Fixing the Disconnect: Aligning How We Teach and How Students Learn

Rebecca Lindell, PhD
Founder and Director
Tiliadal STEM Education Solutions
Introduction:
Is there really a disconnect between how you are teaching and what your students are learning?
Question:
• Do you believe there is a disconnect?
• A. Yes there is a disconnect
• B. Not Sure
• C. No there is not a disconnect
Question

How satisfied are when comparing your students’ performance in your course to how you would like them to perform?

A. Very Satisfied
B. Pretty Satisfied
C. Neither Satisfied or Dissatisfied
D. Pretty Dissatisfied
E. Very Dissatisfied
Time to Think:

Take 2 minutes, and think about why you are satisfied or unsatisfied with what your students learn.
Pair Up:

Choose a partner to discuss your answers with. How do your answers compare to your partners?
Time to Share:
Let’s Discuss the different answers
So what do we think?

Is there a disconnect between how you are teaching and what your students are learning?
Why does this disconnect exist?
Question

Who does the most amount of planned talking in your course?

A. Myself (90%-100% of time)
B. 75% Me/ 25% students asking/ answering questions in class
C. Equal mix between me and my students
D. Students talk the majority of the time while I guide their learning (75% Student/ 25% me)
E. Students do all the talking (90%-100%)
Definitions

- Teacher-centered classes occur when 50% or more of the talking is done by the instructor.
- Student-centered classes occur when 50% of more of the talking is done by the students.
Overview of Instructor-centered Courses

• Instructor-centered courses are typified where the majority of time is dominated by the instructor
  – Lecturing
  – May ask students questions but do not receive student responses
  – Students may ask questions, but do not seem satisfied

• The instructor is talking, but are the students learning?

• If the students are talking, but is the instructor teaching?
Typical Instructor-Centered Courses

• Students frantically taking notes
• Trying to maintain the pace of the instructor
• Take notes home and try to process them there
• Students may have questions/confusion at home but no one there to help them
Cognitive Load Theory

• Often produces overload of students’ cognitive resources which are limited
• Cognitive load theory, developed by Cognitive Psychologist John Sweller in the late 1980’s.
• The human brain cannot learn material if it takes too many cognitive resources or rather if the cognitive load is too high!
Example

• Imagine that Luanna is a first-year first-generation student in your STEM course.
• Luanna only has 10 cognitive resources to spend at any one time
• Imagine that she needs
  – 2 resources to listen
  – 4 resources to write down lecture notes
  – 4 resources to process info
  – 2 resources connect to previous learning
• Total 12 resources, so processing resources are reduced.
Example

• Luanna and the rest of your students take your exam
• She scores a 65% on the exam, while the class average is 55% with a STDEV of 5.
• You explain how the mean and standard deviation are used to determine her grade.
• Luanna only knows she got a 65%, which was failing in high school, so she drops your course and concludes she is not meant to have a STEM career!
Things affecting cognitive load:

• Many things can reduce the amount of resources she can spend on processing information and connecting to previous learning.
• Difficulty of the content
• How well it connects to previous learning
  — Assimilation vs. accommodation
• Researchers argue that often the only thing students can do is memorize the content, but does not lead to higher order thinking skills
Bloom’s Taxonomy

- Knowledge
- Comprehension
- Application
- Analysis
- Synthesis
- Evaluation

Higher order thinking skills
Higher cognitive load
Modified Bloom’s Taxonomy

• Lower order thinking skills:
  – Category 1 (Knowledge) – Memorization of Facts
  – Category 2 (Comprehension) – Connecting two facts into new knowledge
  – Category 3 – (Application) Applying new facts to new situation
Modified Bloom’s Taxonomy

• Higher order thinking skills:
  – Category 4 (Analysis) – Analysis of new knowledge with prior knowledge to draw conclusions
  – Category 5 (Synthesis) – Synthesizing new information to generate new conclusions
  – Category 6 – (Decision making) Examine all information and decide the best method to utilize
Faculty-centered (Lecture-based) courses tend to be the most efficient way to convey lower-order thinking skills, but these course are highly ineffective in teaching higher-order thinking skills!
You might be thinking, wait a second, I learned just fine from instructor-centered courses!

Remember You are **NOT** your students!
So how do we fix the disconnect?

The easiest way is to transfer more of your class time to student-centered instruction.
### Spectrum between Instructor-centered and Student-centered course

<table>
<thead>
<tr>
<th>100% Instructor Lead</th>
<th>Majority student active in classroom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimal student interaction with Instructor</td>
<td>Maximum student interaction with instructor</td>
</tr>
<tr>
<td>Students struggle with processing too much information</td>
<td>Students can ask for help when processing information</td>
</tr>
<tr>
<td>Does not lead to deep learning</td>
<td>Leads to more deeper learning</td>
</tr>
</tbody>
</table>
Sage on the Stage
SAGE ON THE STAGE OR GUIDE ON THE SIDE?
Transitioning to Student Centered Instruction

• Think about when you learned in a student-centered environment
  – Reflect how it worked and how can you do that during your regular lecture time

• You can make major transformation or adopt small pieces and try out

• What can you do tomorrow?
Implement basic Student-Centered Approaches

• Clicker questions
  – Do not give students answers right away but count to 12 slowly instead.

• Think-Pair-Share
Think Pair Share

1. Pose thought-provoking question

2. Answer question using clicker

   - Majority correct
     - Discuss with partner or group
     - Answer question using clicker
     - Brief explanation
   - Majority incorrect
     - Answer question using clicker
     - Detailed explanation
Going Beyond Think Pair Share

• Incorporating Team-based learning activities throughout course
  – Combined lecture/ lab/ recitation
  – Incorporate with Think Pair Share

• Flip your classroom – record lectures for students to watch outside of class time!
Thank you Texas Tech STEM SOAR!
Questions?

rlindell@tiliadal.com
https://www.stemedsolutions.com

(under construction, will be live 10/15/17)