Student Guide

***Achieving Classroom Excellence Act* (ACE)**
End of Course Project
Biology I
Probing Pond Life

Project Overview

The project is composed of three components. The student will complete all three components and tasks associated with each:

- Component 1: Create a hay infusion to investigate pond organisms.
- Component 2: Design, conduct, and evaluate an experiment to test the effects of environmental factors on organisms within a pond ecosystem
- Component 3: Complete the Student Learning Reflection as described in the Project Guide.

Project Overview
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- Component 3: Complete the Student Learning Reflection as described in the Project Guide.

Guidelines
Read all Project Components, Task Specifications, and Component/Completion Requirements. The student meets with the Project Coordinator to review progress at the indicated check points in this guide and to decide if adjustments to the student's timeline are necessary. The student must verify that he/she completed all of ACE End of Course Project without assistance. The student is to submit a completed project with all necessary components and forms to the Project Coordinator who will forward it to the evaluation team.

Directions

1. Read through the project steps in each of the Project Components.
2. Complete and sign the Safety Assurance (*Appendix A*) and return to your Project Coordinator.
3. Review the scoring criteria to determine where you can receive credit for your work. Discuss this information with your Project Coordinator.
4. With your Project Coordinator, determine a timeline for completing the project and enter target dates for completing each of the CHECK POINTS listed in the space provided.
5. Be sure to check in with your Project Coordinator at the CHECK POINTS listed in the project.
6. Complete the project steps.
7. Submit the project including the Student Learning Reflection, for scoring by the due date.
8. All forms, components, and necessary artifacts must be included before the project can be assessed.

Requirements for Submission of the ACE End of Course Project
For submission, a completed ACE End of Course Project must include:

1. Completed Student Planner and Agreement forms.
2. A science notebook or log containing all written notes/observations which detail the methods, observations, and results gathered, research, and answers to all questions, as requested in each step of the project Components I and II.
3. Video/electronic documentation of the student conducting Component I.
4. Poster or digital display documentation of the completed project for Component II.
5. Copies of the initialed sign-off Check points and Safety Assurance Form.
6. Completed Project Submission Form as required for authenticity of the work.

Probing Pond Life

Component I: *Hay Infusion Investigation*

Project Task
Conduct an investigation to become familiar with the protocols for sampling, classifying, and estimating population sizes of pond organisms in a laboratory setting.

Research Question
How does depth affect the number and type of protozoa in a hay infusion?

Component I Completion Requirements
1. Video/electronic documentation of student conducting the hay infusion investigation
2. Data tables, graphs, and/or other visual representation of the data recorded in a science notebook/log
3. Answers to questions 1-10 recorded either orally through electronic documentation or in writing in the science notebook/log.
4. Coordinator and student initialed and dated check points must be met/passed.

Required Project Materials and Equipment
Compound Light Microscope
Microscope slides with cover slips
Pipettes
Spring water
Multiple samples of dried grasses or hay
Clock or timer
Notebook or log
Clear 1 L container
*optional: Clear corn syrup (one drop may be added to the slide to slow organism movement)

Procedures:
1. Obtain a gallon of spring water (available at local grocery stores).
2. Obtain a clear container which is at least 1 L in volume. Place a handful of dried grasses or hay into the container and cover completely with water.
3. Wait at least 48 hours.
4. Using a pipette withdraw a sample **(Sample 1)** from the hay infusion. Place a drop or two onto the center of a clean microscope slide and cover with a coverslip.
5. Using proper microscope procedure, scan the slide using the lowest power objective to observe the organism(s) present.
6. Change to next higher power objective. Examine five different slide areas to determine the different types of organism(s) present and the approximate number of each type.
7. Change to the highest power objective (not oil immersion) and observe, describe, and draw each type of organism.
8. Using reference manuals, Internet- based resources, or classification keys for protozoa, classify each organism by name and record name onto drawing. If unable to accurately identify the organism, then assign a descriptive name for identification purposes.
9. Repeat steps 4-8 using a second sample drawn from the hay infusion **(Sample 2)**.

