UF Herbert Wertheim College of Engineering
UNIVERSITY of FLORIDA

POWERING THE NEW ENGINEER TO TRANSFORM THE FUTURE

DEPARTMENT OF
ENGINEERING EDUCATION

The anatomy of a course

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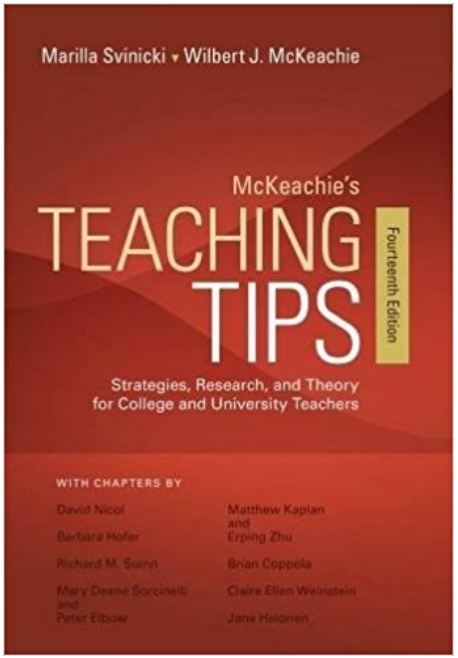
Preparation

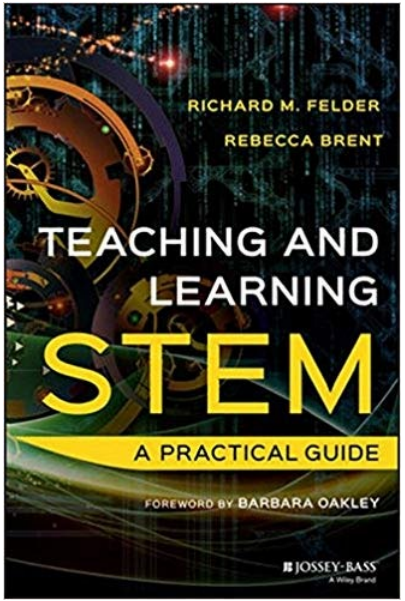
- Identify Student Learning Outcomes or Goals
- Create the syllabus
- Prepare lesson plans
- Choose appropriate teaching methods and technology
- Assessment of student learning

