Moving Forward Using Backward Course Design: Alignment of Learning Outcomes, Instructional Activities, and Assessments

Presented by Cori L. Fata-Hartley, Ph.D.
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Abstract: How will you approach planning or designing your next course? Many STEM instructors follow a common path—select a textbook, identify the chapters to be covered, develop lectures, and finally, create exams. Instructional design methods such as Backward Design offer a more deliberate approach to course development. Backward Design (Wiggins and McTighe 1988) is a conceptual framework that emphasizes the alignment of learning goals and objectives, assessments, and instructional activities. In the first stage, instructors develop specific learning objectives. What are students expected to know, understand, or be able to do after completing the course? Next, the instructor must determine what will serve as acceptable evidence that students have met these objectives (assessment). It is only after these first two steps have been completed that the instructor develops materials such as lectures and assignments that help student to achieve the learning objectives. By using Backward Design, an instructor must identify curricular priorities and assessment methods early. When these priorities have been identified and evaluated, the teacher may then apply the appropriate resources and time to the most important concepts and ideas. Workshop participants will be introduced to the principles of Backward Design and will have the opportunity to apply those principles to their own classes.

Biography: Cori Fata-Hartley is Assistant Dean for Curriculum Coordination in the College of Natural Science. She completed doctoral studies at the Medical College of Ohio and was a postdoctoral fellow in the Institute for Molecular Virology at University of Wisconsin-Madison. Fata-Hartley joined MSU in 2005 and held appointments in Lyman Briggs College and the Department of Microbiology and Molecular Genetics and served as the Interim Director for Faculty and Instructional Development in the Office of Faculty and Organizational Development before being appointed Assistant Dean. Throughout her career she has participated in fellowships focused on teaching and learning in STEM disciplines including the Howard Hughes Medical Institute Teaching Fellowship, New Generation for Scientific Teaching Program while a postdoctoral associate at UW-Madison and the American Society for Microbiology Biology Scholars Program after joining MSU. Her efforts at MSU have focused on improving STEM teaching and learning and increasing the retention and academic success for a diverse group of learners. Fata-Hartley received the 2013 All-University Individual Award for Sustained Effort toward Excellence in Diversity in recognition of her work to promote and foster inclusive learning environments at MSU. As Assistant Dean for Curriculum Coordination, Fata-Hartley plays a lead role in the implementation of the college's ongoing Biology Initiative, an effort to improve the educational experience students pursuing life sciences degrees. She also works with departments and programs across the college to develop and improve curricula and the connections among them.

Video: https://www.youtube.com/watch?v=ph0SsWnS2tU

Notes

- Introduction to curricular design
    - What is a curricula? An "academic plan" to foster student's learning (Stark and Lattuca 1997)
    - Elements of curricula
        - Learning outcomes and objectives
        - Teaching and learning activities
        - Feedback and assessment
            - **ALIGNMENT** = quality curriculum
    - How do we develop curricula?
    - Problems with traditional design
        - Content coverage
            - What chapters will be covered?
            - How many pages?
            - What facts/vocabulary must students recall?
        - Hands-on, minds-off
            - Activity-centered
            - Lack explicit connection to desired learning outcomes
            - Do not engage students in disciplinary practices
        - What's the point?
        - What's the big idea?
        - What does this help us be able to do?
          Why should we learn this?
    - Alternatives to traditional design
        - "Understanding by Design"
        - "Shaping the College Curriculum"
        - "Creating Significant Learning Experiences"
- Overview of Backward Design
    - Situational factors
        - Characteristics of the learners versus characteristics of the teacher
        - Nature of the subject
        - Expectations of external groups
        - Specific context of the teaching/learning situation
    - **Learning goals**
        - Big ideas, disciplinary core concepts
        - Disciplinary practices and competencies
    - **Learning objectives**
        - What students are expected to do
        - Specific
        - **Measureable**
    - **Feedback and assessment** – the methods used to determine whether and to what extent learners have achieved the learning outcomes (Austin)

    - Teaching and learning activities – structure and sequence, activities, and resources that help learners achieve the intended outcomes (Austin)
        - What does the research tell us about how people learn?
    - Create a "teachable unit"
        - Learning goal and objective – assessment – activities – alignment
    - **Big ideas** – have disciplinary significance, are generative, and have explanatory power (Wiggins and McTighe 1998)
        - What should students be able to do with these big ideas?
    - Science practices
        - Ask questions
        - Develop and use models
        - Plan and carry out investigations
        - Analyze and interpret data
        - Use mathematics and computational thinking
        - Construct scientific explanations and arguments based on evidence and reasoning
        - Obtain, evaluate, and communicate information
            - Big ideas + science practice = learning objective
    - Think about adding complexity, higher-order thinking to your learning objectives

- **Learning objective**: Students will illustrate, with words and pictures, the process of succession from a grass field to birch forest climax community.
    - **Rubric** – intermediate
    - **Assessment** – Write a scientific argument about would happen to a birch forest climax community that is affected by a seasonal fire
- **Learning objective**: Students will explain possible reasons for genetic variation in species populations that establish a new area.
    - **Rubric** – absent
    - **Assessment** – Observe the diagram, which features two mountainous squirrel species. Write a scientific argument about how the two squirrel populations became genetically different over time.
- **Nonfunctional verbs** – verbs that cannot be measured or are redundant
    - Able to
    - Appreciation for
    - Awareness of
    - Capable of
    - Comprehend
    - Conscious of
    - Familiar with
    - Shows interest in
    - Knows
    - Has knowledge of
    - Learns
    - Memorizes
    - Understands

    - Will be able to
- Applying Backward Design to your course
    - Framework for establishing curricular priorities (Wiggins and McTighe 1998)