10. Describe and draw any previously unobserved organisms not found in **Sample 1**. Make note of the presence of previously observed organisms which are also found within **Sample 2**.
11. Repeat steps 4-8 using a third sample drawn from the hay infusion **(Sample 3)**.
12. Describe and draw any previously unobserved organisms not found in **Sample 1** or **Sample 2**. Make note of the presence of previously observed organisms which are also found within **Sample 3**.

CHECK POINT #1 DATE _____ Student Initials____ Coordinator Initials ____

Answer the following questions, writing all responses in your science notebook/log.:

1. *The organisms in your hay infusion are alive.* Identify, describe and defend three unique pieces of evidence from your investigation which support this statement.

2. Identify at least two cellular activities and the structures involved in those processes which may be occurring in this investigation.

3. Identify at least four characteristics of the organisms that aided in the classification of these organisms.

4. Identify at least two characteristics that would distinguish an organism as being more "plant-like"?

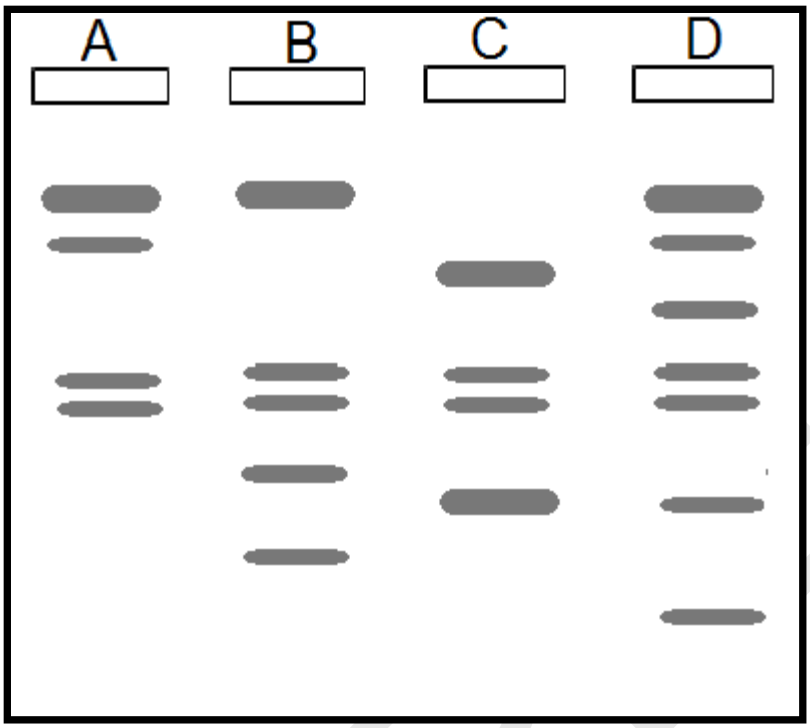
5. Identify at least two characteristics that would distinguish an organism as being more "animal-like"?

6. Compare and contrast the number and types of organisms observed in **Samples 1**, **2**, and **3**.

7. Using only the pond organisms you found, draw a simple food web and explain the role of each organism.

8. What factors would be necessary to add or maintain this investigation over an extended period of time?

9. ***Scenario***: Four organisms were very similar in their physical characteristics. The researcher extracted DNA from each organism to determine how closely they were related. Examine the simulated DNA gel on page 5 and determine which two of the four organisms are <u>more closely</u> related. Explain your response.



CHECK POINT #2 DATE _____ Student Initials___ Coordinator Initials ___

Component II: Impact of Environmental Factors on Pond Life

A pond is a dynamic ecosystem that is impacted by both natural and man-made factors.

Component II Completion Tasks: Using the observations and similar techniques from Component I, you will design and conduct an experiment to test the effect of an environmental factor and how it impacts a pond ecosystem.

Component II Completion Requirements:
The completed project should communicate the following experimental components in a poster presentation or digital display format:

1. Testable hypothesis
2. List of materials
3. Detailed lab procedure including safety precautions.
4. Clearly identified independent, dependent, controlled variables, and the control set up for the experiment.

CHECK POINT #3 DATE _____ Student Initials___ Coordinator Initials ___

5. Conduct the experiment
6. Results: Include data tables, graphs, and/or other visual representation of the data
7. Data analysis: Describe the relationships among your observations (use mathematics if appropriate).