McKeachie's Teaching Tips



Teaching and Learning STEM

- Richard Felder and Rebecca Brent



Student Learning

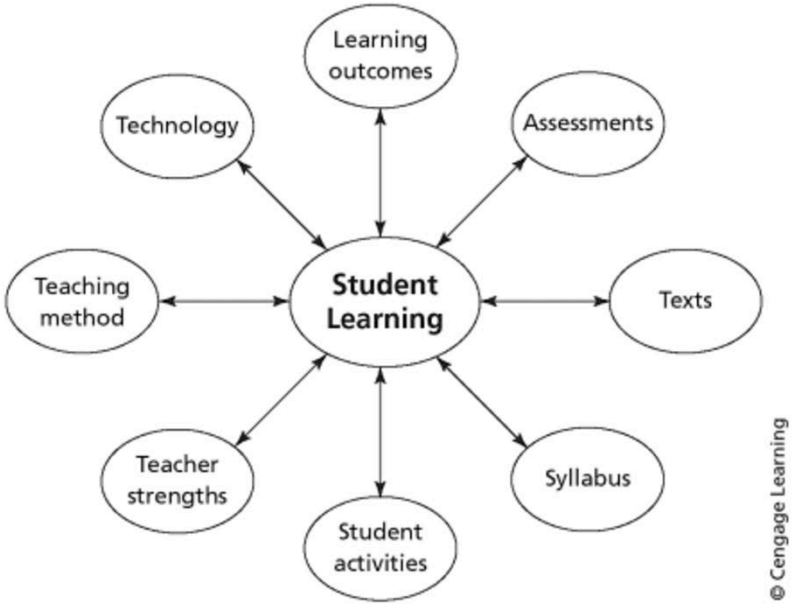


FIGURE 2.1 Components of Course Design

Student Learning Outcomes

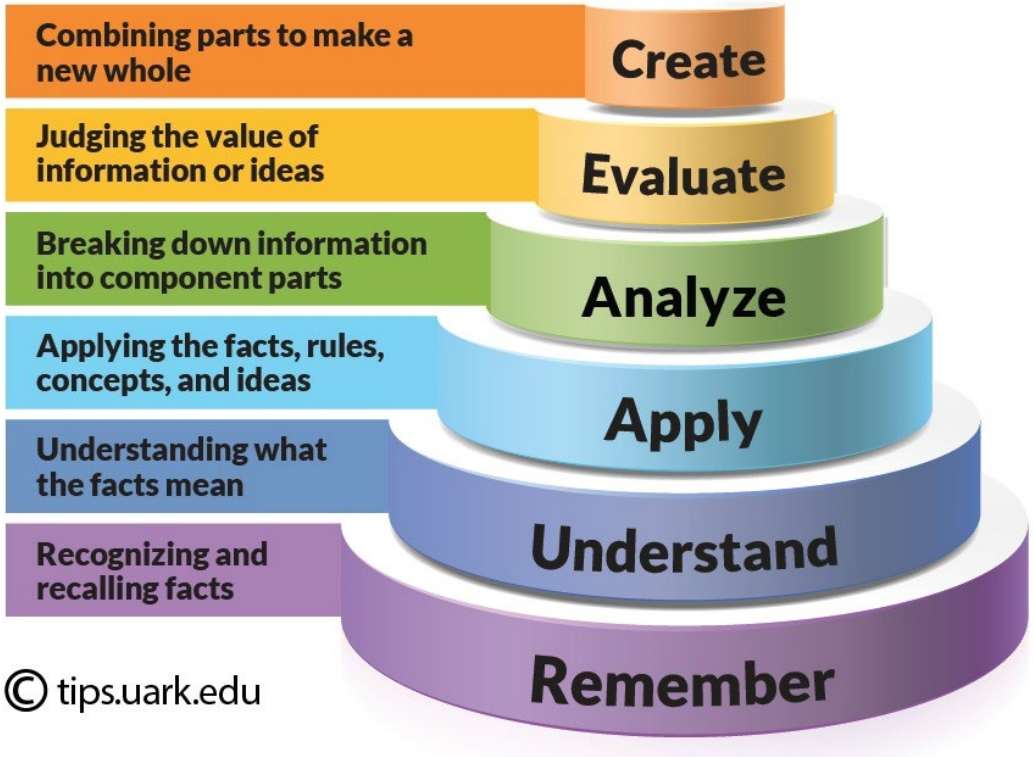
Learning Outcomes	Understanding of theory basics	Recognize examples of theories in real life	Use theories in designing instruction	Choose instructional design appropriate for situation
Knowledge	X (exams)			
Comprehension	X (exams and in-class activities)	X (exams and in-class activities)		
Application			X (in-class design activities)	
Analysis				X (case analysis)
Synthesis			X (design project)	
Evaluation				X (case critique)

FIGURE 2.2 A Planning Chart for Use in Setting Up a Course

Level of Objective in Bloom's Taxonomy	Example (These are stated fairly generically, so the instructor should adapt them to the specific course ideas and language.)
Knowledge	Students will be able to match key terms to the appropriate definition.
Comprehension	Students will be able to define key terms in their own words.
Application	Students will be able to recognize and use concepts and procedures correctly in new situations appropriate to the discipline.
Analysis	Students will be able to break larger issues and/or problems in the course into their component parts to facilitate problem solving and deeper understanding.
Synthesis	Students will be able to combine concepts and procedures from the course in new ways to solve problems or create new ways of seeing the course content.
Evaluation	Students will be able to compare data in ways that will allow them to choose among the data to solve problems or accomplish goals.

TABLE 2.1 Sample Objectives at Different Levels

Bloom's Taxonomy



Bloom's Level	Key Verbs (keywords)	Example Learning Objective
Creating	design, formulate, build, invent, create, compose, generate, derive, modify, develop.	*By the end of this lesson, the student will be able to* determine whether using conservation of energy or conservation of momentum would be more appropriate for solving a dynamics problem.
Evaluating	choose, support, relate, determine, defend, judge, grade, compare, contrast, argue, justify, support, convince, select, evaluate.	*By the end of this lesson, the student will be able to* design an original homework problem dealing with the principle of conservation of energy."
Analyzing	classify, break down, categorize, analyze, diagram, illustrate, criticize, simplify, associate.	*By the end of this lesson, the student will be able to* differentiate between potential and kinetic energy.
Applying	calculate, predict, apply, solve, illustrate, use, demonstrate, determine, model, perform, present.	*By the end of this lesson, the student will be able to* calculate the kinetic energy of a projectile.
Understanding	describe, explain, paraphrase, restate, give original examples of, summarize, contrast, interpret, discuss.	*By the end of this lesson, the student will be able to* describe Newton's three laws of motion to in her/his own words
Remembering	list, recite, outline, define, name, match, quote, recall, identify, label, recognize.	*By the end of this lesson, the student will be able to* recite Newton's three laws of motion.

