

Course Syllabus

Title

Understanding Energy Transfer

Target Audience

This course is intended for pre-service and in-service teachers of physical sciences in grades 5-8.

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 physical 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 energy transfer. Understanding Energy Transfer advances teachers’ understanding and effective teaching about how energy is transferred from one substance to another and what happens in these situations. Through the readings, videos, discussions, assignments, and other interactive experiences, learners in this course will have multiple opportunities to develop content knowledge about transfer of energy and inquiry learning. 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:

- Define energy transfer and conservation of energy and recognizing examples in everyday situations.
- Understand what happens when energy is converted from one form to another.
- Understand inquiry-oriented, research-based methods for teaching these topics.

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 and - 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

- “Energy, Heat and Temperature”
- “The Laws of Thermodynamics”
- “Understanding the Laws of Thermodynamics”
- “Pendulums”
- “Learning through Inquiry and its Implications for Teaching”
- “Some Myths About Inquiry-based Learning and Teaching”

SESSION 1: TRANSFER OF ENERGY

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

- Define what is meant by energy transfer.
- Explain the meaning of the phrase conservation of energy.
- Explain what happens to energy when it is converted from one form to another.
- Give examples of energy transfer in everyday situations.

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: ***What happens when energy transfers from one object to another?***

Activities in this session delve into the process of energy transfer, some of the challenges students may face, and new approaches to teaching and learning. Learners are also introduced to the course, the online learning environment, and the process of thinking like a student again.

Assignments in this session require learners to identify an example of energy transfer and explain how the laws of thermodynamics apply to that example. Learners also map out energy transfer through five steps indicating energy as potential or kinetic.

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: INQUIRY LEARNING

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

- Describe the essential elements of inquiry in the science classroom.
- Explain key findings from research about learning and how they can apply them in the classroom.
- Discuss how an instructional model that sequences learning experiences can help students build a deeper understanding of important physical science concepts.
- Develop strategies for improving one of their current lessons to increase the level of inquiry and to reflect understandings about how people learn.

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 the nature and sequence of learning opportunities improve students' understanding of physical science?***

Activities in this session delve into energy transfer in the context of research about how people learn, with a focus on an inquiry-based instructional model.

Assignments in this session require learners to explain their understanding of inquiry and what inquiry looks like in the classroom and to revise a lesson plan to increase the level of inquiry and incorporate the concepts and resources from the course.

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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