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Promoting Frequent Assessment to Improve Student Learning

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Promoting Frequent Assessment to Improve Student Learning

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Abstract

Chemistry has customarily been a course that gives students great difficulty. It requires that students not only be able to acquire and retain a great deal of knowledge, but also apply this knowledge in a variety of different situations. Acquisition of problem solving skills requires frequent (daily) installments of “time on task”. This research project was designed to keep students on track by requiring more frequent interaction of the student with the material. Two sections of Principles of Chemistry II, CHEM 1212, were examined. One section served as the experimental group and the other as the control group. The control group followed a traditional format of lecture homework assignments and laboratory reports all done as post-assignments. The experimental group also submitted post-assignments, but in addition was required to complete pre-lecture and pre-lab assignments. The experiment proved to be highly successful with increased pass rates for students in the experimental section.
Problem

- Chemistry has customarily been a course that gives students great difficulty.

- It requires that students not only be able to acquire and retain a great deal of knowledge, but that they also be able to apply this knowledge in a variety of different situations.

- Acquisition of these types of problem solving skills requires frequent (daily) installments of “time on task”.
This research project was designed to keep students on track by requiring more frequent interaction of the student with the material and earlier intervention and targeting of problem areas by the instructor.
Two sections of Principles of Chemistry II, CHEM 1212, (2\textsuperscript{nd} semester general chemistry) were examined.

- **Experimental Group** (Spring 2007, 9am–10:50am MWF, 14 students, Instructor – Wallace – lecture and lab)

- **Control Group** (Spring 2007, 11am–12:50pm MWF, 17 students, Instructor – Wallace – lecture and lab)
The experimental group submitted post–homework assignments and lab reports, but in addition were also required to complete pre–lecture and pre–lab assignments. Many of the assignments were split into several parts with multiple submission dates which required more frequent interaction with the material.

The control group followed a traditional format of lecture homework assignments and laboratory reports all done as post–assignments.
Weighting of the Components of the Course:

Exams 50%
Homework 5%

**Experimental Group** – Homework consists of pre-lecture and post-lecture homework assignments.

**Control Group** – Homework consists of post-lecture homework only with only one assignment per chapter.

Lab Assignments 10%

**Experimental Group** – Lab Assignments consist of pre-laboratory homework and lab reports.

**Control Group** – Lab Assignments consist of lab reports only.

Lab Midterm and Lab Final 15%
Post-Test 5%
Final Exam 15%

100%
Assignments

- Experimental Group – 65 total assignments
- Control Group – 37 total assignments
- Difference for Experimental Group – 28 additional assignments (43% more interactions with separate assignments.)
is the rate or speed of a chemical reaction.

rate is found by drawing a line tangent to the concentration–time curve at a particular time and obtaining the rate from the slope of this line.

True or False. Increasing the temperature of a reaction will increase the rate of reaction.

True or False. The addition of a catalyst will slow down a reaction.

Which of the following Does Not affect the rate of a chemical reaction?
- volume of reagents used
- state of subdivision
- removal of a catalyst
- concentration of reagents

What is the order of the reaction based on its rate equation:
Rate = k [A]^2 [B]?
Freezing-point depression, is a colligative property; that is, it depends on the ratio of _______ to solvent particles, not on the nature of the substance itself.

In the freezing point depression lab, which substance will be acting as the solute? naphthalene, biphenyl, p-dichlorobenzene, water, ethylene glycol

Which will have the lower temperature?
A mixture of the solute and solvent.
The solvent by itself.

What type of probe is used in the freezing point depression lab? temperature, O₂ sensor, pH, voltage, conductivity

Please answer True or False to the following statements:
a. While collecting data as the sample cools, it is necessary to continuously stir the sample.
  
b. The temperature of the sample will hit a plateau and this is your freezing point.
  
c. All samples should be washed down the drain with water.

What is the accepted (true) molar mass for naphthalene?

Percent error is calculated by subtracting the experimental value from the accepted value and then dividing by the _________. Then, take the absolute value of this number and multiply by __________.
# Experimental Group

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<th>CHEM 1211 Grade</th>
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## Results

<table>
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<th>Experimental Group</th>
<th>Control Group</th>
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<tbody>
<tr>
<td>Pass Rate (A,B,C, or D)</td>
<td>85.7% (12/14)</td>
<td>64.7% (11/17)</td>
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<tr>
<td>Higher Grade than in CHEM 1211</td>
<td>14.3% (2/14)</td>
<td>0% (0/17)</td>
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<tr>
<td>Same Grade as in CHEM 1211</td>
<td>57.1% (8/14)</td>
<td>47.1% (8/17)</td>
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<tr>
<td>Lower Grade than in CHEM 1211</td>
<td>28.6% (4/14)</td>
<td>52.9% (9/17)</td>
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</tbody>
</table>
Impact

- On-line Pre-lab Assignments delivered via Webassign are now employed in CHEM 1212 and most other Chemistry classes at CCGA.

- On-line Pre-lecture Assignments delivered via Webassign are utilized as bonus assignments in CHEM 1212.