8. Determine whether results of the experimental data support or do not support your hypothesis.
9. Evaluate experimental data to draw appropriate conclusions.
10. Cite references used whether book, periodical, or internet (include URL).

CHECK POINT #4 DATE _____ Student Initials_____ Coordinator Initials _____

Component III Student Learning Reflection

The Student Learning Reflection will be completed in the presence of your Project Coordinator or another certified educator selected by your Project Coordinator. Discuss with your Project Coordinator when and where you should complete your reflection as well as what format you would like your reflection to take. For example, you may choose to write your reflection as if you were writing a journal, or you may prefer to present your reflection verbally, through a multi-media presentation, or through some other format.

Using a method of your choice, explain how this project has contributed to your learning and ability to apply Biology I skills to the real world. Use the questions below to guide your reflection. You may also reflect on additional topics not listed in the questions. Questions 1, 2 and 3 must be addressed, all others are optional. However, your reflection illustrates the depth of your learning and needs to be thorough enough for you and your audience to draw an accurate picture.

1. Explain how this project has contributed to your learning and ability to apply Biology I skills to the real world.
2. How could you improve your lab technique and procedure to get better data samples?
3. If someone repeated your experiment, would you expect them to get similar or different results? Justify your answer.
4. What process did you use to plan and conduct your project?
5. Discuss your experimental design and data collection methods.
6. How well does this project represent your best effort, demonstration of high-quality work, individuality, and creativity?
7. If you were to repeat this project, what would you have done differently? Why?
8. What was your greatest challenge while completing this project?
9. What additional resources would have been helpful in completing this project?

CHECK POINT #6 DATE _____ Student Initials___ Coordinator Initials ___

Biology I: Probing Pond Life Project Scoring

The Project Evaluation Panel will make use of a **Biology I: Probing Pond Water Electronic Appendices** to assist in scoring. There are a total of 103 possible points on the project.

- Component I: *Hay Infusion Investigation* will be evaluated using the Component I Scoring Rubric, *Appendix B*
- Component II: *Probing Pond Life Experiment* will be evaluated using the Component II Rubric, *Appendix B*
- Component III: *Student Learning Reflection* will be evaluated using the Component III Rubric , *Appendix B*

Points from the Component Rubrics (*Appendix B*) will be transferred to the Total Scoring Table (*Appendix C) through use of an electronically linked system.* The electronic table will tally the total points earned on the project by task, component and standard.

The Evaluation Panel will use the Total Scoring Table *(Appendix C),* Total Points by Standard column, to determine how to rate the student's project on each row of the Biology I Performance Level Rubric *(Appendix D).*

After the total points earned on the Biology I Performance Level Rubric *(Appendix D)* are totaled, the panel will use the Performance Level Correlation Table *(Appendix E)* to determine the final student's performance level recommendation.

Appendix A

Appendix A

Oklahoma State Department of Education
ACE Biology I End of Course Project
Safety Assurance

Directions: The student is required to visit the Web sites on the resource list to identify potential safety hazards associated with this ACE Biology I End of Course Project. The student will determine the appropriate Personal Protective Equipment (PPE) and safety protocols necessary to complete this project.

Identifying safety concerns and determining the appropriate PPE and safety protocols are important components of any scientific research activity. Common risks encountered as students conduct scientific research include: 1) cuts from broken glassware, 2) burns from hot plates or burners, 3) electric shock, 4) eye injuries, 5) fires, and 6) chemical spills. Identification of hazards and implementation of protocols to safeguard the student are the responsibilities of the student and project coordinator.

