

Critical thinking!

- Thought experiments

People have to get “reps” with the material
Learning By Doing on Bloom’s Taxonomy

Bloom’s Taxonomy

- **Remember**: Recall facts and basic concepts (define, duplicate, list, memorize, repeat, state)
- **Understand**: Explain ideas or concepts (classify, describe, discuss, explain, identify, locate, recognize, report, select, translate)
- **Apply**: Use information in new situations (execute, implement, solve, use, demonstrate, interpret, operate, schedule, sketch)
- **Analyze**: Draw connections among ideas (differentiate, organize, relate, compare, contrast, distinguish, examine, experiment, question, test)
- **Evaluate**: Justify a stand or decision (appraise, argue, defend, judge, select, support, value, critique, weigh)
- **Create**: Produce new or original work (design, assemble, construct, conjecture, develop, formulate, author, investigate)
Instructor Mindset - Transfer the Power

Student centered learning is guided not told

Formative assessment

Let the student’s understanding dictate the flow of the classroom
What Does a Student Centered Classroom Look Like?

Introduction to material done outside of classroom

Downplay or eliminate lecture

Group based activities to promote collaboration

Problem solving

Acting, movement, and inquiry
Formative Assessment and Adaptability

See the learning process

On the fly, identify strengths and weaknesses of individuals and class

Allow mistakes with little stakes

Tailor future problems or lessons to the needs of your class at every step

Be able to quash any misconceptions immediately
My Undergrad Lecture Experience

Projectile Motion

The trajectory of a kicked football
My Student Centered Lesson Plan

\[ v_f = v_o + at \]

\[ x_f = x_o + v_o t + \frac{1}{2}at^2 \]

\[ v_f^2 = v_o^2 + 2a(x_f - x_o) \]

\[ x_f = x_o + \frac{1}{2}(v_f + v_o)t \]

Simultaneous splat

Some graduate students decide to make headlines in the Tallahassee Democrat by dropping watermelons from the 7th floor of the Keen building, which is at a height of 24 m. The resulting explosions of the watermelons are really fun to watch. Someone decides it would be fun to try and throw a watermelon straight down from the 7th floor, and simultaneously drop a watermelon from the walkway on the second floor, at a height of 4 m, and see if they can have them simultaneously splat on the ground by landing at the same time.

(a) Draw a motion diagram for the motion of the two watermelons.

(b) Make a pictorial model for the motion of the two watermelons.

WCTV Physics Watermelon Drop
Think of a topic you’ve taught the most

Can you convert a lecture on that topic into a student centered class activity?

Write your ideas down and discuss with the people at your table

Grab refreshments!
Student Accountability

Formative assessment leads to identifying your own weaknesses as a student

You pass and fail in front of an audience

Students are incentivized to understand and succeed

Instructor must help students focus on improving
Summative Assessment

Formative assessment identified strengths and weaknesses
Tailor graded materials based on those strengths and weaknesses
Knowing the learning process -> Partial credit
Set up so that most improved students are given opportunity to shine
Pitfall - Student “Buy in”

Requires a lot more student work

- Can’t sit in the corner on your phone

Students afraid to work with others

Struggling -> Quitting
How to Get Students to “Buy In”

Treat students like adults

Encourage interaction

Switch it up

Peer feedback

Peer mentoring
Pitfall - The Chaotic Classroom

Overall noise level

A classroom in motion

Students work at different speeds

Understanding of each topic varies
Stifling the Chaos

Keep class time structured

Find a happy medium in assignment times

Encourage students to peer mentor

Be able to call order

Revisit lesson plan/syllabus often
Effects on Active Learning on Student Performance & Retention - A Case Study

Lisa Bullard, Richard Felder, Dianne Raubenheimer - NC State University

5 Years of data from a sophomore level chemistry class

Class is used to “weed out” people not serious about chemistry and chemical engineering

Two separate sections - one traditional lecture and one student centered but otherwise equal (same tests, homeworks, assignments, etc)
# Retention Rates

Table 3. Percentage Retentions of Students in CBE stratified by GPA

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<th>Start Year 3</th>
<th>Start Year 4</th>
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<td>GPA</td>
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<td>(a) Active</td>
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Recap

Pros

● Active participation / More fun for everyone involved
● Ownership of education/growth
● Monitor and shape the learning process

Cons

● Flow of Class
● Student Buy In