

School to Career

Project-based Learning: Combining PTE Standards and Academic Standards

Use this template for planning and sharing ideas for projects. This template is based on the 6 A's.

Authenticity Academic Rigor* Applied Learning* Active Exploration* Adult Connections* Assessment*

Project

Title of Project	The Effects of Drugs on Heart Rate
Project Developed by	Patti Tucker and Lisa Johnson
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School	Twin Falls High School
Pathway / Small Learning Community	Health Services
Course Title	Biology
Grade Level	10
Students Included in Project	<input type="checkbox"/> Bilingual <input type="checkbox"/> ESL <input type="checkbox"/> Special Needs <input type="checkbox"/> Vocational <input type="checkbox"/> Regular

Authenticity

Briefly describe your project. Include the key question and provide an overview of what students do and learn. Tell why the question is meaningful to the students and where one might see a similar question tackled by an adult in the workplace.

Key Question	Why does what I eat or drink make a difference in how I feel? How can I measure these changes and make healthier decisions?
Overview	Drugs known as stimulants increase the body's metabolism. Other drugs, known as depressants , slow the rate of metabolism. Heart rate is one indicator of increased or decreased metabolism. These drugs will affect the heart rate of Daphnia in the same way as humans. In this laboratory investigation, you will observe the effect of several drugs on the heart rate of a small crustacean, the Daphnia .

Vocabulary/Key Terms

List vocabulary words and key terms essential to student understanding.

Stimulants

Depressants

Vocabulary/Key Terms

Daphnia

Heart Rate

Metabolism

Pulse

Respiration

Active Exploration * Applied Learning * Adult Connections

What classroom-based, community-based, and career-based activities does the project involve? Include a description of the active exploration, applied learning, and adult connections in the project.

Active Exploration Students will monitor the heart rate of *Daphnia* under various conditions including stimulants and depressants and will be able to correlate the change in heart rate to these substances.

Applied Learning Students will observe the effects of drugs and alcohol on the heart and various parameters that measure health. Students will learn and demonstrate how to take blood pressure, pulse and respiration and will be able to correlate these measures with both health and disease.

Adult Connections Tobacco free coalition, cardiologist, ecg technician, school nurse, public health, cop, drug screening coordinator

Classroom Activities

Lecture and power-point on blood pressure

Lab on the effects of chemicals on heart rate

Lab on how to perform vital signs

Community Activities

Guest speaker panel discussion on drugs and alcohol and the effects on the heart

Career Activities

Create and implement a “mini” health fair for the junior high...students will perform vital sign checks and give information on drugs and alcohol on the heart

Academic Rigor

Content Standards Use the space below to list the state content standards addressed by the project. (A list of standards is available at <http://www.sde.idaho.gov/ContentStandards/default.asp> This page, which includes selected high school level standards, is designed to let you easily create a list of standards you are addressing. You may then copy and paste the list into this template.)

Goal 1.2: Understand Concepts and Processes of Evidence, Models, and Explanations	9-10.B.1.2.1 Use observations and data as evidence on which to base scientific explanations. (648.02a)
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Goal 1.6: Understand Scientific Inquiry and Develop Critical Thinking Skills	9-10.B.1.6.1 Identify questions and concepts that guide scientific investigations. (649.01a)	9-10.B.1.6.2 Utilize the components of scientific problem solving to design, conduct, and communicate results of investigations. (649.01b)
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Goal 1.3: Understand Constancy, Change, and Measurement	9-10.B.1.3.1 Measure changes that can occur in and among systems. (648.03b)	9-10.B.1.3.2 Analyze changes that can occur in and among systems. (648.03b)	9-10.B.1.3.3 Measure and calculate using the metric system. (648.03c)
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Goal 5.2: Understand the Relationship between Science and Technology	9-10.B.5.2.1 Explain how science advances technology. (655.01a)	9-10.B.5.2.2 Explain how technology advances science. (655.01a)
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PTE Standards

Standard 2 Integrated Learning-Students will demonstrate how academic knowledge and skills are applied in the workplace and other settings.

Standard 3a-Universal Foundation Skills-Students will demonstrate mastery of the foundation skills and competencies essential for success in the workplace.

School to Career Competencies Please check (x) the competencies addressed by the project

- Communicate and understand ideas and information
- Collect, analyze and organize information
- Identify and solve problems
- Use technology
- Initiate and complete entire activities
- Act professionally
- Interact with others
- Understand all aspects of an industry
- Take responsibility for career and life choices

Student Goal(s) Include student personalized goal(s)

The student will be able to visualize and illustrate how their lifestyle choices impact their overall health and especially their heart.

Assessment

How do you and the students know the project is a success? What are your criteria for measuring students' achievement of the disciplinary knowledge and applied learning goals of the project? What evidence do they use to demonstrate their progress? What deliverables do they need to complete prior to the final exhibition?