Resource List:

Flinn Scientific: http://www.flinnsci.com/Documents/miscPDFs/Safety_Contract.pdf

Flinn Scientific (MSDS): http://www.flinnsci.com/search_MSDS.asp
Science and Safety: http://www.csss-science.org/safety.shtml
Laboratory Safety Links:
http://carnegiescience.edu/first_light_case/horn/labsafety.html
Safety in the Science Classroom: http://www.nsta.org/pdfs/SafetyInTheScienceClassroom.pdf
Be Protected for a Safer Science Experience: Be Prepared!:
http://www.nsela.org/index.php?option=com_content&view=article&id=123:be-protected-for-a-safer-science-experience-be-prepared-&catid=71:sciencesafety&itemid=79

After you have reviewed the information in the documents on the resource list complete the chart. List the potential hazards associated with each component of the ACE Biology I End of Course Project and the specific PPE or safety protocols you have used as safeguards. If the component of the project does not pose a hazard write "not applicable" in the protocol section for that project component. This document must be reviewed and signed by your parent(s)/guardian and project coordinator **before** you begin the ACE Biology I End of Course Project. **This document must be reviewed and amended as needed prior to beginning Component II of the experimental design.**

Appendix A

Example is given in italics

Component	Potential Safety Hazard	PPE or Safety Protocol
Use of the microscope	*Electrical shock*	*Caution must be taken so that the cord is on the table, is not frayed, and does not run across a water source.*

Appendix A

I have reviewed the information found in the resource list above and discussed the potential safety hazards, PPE, and safety protocols described above with my project coordinator. I agree to follow all of the recommendations described above as I conduct my ACE Biology I End of Course Project.

Student
Signature:_____

I have reviewed information found on the ACE Biology I End of Course Project Safety Assurance with my student. I am aware of the potential hazards, appropriate PPE, and safety protocols associated with this project.

Parent/Guardian
Signature: _____

I have reviewed the information found in the resource list above and discussed the potential safety hazards, PPE, and safety protocols described above with the student. I have demonstrated the appropriate use of any required PPE and modeled appropriate safety protocols for the student. As the project coordinator, I assume all safety responsibilities associated with the ACE Biology I End of Course Project.

Project Coordinator
Signature: _____

Project Coordinator

This form must be included in the ACE Biology I End of Course Project

Appendix B

COMPONENT I SCORING RUBRIC CRITERIA

PROJECT TASK	STANDARD COMPONENT	SCORING CRITERIA
Video and Notebook/log of Hay Infusion		
1a. Select three samples from different areas of the hay infusion. Describe and defend your sampling technique.	Process Standards 1, 3, 4	0 – No description or defense of sampling technique 1 – Gives limited description and meager defense of sampling technique 2 – Gives complete description and thorough defense of sampling technique
1b. Properly prepare wet-mount slides for each sample.	Process Standards 1, 3	0 – Does not use a coverslip, or safety procedures are not followed 1 – Correctly uses a coverslip on slide and safety procedures are followed
1c. Demonstrate your ability to properly use a microscope to locate specimen(s) in your hay infusion using various objective lenses.	Process Standard 1	0 – Does not know how to use a microscope, or safety procedures are not followed 1 – Cannot locate organisms without assistance and safety procedures are followed 2 – Exhibits appropriate microscope skills and needs no assistance and safety procedures are followed
1d. Observe, describe, draw, and give approximate number of each type of organism present within the five different locations into each of the samples.	Process Standards 1, 2, 4	0 – Organisms are not described, counted, or drawn 1 – Organisms are poorly described and drawn and counted for a single location 2 – Organisms are carefully described, drawn, and counted for multiple locations within the samples
1e. Classify each organism and record name on drawing. (Student may assign descriptive name if unable to classify)	Process Standard 2 Content Standard 3	0 – Organisms are not classified or named 1 – Mostly descriptive names given to classify organisms 2 – Organisms are classified and appropriately named