Effective Outcomes

- *Focus on what students will know and be able to do*
- *Describe observable and measureable actions or behaviors.*
- *Avoid:*
  - Understand, Appreciate, Become familiar with, Learn about, think about, Become aware of, gain an awareness of, Demonstrate the ability to

Course syllabus

- Contract between the professor and the student
- Describes the contents of the course, catalog description, learning outcomes, weekly course topics, textbooks
- Describes the assessment methods and grading
- Lists policies
- HWCOE has a standard template for a syllabus

Lesson plan

- Create a master list of topics by class period
- Prepare the materials for the lesson
  - Lecture, slides, active learning, work out on the board, etc.
  - Run through the materials, take notes
  - Test any simulations, videos, other technology

BME4409 BME Physiology Fall 2015

Date	Lecture Topic	Notes
Mon 08/24	Introduction/Syllabus	
Wed 08/26	Matlab and Simulink primer	Follow along with laptop
Fri 08/28	Homeostasis	Review/New material
Mon 08/31	Building models	Review/New material
Wed 09/02	Simulink model building	Follow alang with laptop
Fri 09/04	Homeostasis	In Class exercise
Mon 09/07	LABOR DAY - no class	
Wed 09/09	Homeostasis	In Class exercise
Fri 09/11	Nervous system	Review/New material
Mon 09/14	Nervous system	Review/New material
Wed 09/16	Nervous system	In Class exercise
Fri 09/18	Nervous system	In Class exercise
Mon 09/21	Nervous system	In Class exercise
Wed 09/23	review	Exam review
Fri 09/25	Exam 1	50 minutes in class
Mon 09/28	Sensor Physiology	Review/New material
Wed 09/30	Sensor Physiology	In Class exercise

Teaching methods

- Lecture
  - White/Black board
  - PowerPoint slides
- Active learning
  - Incidental: Think-Pair-Share
  - Very involved: Team-based Learning, POGIL

Teaching Methods

- Flipped classroom
  - In class activities – make sure students are prepared
- Hybrid online class
- Fully online class

Online or not, use Canvas

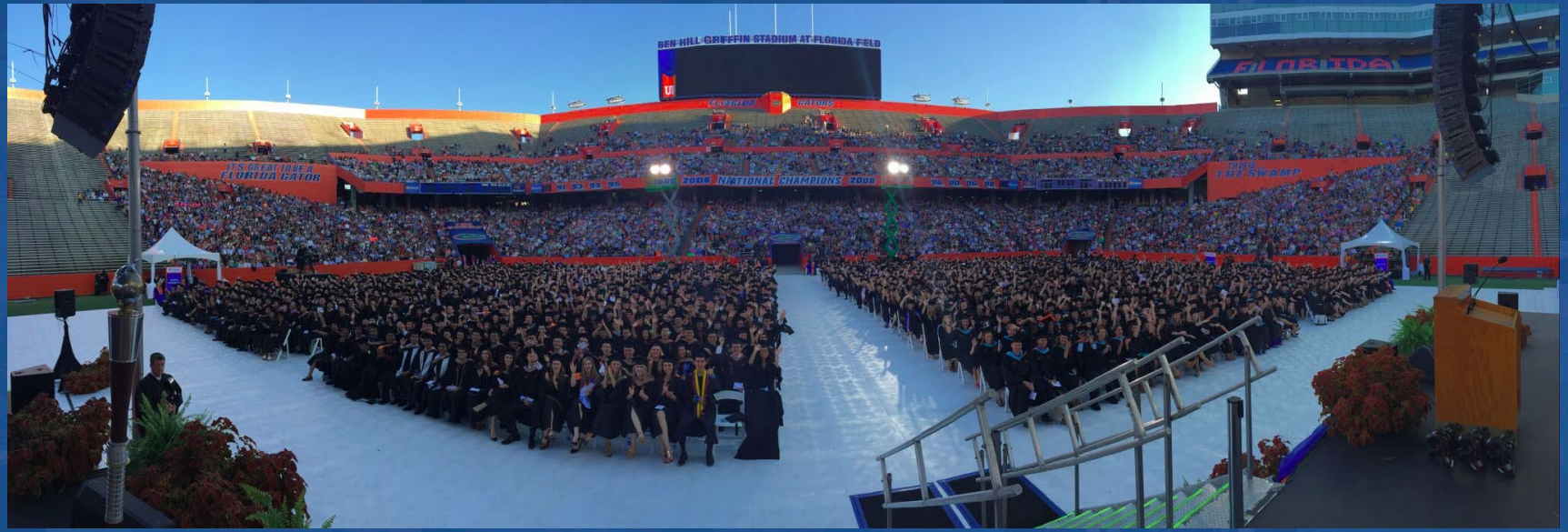
- Students rely on finding information about the class on Canvas
- Setup your gradebook correctly in Canvas
- Students don't read emails, with Canvas, they can setup their smartphones to get notifications – tell them to do that

Assessment methods

- Quizzes, Exams, Final, projects, reports, attendance
- Balance different types of assessments. Figure out how many.
- Make sure assessments are *individual*
- Where possible, use rubrics
- Methods should *directly* assess the learning outcomes

https://www.youtube.com/watch?v=aIhk9eKOLzQ

Assessment video



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