Activity: Graphing Glow-in-the-Dark Paint

FOR THE TEACHER

Summary
In this activity, students will have the opportunity to review the scientific method, and analyze data from a scenario about glow-in-the-dark paint. Additionally, students will create a graph to help them interpret data.

Grade Level
Elementary or Middle School

NGSS Alignment
This activity will help prepare your students to meet the performance expectations in the following standards:

- **2-PS1-2**: Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.
- **Scientific and Engineering Practices**:
  - Analyzing and Interpreting Data
  - Engaging in Argument from Evidence

Objectives
By the end of this activity, students should be able to:

- Identify both the independent and dependent variable in an experiment.
- Determine constants in an experiment.
- Create a bar graph from data.
- Write an appropriate claim-evidence-reasoning response.

Chemistry Topics
This activity supports students’ understanding of:

- Graphing
- Scientific Method
- Experimental Design

Time
**Teacher Preparation**: 10 minutes
**Lesson**: 45 minute – 1 hour

Materials
- Student handout
- Crayons or colored pencils
- Pencils

Teacher Notes
- Teachers may be interested in teaching students about glow-in-the-dark paint prior to using the activity. If so, these websites could be helpful:
  - How does glow-in-the-dark stuff work?
  - How Do Things Glow in the Dark?

- Teachers should start by reading the scenario from the student handout aloud for students to hear.
- It may be helpful to them show this short 1-minute video clip as an example of the experiment.

Submitted by
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Thanks to:
Dow Chemistry Teacher Summit
• Depending on prior knowledge, the teacher may want to discuss the following terms with students:
  o The independent variable is the variable that the experimenter is changing on purpose.
  o The dependent variable is what is being studied and measured in the experiment.
  o The constant(s) in an experiment are conditions that are consistent/the same throughout the entire experiment.

• The teacher may need to demonstrate how to label the x-axis and y-axis of the graph. Students may need help with determining how to plot data that is not a whole number (for example recording 2 hours should be fairly easy, but recording 2 hours and 40 minutes may be confusing).

FOR THE STUDENT
Lesson

Graphing Glow-in-the-Dark Paint

Scenario
Isaac wants to paint the ceiling of his room with a glow-in-the-dark galaxy design since his bedroom is in the basement and has no windows. He wants the glowing effect to last through the whole night, but he doesn’t know which type of paint will glow the longest. So, he has decided to create an experiment in order to choose the best paint for his room.

Isaac found 7 available brands of glow-in-the-dark paint at the local store. Using these samples, he painted each paint on a different square of poster paper that were each measured to be 1 foot x 1 foot. He placed them all in his dark room, and set up a video camera to record how long each sample of paint glowed. He recorded the time that each paint sample stopped glowing.

Analysis Questions
1. Determine each of the following from the scenario described above:
   a. Independent variable:
   b. Dependent variable:
   c. Constant(s):

2. Based on the information recorded below, determine how long the glowing effect lasted for each of the different paint samples. Record the time in the last column of the table.

<table>
<thead>
<tr>
<th>Paint Type</th>
<th>Time sample started glowing</th>
<th>Time sample stopped glowing</th>
<th>Time elapsed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paint by Einstein</td>
<td>3:00 p.m.</td>
<td>5:15 p.m.</td>
<td></td>
</tr>
<tr>
<td>Violet’s Paint</td>
<td>3:00 p.m.</td>
<td>12:25 p.m.</td>
<td></td>
</tr>
<tr>
<td>Indigo Glow</td>
<td>3:00 p.m.</td>
<td>7:30 p.m.</td>
<td></td>
</tr>
<tr>
<td>Roy G. Biv’s Colors</td>
<td>3:00 p.m.</td>
<td>3:45 p.m.</td>
<td></td>
</tr>
<tr>
<td>Spectrum Stains</td>
<td>3:00 p.m.</td>
<td>6:45 p.m.</td>
<td></td>
</tr>
</tbody>
</table>
3. Create a bar graph to compare the data that Isaac collected. Make sure to include labels on your graph, including both the x and y axis.

4. Create a Claim-Evidence-Reasoning statement:
   a. **Claim**: Which paint samples glows for the longest period of time?
   b. **Evidence**: What does the data indicate?
   c. **Reasoning**: Why do you think that paint glows for a longer period than the others?

5. Which paint sample would you choose to create a glow-in-the-dark galaxy design on Isaac’s ceiling?
   d.