

Course Syllabus

Title

Building Understanding

Target Audience

This course is intended for pre-service and in-service teachers of physical science in grades 9-12.

Prerequisites

To successfully participate and complete the assignments in this course, the learner must:

- Be familiar with taking an online course or have completed the PBS “Practice Learning Online with TeacherLine” course.
- Have some experience in grades K-12 classrooms.
- Have an interest in life, earth and space sciences.

Course Description

This course focuses on three elements: content knowledge, inquiry and other teaching strategies, and use of multimedia and visualization tools in teaching and learning about building understanding. Building Understanding examines how you can match content knowledge to a range of pedagogical strategies to improve students’ understanding of motions and forces and other topics in physical science. Through the readings, videos, discussions, assignments, and other interactive experiences, learners in this course will have multiple opportunities to develop content knowledge about pedagogical content and making energy concepts understandable. Learners will experience a rich multimedia, inquiry-based learning environment as their students ideally would in their own classrooms. The course provides effective teaching methodologies, strategies and tools that can be used when teaching physical science concepts.

Instructor/Facilitator

See instructor/facilitator sheet.

Credits

To be determined by college or university.

Course Goals

As a result of participating in this course learners will:

- Explore the concept of pedagogical content knowledge and applying it to physical science teaching.
- Explore techniques for meeting the needs of individual learners.

Outline of Content and Assignments

Learners in this course are expected to participate in discussions and complete assignments. Learners are also expected to keep a personal notebook (which is not assessed) to keep notes, complete exercises and record reflections about their learning experiences in this course.

Discussion Activities

- **Essential Question** – Each session includes a discussion about an essential question and teaching and learning issues related to this question. Learners post responses to questions posed in the course and respond to posts submitted by their colleagues.

Assignments - Learners are expected to submit assignments. Rubrics are provided for assessment of all assignments, and the course content includes assignment samples.

Assignments in this course include:

- **Writing Assignments** - Short writing assignments (essays) are submitted to the facilitator.

Required Readings

- “Pedagogical Content Knowledge: Teachers' Integration of Subject Matter, Pedagogy, Students, and Learning Environments”
- “Content Knowledge Without Pedagogy Shortchanges Students”
- “The Laws of Thermodynamics”
- “Understanding the Laws of Thermodynamics”
- “Examples of Potential and Kinetic Energy”
- “Differentiating Instruction: Finding Manageable Ways to Meet Individual Needs”
- “Teach Me, Teach My Brain”
- “Teaching Standard A”

SESSION 1: PEDAGOGICAL CONTENT KNOWLEDGE

Objectives - After completing this session, learners will be able to:

- Define the term *pedagogical content knowledge*;
- Explain why pedagogical content knowledge is important for effective teaching;
- Evaluate how their content knowledge and knowledge of pedagogy are reflected in their teaching about motions and forces; and
- Develop strategies for improving their pedagogical content knowledge.

Using an inquiry-based approach, the session is divided into the following sections: Invitation, Exploration, Explanation, Application and Putting It into Practice. The **Essential Question** for this session is: ***How can you combine knowledge of content and knowledge of pedagogy to teach about motions and forces more effectively?***

Activities in this session delve into combining knowledge of content and pedagogy to teach more effectively about motion and forces.

Assignments in this session require learners to identify a key concept involving motion and forces that is challenging for their students to understand and to describe how they would use pedagogical content knowledge to develop an effective appropriate teaching approach to teach the concept. Learners also describe relationships between key findings about how people learn and the importance of pedagogical content knowledge.

Discussions in this session focus on finding solutions for the essential question for this session.

Learners will record notes and reflections in their personal notebook about different concepts, methods, activities and ideas presented throughout the session.

SESSION 2: MAKING ENERGY UNDERSTANDABLE

Objectives - After completing this session, learners will be able to:

- Identify key ideas for teaching the concepts of potential and kinetic energy and their relationship to the laws of thermodynamics;
- Identify ways to improve students' understanding about potential and kinetic energy;
- Define *differentiated instruction* and explain its goals; and
- Provide examples of when and how they might use alternative strategies to teach science concepts.

Using an inquiry-based approach, the session is divided into the following sections: Invitation, Exploration, Explanation, Application and Putting It into Practice. The **Essential Question** for this session is: ***How can you modify and shape your teaching strategies to meet the needs of individual learners?***

Activities in this session will delve into how to teach diverse learners the concepts of kinetic and potential energy more effectively by using differentiated instruction.

Assignments in this session require learners to identify and write about one key idea related to potential and kinetic energy and their connection to the laws of thermodynamics and then describe strategies and ideas for how they would adapt their instruction of the key idea for two students with different learning styles or strengths.

Discussions in this session focus on finding solutions for the essential question for this session.

Learners will record notes and reflections in their personal notebook about different concepts, methods, activities and ideas presented throughout the session.

Schedule

This course is scheduled to take approximately 30 hours to complete.

Requirements

Learners are expected to:

- Complete all assignments.
- Participate and actively engage in discussions with fellow learners while contributing to the social construction of knowledge.
- Be self-directed and self-motivated.
- Ask for assistance when they need it.

Facilitators are expected to:

- Provide feedback to all learners.
- Participate in discussions to keep them moving forward.
- Provide assistance to learners who need it.

Technical Requirements

- Word Processor
- Internet service provider
- E-mail
- Shockwave and Flash: <http://www.macromedia.com/downloads/>
- Acrobat Reader: <http://www.adobe.com/products/acrobat/readstep.html>
- QuickTime: <http://www.apple.com/quicktime/download/>

Standards of Academic Integrity

As posted on PBS TeacherLine Web site at
http://teacherline.pbs.org/teacherline/help/help_template3.cfm?subID=197

Evaluation

This course is evaluated on a letter grade basis, and graduate credit may be available. See the PBS TeacherLine Web site for details pertaining to specific graduate credit instructions.

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