

MODIFIED UBD LESSON PLAN

COURSE: Introduction to Engineering

UNIT: Problem Solving

EXERCISE: Destructive Testing and Mathematical Modeling

TIME FRAME: 3 - 4 Hours



PREPARATION: *Summary of "to do's" that the teacher should understand and prepare before bringing this lesson to the classroom.*

Teachers will need to ensure that the proper supplies are available for students to build their solutions.

Materials:

- PAPER CLIPS NO.1 BX100
- PAPER CLIPS-JUMBO BX100
- MARKER DRY ERASE ST5 NASCO

Additional Resources:

- Classroom white board

Information:

Before starting this exercise, students should have an understanding of material covered in:

- ✓ Reading: Problem Solving



SAFETY: *Summary of safety strategies in the lesson.*

There are no safety strategies for this exercise.

S1 DESIRED RESULTS:

ESTABLISHED GOALS:

Problem Solving Techniques and Applications Standards:

Teachers should use the STEM Academy Standards Correlation System available in the STEM Connections area of a unit to extract specific standards and insert these standards here.

TRANSFER:

Students will be able to independently use their learning to...

- Identify and describe estimation techniques;
- Identify and perform brainstorming strategies.

MEANING:

UNDERSTANDINGS

Students will understand that...

- Testing is necessary in STEM fields and should be carried out often;
- Testing can bring up very difficult problems that must be solved.

ESSENTIAL QUESTIONS

Students will keep considering...

- How their problem solving techniques can become better and more efficient;
- Different types of problem solving that would work best for them.

ACQUISITION OF KNOWLEDGE AND SKILL:	
<i>Students will know...</i> <ul style="list-style-type: none"> The terms analytic and creative problem solving; The ten step design process. 	<i>Students will be skilled at...</i> <ul style="list-style-type: none"> Compiling simple experiment data, comparing and contrasting results from peers.

S2 EVIDENCE:	
EVALUATIVE CRITERIA:	ASSESSMENT EVIDENCE:
<ul style="list-style-type: none"> Effecting testing Comparative data 	<i>Performance Task(s):</i> Destruction Testing and Mathematical Modeling In this activity, students will use destructive testing to determine the strength and durability of two types of paper clips.
<ul style="list-style-type: none"> Interactive Carried out Correct answers 	<i>Other Evidence:</i> <ul style="list-style-type: none"> Discussion Case Study Online Test

S3 LEARNING PLAN: *Summary of Key Learning Events and Instruction*

Outline:

- Set Introduction**
 Use the following link to help you set up this brainteaser:
Braingle.com/brainteasers/29839/tic-tac-toothpick.html
 The instructor may find it easier to draw the tic-tac-toe figure on the board instead of using toothpicks, and then have volunteers come to the board to try and solve the problem.
- Instructor Review**
 Before starting today's lecture, review the online document Problem Solving. This document will aid you in using the PowerPoint and provide an additional resource along with more examples.
- Student Notes**
 During the presentation, encourage students to take notes as this material will be tested at the end of the unit. Allow time for questions and writing down important information.
- Review**
 At the conclusion of the presentation, review the materials covered and answer any additional questions the students may have

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5. Activity

Direct students to go online and open Problem Solving Activity. While students are reading through the introduction to the case study pass out the necessary materials.

- ❖ When students have finished reading the introductory paragraphs, review instructions 1-9 together as a class. Answer any questions the students may have at this point. Divide your students into groups of two.
- ❖ Once you feel all of your students are comfortable with the case study, have them complete all 9 steps with their partner.
- ❖ Students should also complete the assessment questions at the end.
- ❖ Have them turn this material in for a grade.

6. Study

Encourage students to study for the test at the beginning of the next class covering the unit's material.

Progress Monitoring:

- The instructor will need to monitor the classroom, checking student's work and ensuring students are on task and following directions.
- Ensure students store their projects at the end of class and leave all materials in the room.
- At the end of the activity, post student projects in the room and provide appropriate feedback.

 **DIFFERENTIATION:** *Summary of Key Differentiation Techniques*

Please use this space to insert your differentiation techniques. Depending on the needs of students, various techniques might be needed in a classroom, therefore use the information below and experts in the area needed to design your plan for differentiation.

The ASCD Study Guide for Integrating Differentiated Instruction and Understanding by Design: Connecting Content and Kids.
by Carol Ann Tomlinson, Jay McTighe

Integrating Differentiated Instruction and Understanding by Design: Connecting Content and Kids.
by Carol Ann Tomlinson, Jay McTighe
ISBN-13: 978-1416602842
ISBN-10: 1416602844

Differentiating Reading Instruction
by Laura Robb.
ISBN13: 9780545022989

A Teacher's Guide to Differentiating Instruction
The Center for Comprehensive School Reform and Improvement

 **CAREER CONNECTIONS:** *Summary of Career Opportunities Associated with this Lesson*

Engineer

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Engineers use problem solving constantly. Destructive testing is only done in many engineering disciplines.

Teacher

Teachers are tasked with solving problems and finding the best way to teach students.

Judge

Court judges are responsible for using problem solving to determine many different issues the judicial system is responsible for.


Good sources for career connections:

Occupational Outlook Handbook

<http://www.bls.gov/ooh>

The National Career Clusters® Framework

<http://www.careertech.org/career-clusters>

 **KEYWORDS:** *Please Insert Keywords from this Lesson with their Definitions*

DESTRUCTION—the action or process of causing so much damage to something that it no longer exists or cannot be repaired.

PROBLEM—a matter or situation regarded as unwelcome or harmful and needing to be dealt with and overcome.

ACTION—a thing done, an act.

Use resources like dictionary.com to find definitions to your keywords