Appendix B

PROJECT TASK	STANDARD COMPONENT	SCORING CRITERIA
Questions From Hay Infusion		
1f. Identify, describe and defend three unique pieces of evidence from your investigation which support this statement.	Content Standards 1, 5	0 – Cites no evidence 1 – Identify and describe but do not defend evidence 2 – Identify, describe and defend three pieces of evidence
1g. Identify at least two cellular activities and the structures involved in those processes which may be occurring in this investigation.	Content Standards 1, 5	0 – Does not identify any cellular processes or structures 1 – Identifies 1 cellular process and one structure correctly 2 – Identifies 2 cellular processes and structures correctly
1h. Name at least four characteristics that aided you in your classification of these organisms, and list which are plant-like and which are animal-like.	Content Standard 3	0 – Does not name any characteristics 1 – Names 1 - 3 characteristics 2 – Names 4 characteristics
1i. Compare and contrast the number and types of organisms observed in **Samples 1**, **2**, and **3**.	Process Standards 1, 2	0 – Does not describe differences 1 – Describes at least 1 difference 2 – Describes 2 or more differences
1j. Draw a simple food web using the organisms in your sample and explain the role of each organism.	Process Standard 5 Content Standards 4, 5	0 – Does not draw or explain food web 1 – Draws but does not explain food web correctly 2 – Draws and explains food web
1k. What factors would be necessary to add or maintain this investigation over an extended period of time?	Content Standards 1, 2, 5	0 – Does not identify any factors 1 – Describes at least 2 factors 2 – Describes at least 3 factors
1l. After examining the simulated DNA gel explain how you determined the two most closely related species.	Process Standard 4, 5 Content Standard 2	0 – Is unable to explain which 2 species are more closely related 1 – Gives limited explanation of species relationship 2 – Fully explains how the gel depicts the species relationship

Appendix B

COMPONENT II SCORING RUBRIC CRITERIA

PROJECT TASK	STANDARD COMPONENT	SCORING CRITERIA
Experimental Design: Poster Presentation or Digital Media and Notebook/log		
2a. Describe the design of an experiment with control setup and provide a rationale to test the effect of an environmental factor and how it impacts a pond ecosystem.	Process Standard 3	0 – Does not provide an experimental design 1 – Experimental design is incomplete 2 – Fully describes an appropriate design with control setup with a rationale
2b. Develop a testable hypothesis.	Process Standard 3	0 – No hypothesis is given 1 – Hypothesis is incomplete 2 – Hypothesis is testable and contains both independent and dependent variables
2c. Select quantifiable data and appropriate units.	Process Standard 1	0 – Does not quantify data or misuses SI units 1 – Data is partially quantified and some units are correctly identified 2 – All data is quantified and units are appropriately applied
2d. Prepare a complete list of materials needed to conduct your experiment.	Process Standard 3	0 – List is partial or incomplete 1 – List is complete with appropriate quantities 2 - List is complete with appropriate quantities and sizes indicated
2e. Design and document detailed lab procedures and safety precautions in your notebook/log.	Process Standard 3	0 – Procedural directions are incomplete or missing steps 1 – Procedural directions are complete, yet are given in the wrong order. 2 – Procedural directions are ordered correctly, complete, and described in such a manner the experiment can be reproduced.
2f. Conduct the designed experiment.	Process Standard 3	0 – Student does not provide evidence or artifact of conducted experiment. 1 – Procedure is not ordered /followed correctly. 2 – Most measurements or observations are given. 3 – All critical steps are listed, yet may be out of sequence. Not all

		measurements are labeled. Observations are not detailed. 4 – Complete step by step account of what student did, or every step that was taken is documented. All measurements are given and labeled. Observations are listed and detailed.
2g. Collect and record quantitative and qualitative data from the designed experiment. Prepare a data table and graph depicting results.	Process Standards 1, 4, 5	0 – No quantitative or qualitative data collected. 1 – Quantitative or qualitative data collected or represented appropriately 2 – Quantitative or qualitative data collected and represented appropriately 3 – Quantitative and qualitative data collected and represented appropriately
2h. Analyze data to describe trends revealed by data.	Process Standards 4, 5	0 – No trends are stated, and calculations, if needed, are not given. 1 – Trends in data table or graph are correctly described. If appropriate, mathematical relationships are not identified and calculations are not shown. Error analysis is not discussed. 2– Trends in data table or graph are incorrectly or incompletely described. If appropriate, mathematical relationships are identified but no calculations shown. Error analysis is discussed. 3 – All trends in data table and graph are correctly described. If appropriate, mathematical relationships are identified and calculations shown. Error analysis is discussed.
2i. Evaluate experimental data to draw the most logical conclusion that is best supported by the evidence. Use analyzed data to confirm, revise, or reject hypothesis.	Process Standard 4 Content Standard 4	0 – No evaluation of experimental data, nor analysis of data to confirm, revise or reject stated hypothesis. 1 – Experimental data was evaluated to draw the most logical conclusion or analyzed data was used to

