Cause & Effect and Dependent & Independent Variables

Grade level: 9-12

Introduction

If you are assessing students' understanding of the cross-cutting concepts of cause and effect and dependent and independent variables, you will need to provide them with reading materials of varying text complexity that match their grade-level and/or reading abilities. This allows you to focus assessment on the comprehension of the concept without interference from text complexity.

The following lesson plan instructs teachers on gathering materials of varying text complexity using EBSCO's Science Reference Source database and presenting a unified lesson on Cause & Effect and Dependent & Independent Variables. This lesson can also serve as a template for teaching other topics or concepts.

Objectives

Students will be able to:

- Identify dependent and independent variables from multiple sources at a determined text complexity.
- Define cause and effect and differentiate between correlations and regressions
- Use evidence from the text to determine relative size, direction and type of interactions among variables.
- Integrate technical information from text with a visual form (interaction web)
- Visually model the interactions among electromagnetic force variables**

Standards

CCSS.ELA-Literacy.RST.6-8.2, CCSS.ELA-Literacy.RST.6-8.9, CCSS.ELA-Literacy.RST.6-8.7, NGSS MS-PS2.B**

*** This objective and associated standards can be interchanged with any desired topic and associated Science Standard (i.e., another NGSS DCI or specific state standard).*

Materials

1.   Computer/laptop/tablet
2.   Access to Science Reference Source

EBSCO

Procedures

Educator

1. Sign in to Science Reference Source to ensure you can access and save to your folder.

2. Collect multiple resources appropriate for the topic and students' varying reading abilities.

    a. Type in a search string, such as ***((electromagnetic OR magnetic) AND interaction)*** and choose an appropriate Lexile Reading Level (e.g. ***700-1100 / Grades 7-8***).

    b. Save desired articles to your folder to distribute to students.

3. Provide students with materials via school technology (Moodle, Blackboard, Desire2Learn, Instructure, etc.)

4. Have students read their individually assigned materials and list the variables from their texts.

5. Guide the class in a discussion of cause and effect.

    a. Have students create definitions (in their own words) for dependent and independent variables, correlation, regression, direct relationship, inverse relationship.

    b. Write definitions on the board for students to refer back to.

6. Have students individually review their variables and interactions, organize and classify them.

7. Provide assignment instruction to students to create a graphic representation of their variables using the scheme in Figure 1 or have students design their own:

    a. Arrow size: strength of interaction

    b. Direction: single-headed arrows show directional regressions; double-headed arrows show correlations

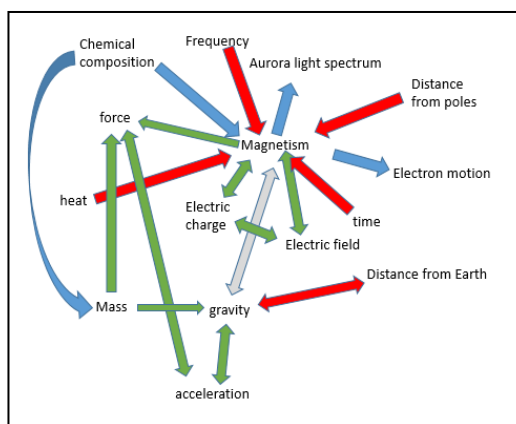   c. Color: one color may indicate a direct relationship; another color may indicate an inverse relationship.

Figure 1

Student

1. Access resources provided by the educator via school technology.

2. Read and assimilate content to identify variables in each article.

3. As a class, define the following terms:

    a. Dependent variable

    b. Independent variable

    c. Cause and effect

    d.   Correlation

    e.   Regression

4. Review your list of variables and determine which are dependent and which are independent.

5. Identify all interactions and relationships among variables and label which interactions are correlations.

6. Design a model to visually explain the relationships among each variable.

    a.   Use the arrow size/direction/color scheme provided by the teacher

    OR

    b.   Create your own scheme for labeling variable and interaction categories.

7. Using available technology (iPad apps, computers, etc.) or craft/engineering supplies, publish an interaction web which visually organizes and explains the types of variables related to electromagnetic forces; include a legend for your graphic and a caption explaining the patterns you see.

8. Present your graphic to the class; explain your variables, interactions, legend, and patterns discovered.

Extension Activity

Compare graphics of all classmates and determine common patterns. Develop a testable hypothesis, appropriate variables and controls, and an experimental design to test your hypothesis.

Assessment

Formative Assessment

Review students' design model, either evaluate rough drafts of their visualization or evaluate individuals taking part in group discussion of their design.

Summative Assessment

Review final graphic and/or student presentation of the graphic.