The hands on lab and questions allow the student to demonstrate their understanding the heart and how various drugs and alcohol affect their heart. Career exploration will lead to a better understanding of what it takes to be successful in healthcare and how science, math, literacy and technology tie into that career development. Learning how to assess vital signs and then demonstrating this knowledge through a health fair will reinforce the importance of good health.

DISCUSSION OF RESULTS RUBRIC

Attributes	Above Standard	At Standard	Attribute Still A Goal	Attribute Points Earned
	(5-4.5)	(4-3.5)	(3-0)	
Procedure and Tested Variable Summary	The project and tested variables are elaborately summarized.	The project and tested variables are briefly summarized.	The project and tested variables are not summarized completely or are not present.	/5
	(5-4.5)	(4-3.5)	(3-0)	
Relationship Identification	Discovered relationships are clearly identified, follow logically from gathered data, and are accompanied by accurate equations.	Discovered relationships are clearly identified, follow logically from gathered data, and accompanied by an equation that partially matches the gathered data.	Discovered relationships and equations are not clearly identified, inaccurate or missing.	/5
		(5-3.5)	(3-0)	
Relationship Examples		At least two data points per relationship are quoted to exemplify stated relationships.	Supporting data points are missing or incomplete.	/5
	(5-4.5)	(4-3.5)	(3-0)	
Relationship Model	Used and accurately applied their mental model of the world to postulate a physical explanation for findings.	Used and incorrectly applied their mental model of the world to postulate a physical explanation for findings.	Little or no attempt to apply their mental model of the world was present.	/5
	(10-9)	(8.5-7)	(6.5-0)	

Assessment

Relationship Focus	Identified relationships focus on the answer to the main question(s) identified in the project's purpose and is connected to the larger context of their topic of study.	Identified relationships mostly focus on the answer to the main question(s) identified in the project's purpose and are connected to the larger context of their topic of study.	Identified relationships have little or no connection to the project's purpose nor to the larger context of their topic of study.	/10
	(5-4.5)	(4-3.5)	(3-0)	
Errors	Errors are clearly identified and the impact of these errors on data and conclusions are also identified and discussed.	Errors are clearly identified.	Errors are not clearly identified.	/5
		(5-3.5)	(3-0)	
Project Extensions		Ideas for future study of the project's topic along with suggestions for the project's improvement are identified.	Few or no ideas for future study of the project's topic along with suggestions for the project's improvement are present.	/5
Total Conclusion Points Earned				/40

Student Observation Sheet and Rubric

Student Observation Criteria

Your group's effort, cooperation, teamwork and collaboration will be observed by your teacher on a daily basis. These informal observations will be the basis of your Student Observation grade. This aspect of your project will contribute to 30 points of the 200 possible points. There are a variety of criteria which must be met to maximize your credit in this portion of your project. The criteria are:

Measurements	Consistently made careful measurements taking time to see that the measurements made sense.
Use of Class Time	Came to class prepared and equipped; made effective use of time; were always on task and actively involved in the project.
Team Work	Consistently worked together as a well-coordinated team; divided large task into a number of smaller tasks; smaller tasks were assigned to team members; team members pulled their own share.
Collaboration	Made successful efforts to collaborate with other students (in different classes or schools) and with scientists who are experts on the topic of study.
Communication/Leadership	Project leader was assigned; effectiveness of his/her role was clearly evident by the level of communication and coordination with each other and with the teacher.
Project Sustainment	Sustained the project with virtually no intervention from teacher; utilized problem-solving skills to implement the technology.
Observation Point Total	
/30	
Observations	
Notes	

Assessment

Date		
Activity		

Presentation Rubric

Attributes	Above Standard	At Standard	Attribute Still A Goal	Attribute Points Earned
	(5-4.5)	(4.5-3.5)	(3.5-0)	
Resource Utilization	Utilized all resources described on Information Sheet to acquire info; incorporated info into presentation and web page.	Utilized some resources described on Information Sheet to acquire info; incorporated information into presentation and web page.	Utilized few or no resources described on the Information Sheet to acquire information into presentation and web page.	/5
	(10-9)	(9-7)	(7-0)	
Topic Discussion	Informed when speaking (without reference to notes) about the material.	Informed when speaking about the material while referencing notes.	Unable to accurately discuss information related to topic or simply read information from paper.	/10
	(10-9)	(9-7)	(7-0)	
Visuals & Supplementary Materials	Oral report included computer-generated and/or hand made visuals (clip-art, graphs, tables, charts, and QuickTime movies), and was presented with multimedia software that enhanced presentation.	Oral report included computer-generated and/or hand made visuals (clip-art, graphs, tables, charts, and QuickTime movies) that enhanced presentation, but was not presented with multimedia software.	Oral report did not include visuals or supplementary materials or materials used did not enhance presentation.	/10
Total Presentation Points Earned				/25

