Syllabus

Title
Accomplished Science Teaching: Letting Science Lead

Target Audience
This course is intended for pre-service and in-service science teachers, specialists, or coaches serving grades K-12.

Course Description
This course is the second in the Accomplished Science Teaching series. The courses may be taken individually or as a series. This research-based course draws upon data from the National Board for Professional Teaching Standards' performance assessment of science teachers. This course focuses on the scientific content of a lesson. While it's easy to find engaging and fun science activities to include in science instruction, this course will ensure the science is leading the development of the lesson. Learners will consider what students should learn from their science education and through an exploration of scientific and engineering practices, as outlined in the National Research Council's *A Framework for K-12 Science Education*, and two inquiry-based models, learners will build an effective science lesson that lets the science lead. Several ideas in this course will be revisited in more depth in the third course from the Accomplished Science Teaching series.

ATLAS Videos
The National Board aims to support teacher preparation by offering ATLAS (Accomplished Teaching, Learning and Schools). ATLAS is a unique, searchable online library of authentic videos showing National Board Certified Teachers at work in the classroom. Each video is accompanied by the teacher's written reflection about the instruction or the activity shown. Aligned to professional teaching standards and indexed by teachers, ATLAS serves as a window into what accomplished teaching looks like.
More than just a video library, ATLAS cases demonstrate Board-certified teachers' approaches to teaching and to make their accomplished practice accessible.

ATLAS cases have been provided in this course to demonstrate accomplished science teaching and to serve as models of science instructional practices and strategies. These videos can be found in the course through the "Accomplished Teaching in Action" sections. They are not required course content, but are highly recommended.

Instructor/Facilitator
This course is facilitated by National Board Certified Teachers (NBCT) in Science.

Credits
Credits are determined by the college or university. The course was designed to be equivalent to a three-credit graduate level course.

Goals
By the end of the course, learners will
- have thought about science content and science practices, and placed them in a context of inquiry learning;
- have explored setting scientific goals for a single lesson, as well as measurable evidence that the goals are being addressed; and
- have reflected on how the course activities and information can have an impact on teaching practices.

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Session 1: Science and the Architecture of Accomplished Teaching

This session begins with an introduction to the "Architecture for Accomplished Teaching," defined by the National Board for Professional Teaching Standards, which provides a framework that is common to accomplished teachers. The course focuses on two steps: knowing your students as learners (specifically, what science do they need to learn?), and setting high, worthwhile goals. In this session, learners reflect and make decisions about given scientific topics as well as topics they are currently teaching and they begin a final project, which they will work on throughout the course.

Learning Goals

- Consider what students should learn from their science education.

Evidence of Learning

1. Describe what a detailed definition of science implies about what students should learn. (Activity 3)

Session 2: Defining the Science Content for a Lesson

Session 2 starts a process of identifying learning goals appropriate to a single lesson; this supports Step 2 of the Architecture of Accomplished Teaching, Knowing what your students need to learn and in what order. In the session, learners are encouraged to think carefully about the science content being taught and how to create focused, purposeful goals.

Learning Goals

- Understand the distinction between factual and conceptual science content goals.
- Determine the instructional priority for a science lesson and craft a corresponding learning goal.

Evidence of Learning

1. Classify science content goals as factual or conceptual. (Activities 3, 4, and 6)
2. Explain the classification. (Activities 3 and 6)
3. Identify science content goals for a lesson. (Activities 4 and 6)
4. Select one goal as the focus or main priority for a lesson. (Activities 4 and 6)

Session 3: Science and Engineering Practices

In this session, learners explore the idea outlined in the National Research Council's *A Framework for K-12 Science Education* that for students to learn science they must be taught how science is practiced, in the context of scientific content. Learners will look at the science and engineering practices, and consider how to write goals that include these practices as part of what students will learn.

Learning Goals

- Become familiar with scientific and engineering practices as outlined in the National Research Council's *A Framework for K-12 Science Education*.
- Understand how these practices must be developed through the context of science.

Evidence of Learning

1. Identify skills from science practices that a class of students display. (Discussion)
2. Describe an activity and goal that focus students on learning one of the science practices. (Activities 5 and 7)

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Session 4: Inquiry in the Classroom

This session introduces two approaches to science inquiry teaching and learning. Learners will consider these approaches using examples from actual science classrooms, and put lessons of their own design within a larger plan to engage students in the inquiry process.

Learning Goals

- Become familiar with models of two approaches to inquiry-based science.
- Understand that engaging students in inquiry-based science can help them learn content in a context of how science is practiced.

Evidence of Learning

1. Identify elements of inquiry-based science teaching in example classroom video. (Activity 4)
2. Place existing or upcoming lessons within an inquiry process. (Discussion, In the Classroom)

Session 5: Identifying Measurable Evidence of Learning

In this session, the emphasis is on understanding what constitutes "evidence of student learning" and how identifying potential evidence contributes to greater science learning. This contributes to the Architecture of Accomplished Teaching's Step 2, Setting high and worthwhile goals, and will provide insight into Step 4, Evaluating student learning. Learners will consider the importance of defining, during the planning process, the evidence of student learning to look for in a lesson, focusing on the question "What will student success look like in this lesson?" Also, learners will identify some examples of evidence for particular goals (science content and science practices) and will use that evidence to describe students' learning in some video examples of a lesson.

Learning Goals

- Understand "evidence of student learning" as described in this course.

Evidence of Learning

1. Write statements of evidence of student learning for given lesson goals (including conceptual goals). (Activities 3 and 4)
2. Describe student learning as shown in a video in terms of given statements of evidence. (Activity 5)

Session 6: Reflecting on Goals and Evidence

This session gives learners an opportunity to reflect on how the different kinds of goals and the evidence work together to help let the science guide instruction. Learners will also reflect on their work in the course and submit their final project.

Learning Goals

- Consider the implications for classroom instruction of inquiry, the different kinds of goals, and looking for evidence of learning.

Evidence of Learning

1. Explain how thinking about science content and science practices within a context of inquiry helps to identify goals for learning in a lesson. (Activity 2)

Schedule

This course is scheduled to take approximately 45 hours to complete readings, activities, video, discussions, assignments, reflections, reviews, and a final project.

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Requirements
Learners are expected to:

- Complete all assignments
- Maintain a reflection journal
- Participate regularly in discussion forums
- Ask for assistance when they need it
- Review and respond to facilitator feedback

Materials (hardware, software, plug-ins)
Technical Requirements:

- Word processor
- Internet browser with javascript
- High speed Internet service provider (for video viewing)
- E-mail
- Ability to view PDF documents

Evaluation
This course is evaluated on a letter grade basis, and may be available for graduate credit. See graduate credit details pertaining to specific graduate credit institutions.