Liberal Arts Essentials Assessment Plan

Course: PHEN 121: Classical Physics I

Writing Unit: No

Instructor(s): Faculty in Department of Physics & Engineering

Methods: Assessment of Problem Solving Skills and Course Evaluation Form

LAE Category: Scientific Understanding

Goal 1: Muskingum students will develop skills in perception, analysis, and expression.

Learning Objective 1: A Muskingum College student will be able to define a meaningful issue (or problem) related to an academic area of study, formulate a position (or solution or argument) on that issue, and communicate his or her position effectively to a professional audience.

Departmental Perspective 2: Students will develop the ability to analyze questions related to major concepts covered in a field of study.

A. Student work examined

The problem solving steps for a significant problem (i.e. an application of physics requiring AT LEAST two equations with two unknowns) will be evaluated for a mid to late semester exam.

A second stream of evidence that will be used is LAE Goal Assessment Evaluation Form given to students during the final week of class. This form includes questions asking the students to evaluate how well the course addressed the goals of the LAE. Using both a self reported measure (an evaluation) and a measure assessed by the faculty member (problem solving steps) ensures that multiple streams of data are being used to develop a sense of how well the course is meeting the goals of the LAE.

B. Scoring Criteria

Briefly explain the criteria used to evaluate student performance in relation to the learning objective (i.e., what constitutes advanced, proficient, partially proficient, not proficient, etc.)

Attach copies of measurement instrument or rubric.

The problem solving steps evaluated include: problem description (i.e. diagram, knowns, unknowns, etc.), physics application (e.g. Newton’s 2nd Law), mathematical analysis (e.g. solve two equations in two unknowns), and logical organization.
A problem solving steps rubric (adapted from Problem Solving Rubric v4.2 by Jennifer L. Docktor at University of Minnesota) is attached. Each step is based on a 5 point scale with 4 being the highest score and 0 the lowest.

The score for each step will be added and an average score will be obtained. Students will be ranked according to the following breakdown.

- **Exceeds Expectations**: $3.5 < \text{Average Score} \leq 4.0$
- **Meets Expectations**: $2.5 < \text{Average Score} \leq 3.5$
- **Doesn’t Meet Expectations**: $\text{Average Score} \leq 2.5$

C. **Attachments (Rubrics, Checklists, Pre and Post tests, other evaluation methods, etc.)**
**Problem Solving Steps Rubric** (adapted from Problem Solving Rubric v4.2 by Jennifer L. Docktor at University of Minnesota)

<table>
<thead>
<tr>
<th></th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Problem Description</strong></td>
<td>The solution includes an appropriate and useful problem description.</td>
<td>The description is useful but contains minor omissions or errors.</td>
<td>The description is not useful, or a key feature of the description is missing or incorrect.</td>
<td>An attempt is made, but most of the description is not useful, incomplete, or incorrect.</td>
<td>The solution does not include a description, or all of the description is incorrect.</td>
</tr>
<tr>
<td><strong>Physics Application</strong></td>
<td>The solution indicates an appropriate and complete application of physics to the specific conditions in this problem.</td>
<td>The specific application of physics to this problem contains minor omissions or errors.</td>
<td>An important specific relationship or condition is missing or applied incorrectly.</td>
<td>An attempt is made, but most of the specific application of physics to this problem is missing or incorrect.</td>
<td>The solution does not indicate a specific application of physics, or all of the application is incorrect.</td>
</tr>
<tr>
<td><strong>Mathematical Analysis</strong></td>
<td>Suitable mathematical procedures are used during the solution execution.</td>
<td>Suitable mathematical procedures are used with minor omissions or errors.</td>
<td>An important mathematical procedure is missing or is used with errors.</td>
<td>Attempted mathematical procedures are inappropriate, left unfinished or contain serious errors</td>
<td>There is no evidence of mathematical procedures in the problem solution or all mathematical procedures are inappropriate.</td>
</tr>
<tr>
<td><strong>Logical Organization</strong></td>
<td>The entire problem solution is clear, focused, and logically connected.</td>
<td>The solution is clear and focused with minor inconsistencies.</td>
<td>Parts of the solution are unclear, unfocused, and/or inconsistent.</td>
<td>Most of the solution parts are unclear, unfocused, and inconsistent.</td>
<td>The entire solution is unorganized (haphazard) and contains obvious logical breaks.</td>
</tr>
</tbody>
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