Analysis is extended to prediction(s), follow-up question(s), or real world application(s).		confirm or reject hypothesis. 2 – Experimental data was evaluated to draw the most logical conclusion best supported by the evidence and analyzed data to confirm, revised, or reject hypothesis or no extension is made. 3 – Experimental data was evaluated to draw the most logical conclusion best supported by the evidence, analyzed data to confirm or reject hypothesis, and at least one extension is made.
2j. Cite all references used.	Process Standard 4	0 – No references or an insufficient number of references are cited 1 – Evidence of prior research present but missing critical sources. 2 – Evidence of prior research specific to the purpose of the experiment has been conducted, yet the documentation of sources is incomplete or vague. 3 – Evidence of prior research specific to the purpose of the experiment has been conducted. A sufficient number of references are cited, and documentation of sources is complete.

COMPONENT III SCORING RUBRIC CRITERIA

PROJECT TASK	STANDARD COMPONENT	SCORING CRITERIA
Student Reflection		
3a. Using a method of your choice explain how this project has contributed to your learning and ability to apply Biology I skills to the real world.	Process Standard 4 Content Standards 3, 4	0 – No explanation given 1 – Logical explanation given 2 – In-depth explanation given
3b. If someone repeated your experiment, would you expect them to get similar or different results? Justify your answer.	Process Standard 3	0 – No justification given 1 – Logical justification provided 2 – In-depth justification provided

Appendix B

Total Scoring Table

Using the Component Rubric Criteria, there are a total of 101 possible points.

Points from the Component Rubrics Criteria (*Appendix B*) will be transferred to the Total Scoring Table (*Appendix C) through use of an electronically linked system.* The electronic table will tally the total points earned on the project by task, component and standard.

The electronic version of the total scoring table has a similar format to the one below.

	Total Points from Criteria Scoring				
	Component I		**Component II**	**Component III**	**Total Points by Standard****
Standard	*Video**	*Questions**	*Experimental Design**	*Student Reflection**	
P 1.0	4(5)	1(2)	2(6)	-	(13)
P2.0	2(4)	1(2)	-	-	(6)
P 3.0	2(3)	-	5(12)	1(2)	(17)
P.4.0	2(4)	1(2)	4(13)	1(2)	(21)
P 5.0	-	2(4)	2(7)	-	(11)
C 1.0	-	3(6)	-	-	(6)
C 2.0	-	2(4)	-	-	(4)
C 3.0	1(2)	1(2)	-	1(4)	(8)
C 4.0	-	1(2)	1(3)	1(2)	(7)
C 5.0	-	5(8)	-	-	(8)
Grand Total	11(18)	17(32)	14(43)	4(10)	(101)

* The first number in each cell represents the number of times a standard is correlated to a task or question in the rubric. The number in parentheses represents the maximum number of points possible for that standard by component.
** Scores which will be used by the Evaluation Panel to determine the student's final performance level.

Appendix C

Appendix D

ACE End of Course Projects
Performance Level Rubric
Biology I

	1	2	3	4
Process Standard 1. Observe and Measure - Observing is the first action taken by the learner to acquire new information about an organism or event. Opportunities for observation are developed through the use of a variety of scientific tools, allowing the student to distinguish between observation and inference. Measurement allows observations to be quantified.	Student demonstrates little to no mastery of the process standards.	Student demonstrates partial mastery of the process standards.	Student demonstrates mastery of the process standards including such skills as identify qualitative and quantitative changes, use appropriate tools, and use appropriate International System of Units.	Student demonstrates a superior and in-depth mastery of the process standards.
Process Standard 2: Classify - Classifying establishes order. Organisms and events are classified based on similarities, differences, and interrelationships.	Student demonstrates little to no mastery of the standard.	Student demonstrates partial mastery of the standard.	Student demonstrates mastery of the standard including such skills as use observable properties to make biological classifications and identify properties by which a classification system is based.	Student demonstrates a superior and in-depth mastery of the standard.
Process Standard 3: Experimental Design – Understanding experimental design requires that students recognize the components of a valid experiment.	Student demonstrates little to no mastery of the standard.	Student demonstrates partial mastery of the standard.	Student demonstrates mastery of the standard including such skills as evaluate the design of a biology laboratory experiment, identify experimental variables, use mathematics, identify possible hypotheses, and recognize hazards.	Student demonstrates a superior and in-depth mastery of the standard.