Assessment

General Science Lab Rubric

	Distinguished (3)	Satisfactory (2)	Borderline (1)	Unsatisfactory (0)
FORMAT				
Title Page	Contains title, name, date, course, teacher, period.	Missing one except title or name.	Missing two except title or name.	Missing more than two, or title or name.
Sequence	Logically sequenced: Question, Hypoth., Test, Mater./Proc., Data, Anal./Conclusion. All present.	Not more than one category missing or out of sequence.	Not more than 2 categories missing or out of sequence.	More than 2 categories missing or out of sequence.
Clarity	Lab report sections clearly distinct from each other; grammatically correct English; figures/graphs correctly titled & labeled.	Sections clearly labeled but not separated; English generally correct; figures/graphs correctly labeled but not titled.	Sections labeled but not separated; frequent errors in grammar; figures/graphs labeled but contain errors in units, axes or headings.	Sections not labeled nor separated; English poor; figures/graphs not titled nor labeled.
REPRODUCIBILITY				
Hypothesis	Clear explanation of purpose; educates by providing context.	Gives a correct purpose with some framework	Declares a purpose that is correct.	Purpose is incorrect.
Design	Clear step-by-step description of experimental procedures; labeled diagrams/drawings of any apparatuses/devices used to carry out the experiment.	Step-by-step description that misses not more than one key detail; diagrams/drawings included but not labeled	Step-by-step description that misses not more than two key details; apparatuses/devices mentioned but not shown.	Description lacks more than two key details; no mention of apparatuses/devices used to carry out the experiment.
Detail	Includes formulas/calculations used to analyze data & explains their use. Records observations and explains their import. All original data included.	Includes formulas and calculations used to analyze data. Records observations, sometimes their import. Most original data included.	Includes formulas and some calculations used to analyze data. Records some observations. Some original data included.	Does not include formulas nor calculations used to analyze data. No observations noted. Original data not present.
ACCURACY				
Units	Units are used correctly and consistently throughout the report.	Units generally used correctly in most of report	Units used only in some key parts of report.	Units are rarely used or are generally incorrect.
Data Manipulation	Calculations clearly laid out. Dimensional analysis/Math correct. Figures display data correctly, all variables labeled.	Calculations contain few errors in dimensional analysis or math. Figures correct, variables unlabeled.	Calculations contain some errors in dimensional analysis or math. Figures correct. No labels or legend.	Dimensional is analysis not used. Math not shown. Figures display data incorrectly.
CONCLUSION				
Framework	Restates the hypothesis, supports or refutes it and explains the role of the test in making the decision.	Restates the hypothesis and supports or refutes it.	Supports or refutes the hypothesis without restating it.	Does not address the hypothesis.
Evidence	Uses data powerfully as evidence to support statements.	Uses data to support statements.	Refers to data in the body of the report as support.	Does not use data to support arguments
Logic	Conclusion is logically forced from data and prior knowledge.	Conclusion is logical but not thoroughly defended.	The conclusion is logical but poorly defended	The conclusion is incorrect.
Error	Identifies sources of error and explains effect on results.	Identifies sources of error.	Suggests possibility of error but identifies no sources.	Does not address possibility of error.
Context	The expt. is made meaningful by discussion of its scientific or societal implications; proposals for further investigation are made.	An application or use of the work is provided; a proposal for further investigation is made.	The work is generally ascribed to be useful but no rationale is provided for thinking so.	No relevance is provided for the work.

Recommended Resources / Sample Products

Recommended Resources / Sample Products

Software or Materials Needed

(Examples)

Internet, computers, website, blood pressure cuffs, stopwatch, stethoscopes, daphnia, microscopes, various lab materials

Teacher-Developed Materials

(Examples of materials that can be shared with other classes. Please attach samples.)

Power-point, lab materials and discussion of effects of various chemicals on the heart rate of daphnia

Lab and discussion attached at end.

Student-Developed Materials

(Examples of products that can be shared with other classes. Please attach samples.)

Lab report

Websites Used

(Examples)

<http://www.brainpop.com/health/personalhealth/bloodpressure/>

Final Words

(In a sentence or two, highlight your project's overall value.)

Teacher Tips

(Use the first person to share a useful idea that helps with implementation and ensures success. Make it chatty, informal.)

Line up guest speakers early and make sure they include visual aides. Obtain supplies for lab and include a variety of antibiotics

Timeline

What sequence of teaching and learning experiences will equip students to develop and demonstrate PTE standards and the Academic standards?

Day 1-Powerpoint, brainpop and take quiz. Discuss lab components

Day 2-Perform lab. Demonstrate, practice and learn vital signs skills-check off.

