

Course Syllabus

Title

Understanding Motion and Force

Target Audience

This course is intended for pre-service and in-service teachers of physical sciences in grades K-4.

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 understanding motion and force. Understanding Motion and Force examines how and why rolling and falling motions occur and explores how to analyze the forces that cause these motions. Through the readings, videos, discussions, assignments, and other interactive experiences, learners in this course will have multiple opportunities to develop content knowledge about motion and force. 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 motion and force 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 relationship between rolling and falling motions.
- Understand basic concepts of force.
- Identify the causes of floating and sinking motions.
- Explore how making and testing predictions can foster learning.

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

- “Ball on Ramp”
- “Successively Steeper and Shallower Ramps”
- “Making Predictions: A Way to Expand Learning”
- “Coffee Cups, Ice Trays and Elephants (Oh, My!)”

SESSION 1: INVESTIGATING MOTION

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

- Make predictions about the motion of rolling and falling objects and make observations to test their predictions.
- Relate these observations to the concepts of constant speed, acceleration, and force.
- Describe the relationship between rolling and falling motions.
- Describe methods for prediction, observation, and reflection, and use them with students.

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 an object rolls or falls?***

Activities in this session delve into two specific types of motion, rolling and falling. Learners make predictions about how objects move, and then test these predictions. Through careful observation and reflection, learners will strengthen their understanding of acceleration and its relationship to rolling and falling as well as force.

The assignment in this session requires learners to summarize Galileo’s key ideas regarding key motion concepts.

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: ANALYZING FORCES

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

- Identify and represent forces such as gravity, friction, the normal force, and impulsive force and analyze how they affect the motion of an object.
- Explain and give examples of Newton’s First Law of Motion.
- Identify effective processes for experimentation and apply them to their own learning and teaching.

Using 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 do various forces affect how an object moves?***

Activities in this session delve into some basic types of forces and the effects those forces have on objects. Learners learn about how forces balance, enhance, or counteract each other and determine whether objects fall, sink or float, or move horizontally. These concepts are also examined more formally in Newton’s First Law of Motion.

Assignment(s) in this session require learners to identify the role of gravity and the normal force, friction, and particular impulsive forces in given situations and describe the motion of given examples in terms of Newton's First Law. Learners also describe modifications they will make to a motion and forces lesson based on what they have learned 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.