

## Course Syllabus

### Title

Understanding Solubility and Density

### 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 properties of matter. Understanding Solubility and Density advances understanding and effective teaching about how differences in solubility of substances affect density. Through the readings, videos, discussions, assignments, and other interactive experiences, learners in this course will have multiple opportunities to develop content knowledge about solubility and density. 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 properties of matter 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:

- Understand how dissolving one substance into another affects mass and volume.
- Understand how the effects of solubility on density influence real-world examples.
- Examine attributes of effective learning environments.

### 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:



- **Questions: Compare Your Answer** - Learner's written responses to a question are compared to answers written by experts in the field.
- **Writing Assignments** - Short writing assignments (essays) are submitted to the facilitator.

### Required Readings

- "Density Changes Chart"
- "What Causes the Bends?"
- "How Submarines Work"
- "Properties and Changes of Properties in Matter"
- "Funny Water"
- "Snapshots of Meaning-Making Classrooms"
- "A Strategy for Excellent Teaching"

## SESSION 1: SOLUBILITY AND DENSITY

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

- Identify multiple ways to change density.
- Explain how dissolving one substance into another affects mass and volume.
- Apply the effect of solubility on density to explain bubble formation, oil spills, and ocean currents.
- Describe how they might teach about the effect of solubility on density in the classroom.

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 might differences in solubility affect density?***

Activities in this session delve into the changes in density, in particular how solubility of one substance in another affects the density of the resulting mixture.

Assignments in this session require learners to explain macroscopic and microscopic properties of matter, to accurately use properties of matter terms and definitions, and to develop a lesson idea given specific materials and resources.

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: THE ENVIRONMENT FOR LEARNING

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

- Identify common attributes of effective learning environments.
- Predict the effect that particular aspects of the classroom environment have on student learning.
- Enhance their ability to change specific aspects of the classroom environment based on evidence from classroom observations.

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 can the environment of your classroom foster inquiry-based learning?***

Activities in this session delve into concepts of solubility and density in the context of how to create a classroom environment that fosters inquiry learning.



Assignments in this session require learners to explain how a non-physical aspect of the learning environment influences learning and to develop a lesson plan on properties of matter using the resources and concepts 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](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.