Day 3-Guest speakers

Day 4-Complete lab and begin writeup. Brochure or classroom teaching.

Day 5-Presentations/Health Fair

OBSERVING THE EFFECT OF DRUGS ON HEART RATE

INTRODUCTION:

Drugs known as **stimulants** increase the body's metabolism. Other drugs, known as **depressants**, slow the rate of metabolism. Heart rate is one indicator of increased or decreased metabolism. These drugs will affect the heart rate of **Daphnia** in the same way as humans.

In this laboratory investigation, you will observe the effect of several drugs on the heart rate of a small crustation, the **Daphnia**.

MATERIALS:

5 **Daphnia**

Petroleum jelly

Depression slide

Coverslip

Compound microscope

Paper towel cut into five 5cm squares

Clock with second hand

100 mL beaker

5 medicine dropper bottles for drug solutions

Medicine dropper for collecting **Daphnia**

***Solution-1** Tobacco

****Solution-2** Coffee

****Solution-3** Orange pekoe tea

*****Solution-4** Diet pill (containing phenylpropanolamine HCl)

******Solution-5** Ethyl alcohol

PREPARATION OF SOLUTIONS:

Put all solutions in clean, labelled dropper bottles

*To prepare Solution-1, tobacco, soak one high-nicotine cigarette in **100 mL** of distilled water overnight. Filter the solution to remove pieces of tobacco.

To be consistent, use single-serving coffee bags and tea bags in **100 mL of distilled water to prepare Solution-2 and Solution-3, coffee and tea .

*** To prepare Solution-4, dissolve 1 pill or capsule containing phenylpropanolamine HCl in **100 mL** of distilled water.

****To prepare Solution-5, ethyl alcohol, add **10 mL** of ethyl alcohol to **90 mL** of distilled water. The volume will be slightly less than 100 mL.

PROCEDURE:

1. Using a clean medicine dropper, collect one **Daphnia** in fluid from the stock culture. Place the **Daphnia** into the well of a clean depression slide. Place a small dab of petroleum jelly in the well to slow the daphnia's movement. Add the coverslip, and observe under low power.

2. To collect control data, count the Daphnia's heart beats for **10 seconds**. Record this number under **Trial 1** in your data table. Turn off the microscope light, and wait **20 seconds**. Record the count for **Trials 2 and 3**, always turning off the light and waiting 20 seconds between each **10 second count**.

3. Use a clean medicine dropper to place a drop of **Solution 1** on the depression slide so that it touches one edge of the coverslip. Place a piece of paper towel along the opposite edge of the coverslip to draw the solution into the fluid around the Daphnia.

4. Wait one minute for the solution to take effect. repeat step 2 for data on Solution 1. Record your data in the data table.

5. Clean the slide and coverslip with soap and water. Rinse thoroughly. Prepare a slide with a fresh Daphnia by repeating step 1.

6. Repeat steps 3-5 for test solutions 2-4. Repeat steps 3 and 4 for Solution 5. Record all the data in the proper spaces on the data table.

DATA TABLE:							
	10-second Heart Rate			Calculations			
Solution	Trial 1 (A)	Trial 2 (B)	Trial 3 (C)	Average 10 sec. Heart Rate (D)	Average 60 sec. Heart Rate (E)	Change in Heart Rate (F)	Percent difference (G)
Control						-----	-----
1							
2							
3							
4							
5							

CALCULATIONS:

7. Calculate the average 10 second heart rate for the control and each test solution. The formula is: $(A + B + C) / 3$
Record the answers in the proper spaces in column **(D)** of the data table.

8. Calculate the average 60 second heart rate for the control and each test solution. The formula is: $D \times 6$
Record the answers in the proper spaces in column **(E)** of the data table.

9. Calculate the change in heart rate for each test solution. The formula is : $E_{sol} - E_{control}$
Record the answers in the proper spaces in column **(F)** of the data table.

10. Calculate the percent difference in heart rate for each test solution.
The formula is : $(E_{\text{sol}} / E_{\text{control}}) \times 100$
Record the answers in the proper spaces in column (G) of the data table.

GRAPHING DATA:

Make two graphs with the x-axis for both, the test solutions. Plot the data in column E on the y-axis of graph 1. Plot the data in column F on the y-axis of graph 2. Give each graph a title and a label for the x-axis and y-axis. **NOTE:** Be sure to allow for negative changes in graph 2. You might want to try a bar graph for graph 2.

QUESTIONS:

Q1. Which solutions increased the heart rate of Daphnia?

Which decreased the heart rate of Daphnia?

What drug does each solution contain?

Q2. Which solutions caused the heart rate of Daphnia to differ by more than 10 percent?

Q3. Based on your data, which solutions contain drugs classified as stimulants?

as depressants?

Q4. Why did you need to use a fresh Daphnia for each solution?

