Utilizing the Textbook in the Flipped STEM* classroom

*Science, Technology, Engineering, and Mathematics

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Icebreaker:

Share with the group:
- Name
- Department
- As a student or instructor, how have you used the textbook in your coursework?
- Can you recall any courses which used the textbook in an especially effective way?
In this session, we will:

- Discuss the benefits of student-centered active learning and “flipping” the classroom.
- Consider the purposes of readings outside class as preparation for active learning.
- Compare methods for measuring student learning from readings outside class.
- Design in-class activities which deepen and apply knowledge gained from readings.
What is “flipping” the classroom?

- Replacing traditional lectures with more student-centered learning strategies.
- Focus on active learning, discussions, problem-based learning, group work, and peer instruction.
- Content delivery is moved outside of the classroom, for example, through videos, or pre-class readings.

http://cte.cornell.edu/teaching-ideas/designing-your-course/flipping-the-classroom.html
What is “flipping” the classroom?

Lecture-Based Approach

BEFORE CLASS
Students do reading to prepare for class – or do they??

IN CLASS
Faculty lecture
Students gain first exposure to material

AFTER CLASS
Faculty not available
Students do homework to practice and apply material

Flipped Classroom

BEFORE CLASS
Students gain first exposure to material via video/reading

BEFORE OR AT START OF CLASS
Students complete assignment/quiz to ensure preparation

IN CLASS
Faculty guide student learning, answer questions
Students collaborate to practice and apply material

http://www.crlt.umich.edu/node/58368
How do the students benefit?

- Students learn teamwork skills by working with their peers.
- Encourages formation of learning communities.
- Interactive teaching deepens learning and enhances motivation and achievement.
- Increase student retention in STEM disciplines by 22% (even more for minority students!)


Barkley et al. (2005); Carleton College; Johnson and Johnson (2002); Wenzel (2000)
Will students actually prepare?

- Have students complete reading quizzes online or in class, and assign a grade based on participation/correctness.
- Teach class as if students have done the reading. If students know they’ll get a recap when they arrive in class, they’ll be less inclined to prepare.
- Emphasize accountability to fellow students by creating class ground rules.
- Class time loses value if you don’t prepare!

How do students read the textbook?

- The director of the Harvard Reading-Study Center gave 1500 first year students a thirty-page chapter from a history book to read, with the explanation that in about twenty minutes they would be stopped and asked to identify the important details and to write an essay on what they had read.

- The class scored well on a multiple-choice test on detail, but only fifteen students of 1500 were able to write a short statement on what the chapter was all about in terms of its basic theme. Only fifteen of 1500 top first year college students had thought of reading the paragraph marked "Summary", or of skimming down the descriptive flags in the margin.

- Students should ask themselves what it is they want to get out of a reading assignment, then look around for those points.

http://www.dartmouth.edu/~acskills/docs/harvard_reading_report.doc
1) What type of course content is best communicated by the textbook and other readings?
2) What type of course content is most suited for active learning experiences?

Brainstorm on your own, then share your ideas with your neighbor(s).
Bloom’s Taxonomy: Levels of Learning

(Bloom, 1956)

Synthesis
Evaluation
Analysis
Application
Comprehension
Knowledge

In-class, with facilitator
Out of class, from readings
What are the primary ideas, skills and behaviors student should acquire from the outside class readings?

What kind of format would best measure these learning outcomes?

What in-class activities would deepen and expand these learning outcomes?
Choose a textbook excerpt on a familiar topic.  
[ Chemistry, Physics, Statistics, Computer Science (C++), Animal Behavior, Psychology, Cell Biology ]

Form groups of 3-5 people.

Individually skim the reading, noting which concepts, applications, or sections are especially important.

As a group, create 2-3 learning outcomes for students based on the reading.

Suggest a reading assignment which will prepare students for active learning in-class.
Preparation Assessment Options

- Reading quizzes in class or online.
- Blackboard adaptive release allows extra information to be provided only to students who obtain a minimum score.
- I-clicker or other in-lecture scored questions.
- In-class minute papers.
- Online forums or discussion boards.
- Incorporate peer feedback -- include responding to your peers posts as part of the assignment.

http://cte.cornell.edu/teaching-ideas/designing-your-course/flipping-the-classroom.html
As a group, **design an activity to measure student learning** from your out-of-class reading assignment.

Use the **questions on your worksheet** as a guide.
Examples of Active Learning

- In-class individual/group problem solving.
- Sketch and label a flow chart, concept map, or diagram.
- Think/Write-Pair-Share.
- Group discussions or debates.
- Case Studies or role-playing.
- Peer Instruction – students teach each other.
- Minute paper/muddiest point exercise.

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As a group, **design an in-class active learning experience** to deepen and apply student learning from your out-of-class reading assignment.

Use the **questions on your worksheet** as a guide.
Additional Resources

Flipped classroom guides:
http://cft.vanderbilt.edu/guides-sub-pages/flipping-the-classroom/
http://www.crlt.umich.edu/node/58368

Flipped learning FAQ by Derek Bruff (Vanderbilt and CIRTL):
http://www.cirtl.net/node/7788

Suggestions for in-class active learning:

Myths about textbook reading:
http://www.dartmouth.edu/~acskills/docs/6_reading_myths.doc

Short video interviews with flipping pioneers:
https://www.youtube.com/watch?v=2H4RkudFzlc&feature=channel&list=UL
https://www.youtube.com/watch?v=nEfojG9ckYA&index=210&list=UL2H4RkudFzlc

Promoting diversity in STEM:
http://tinyurl.com/m7qsdec
QUESTIONS?

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