**Title:**  A&P Lab Ticket to Enter

**Course and Format:** For a face-to-face anatomy & physiology lab

**Purpose:** The purpose of this pre-class activity is to introduce the concept, the equations and graphs that are associated with quantities that vary directly or inversely with each other

**Learning Objectives:** (for the entire lesson, of which this is the introductory part)

 Biology:

1) Interpret the equation that relates blood flow to pressure and resistance

2) Explain the impact of changes in resistance (pressure, radius, length and viscosity) on blood flow

Mathematics:

1) recognize direct and inverse variation relationships in data sets.

2) model the variation relationship observed in data with an equation.

3) Solve an equation to calculate the constant of variation for a data set

4) Use the equation to predict additional values

5) Create a graph of the data and the equation

6) Predict additional values based on the type of variation

 Data Literacy:

1. Estimate additional values based on the graph
2. Interpret graphs

**Implementation and Andragogy:** Graphing Ticket to Enter is a pre-class assignment where students are expected to complete a worksheet based on information they read and a video they watched. The completed worksheet should be either submitted electronically before class or shown to the instructor as they enter the classroom or lab. The Ticket to Enter does not need to be graded for correctness. Answers should be reviewed during class time. Answers could be projected, and time given for students to ask questions. Class time allotted to this should be approximately 5 minutes.

**Time to complete the task:** Students outside of class should expect to spend about 10 - 15 minutes. The instructor should spend approximately 5 minutes reviewing the answers and answering any questions in class.

**Conclusion and Future Plans:** The Ticket to Enter leads into a biology class where students explore the relationships between blood flow and the factors of resistance. This activity places more emphasis on the data literacy objectives. A biology classroom would place more emphasis on the biology objectives, with the math creating a foundation to understand the biology. Ideally the students would complete the activity in both math and biology to increase their understanding.

**Title:**  A&P Lab Activity

**Course and Format:** For a face-to-face anatomy & physiology class.

**Purpose:** The purpose of this activity is for students to observe the changes in blood flow that are caused by changes in pressure, radius, length, or viscosity. Students will connect what they observe to the concept, the equations, and graphs that are associated with quantities that vary directly or inversely with each other

**Learning Objectives:** (for the entire lesson, of which this is the activity is one part)

 Biology:

1) Interpret the equation that relates blood flow to pressure and resistance

2) Explain the impact of changes in resistance (pressure, radius, length, and viscosity) on blood flow

Mathematics:

1) recognize direct and inverse variation relationships in data sets.

2) model the variation relationship observed in data with an equation.

3) Solve an equation to calculate the constant of variation for a data set

4) Use the equation to predict additional values

5) Create a graph of the data and the equation

6) Predict additional values based on the type of variation

 Data Literacy:

1. Estimate additional values based on the graph
2. Interpret graphs

**Implementation and Andragogy:** Students should be placed into small groups of 2 - 4 people. Groups should have access to a computer to access the simulation. Each student should complete their own copy of the worksheet. The instructor should move between the groups making certain that they are seeing the variation relationships and modeling them correctly.

**Time to complete the task:** The activity will take students about 45 minutes to complete.

**Conclusion and Future Plans:** The Blood Flow Dynamics activity is designed for a biology class.  A similar activity is available for a math classroom.  This version of the activity places more emphasis on the biology objectives.  The math version of the activity places more emphasis on the data literacy objectives, with the math creating a foundation to understand the biology.  Ideally, the students would complete the activity in both math and biology to increase their understanding.

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**Title:**  A&P Lab Assessment

**Course and Format:** For a face-to-face anatomy & physiology class.

**Purpose:** The purpose of this assessment is for students to observe the changes in blood flow that are caused by changes in pressure, radius, length or viscosity. Students will quantify what they observe and discuss the impact these changes have on blood flow.

**Learning Objectives:** (for the entire lesson, of which this is the assessment is one part)

 Biology:

1) Interpret the equation that relates blood flow to pressure and resistance

2) Explain the impact of changes in resistance (pressure, radius, length and viscosity) on blood flow

Mathematics:

1) recognize direct and inverse variation relationships in data sets.

2) model the variation relationship observed in data with an equation.

3) Solve an equation to calculate the constant of variation for a data set

4) Use the equation to predict additional values

5) Create a graph of the data and the equation

6) Predict additional values based on the type of variation

 Data Literacy:

1. Estimate additional values based on the graph
2. Interpret graphs

**Implementation and Andragogy:** Students should complete the assessment individually. The assessment question could be used alone or placed on a quiz or exam.

**Time to complete the task:** This assessment question will take students about 10 minutes or less to complete.

**Conclusion and Future Plans:** This assessment question is designed for a biology class. A similar assessment is available for a math classroom. This version of the assessment places more emphasis on the biology objectives. The math version of the activity places more emphasis on the data literacy objectives.