Appendix D

	1	2	3	4
Process Standard 4: Interpret and Communicate - Interpreting is the process of recognizing patterns in collected data by making inferences, predictions, or conclusions. Communicating is the process of describing, recording, and reporting experimental procedures and results to others. Communication may be oral, written, or mathematical and includes organizing ideas, using appropriate vocabulary, graphs, other visual representations, and mathematical equations.	Student demonstrates little to no mastery of the standard.	Student demonstrates partial mastery of the standard.	Student demonstrates mastery of the standard including such skills as make predictions, interpret data, determine if results support hypotheses, draw conclusions, and create graphs and charts.	Student demonstrates a superior and in-depth mastery of the standard.
Process Standard 5: Model - Modeling is the active process of forming a mental or physical representation from data, patterns, or relationships to facilitate understanding and enhance prediction.	Student demonstrates little to no mastery of the standard.	Student demonstrates partial mastery of the standard.	Student demonstrates mastery of the standard including such skills as interpret biological models and select predictions based on models.	Student demonstrates a superior and in-depth mastery of the standard.
Standard 1: The Cell - Cells are the fundamental unit of life, composed of a variety of structures that perform functions necessary to maintain life.	Student demonstrates little to no mastery of the standard.	Student demonstrates partial mastery of the standard.	Student demonstrates mastery of the standard including such skills as identify cell structures, organization, and functions.	Student demonstrates a superior and in-depth mastery of the standard.
Standard 2: The Molecular Basis of Heredity - DNA determines the characteristics of organisms.	Student demonstrates little to no mastery of the standard.	Student demonstrates partial mastery of the standard.	Student demonstrates mastery of the standard including such skills as understand the cell cycle, replication, transcription, mitosis, and gene recombination.	Student demonstrates a superior and in-depth mastery of the standard.

Appendix D

	1	2	3	4
Standard 3: Biological Diversity - Diversity of species is developed through gradual processes over many generations.	Student demonstrates little to no mastery of the standard.	Student demonstrates partial mastery of the standard.	Student demonstrates mastery of the standard including such skills as identify evidence of common ancestry related to biological diversity and adaptations.	Student demonstrates a superior and in-depth mastery of the standard.
Standard 4: The Interdependence of Organisms - Interdependence of organisms in an environment includes the interrelationships and interactions between and among organisms.	Student demonstrates little to no mastery of the standard.	Student demonstrates partial mastery of the standard.	Student demonstrates mastery of the standard including such skills as understand organism and species interaction in an ecosystem and explain population dynamics.	Student demonstrates a superior and in-depth mastery of the standard.
Standard 5: Matter, Energy, and Organization in Living Systems - Living systems require a continuous input of energy to maintain their chemical and physical organizations.	Student demonstrates little to no mastery of the standard.	Student demonstrates partial mastery of the standard.	Student demonstrates mastery of the standard including such skills as identify the basic processes within photosynthesis and respiration.	Student demonstrates a superior and in-depth mastery of the standard.
Student Learning Reflection	Student demonstrates less than a Limited Knowledge level of understanding how this project has contributed to the student's learning and real world application of Biology I skills.	Student demonstrates a partial understanding how this project has contributed to the student's learning and real world application of Biology I skills.	Student demonstrates understanding of how this project has contributed to the student's learning and real world application of Biology I skills.	Student demonstrates superior understanding of how this project has contributed to the student's learning and real world application of Biology I skills, including past and future benefits of this experience on the student's life.

Appendix D

Biology I: Probing Pond Life
Performance Level Correlation Table

Proficiency Level	***Total Scoring Table*** *Appendix C*	***Performance Level Rubric*** *Appendix D*
Advanced	Total points are **equal to or greater than 76**, with no scores equal to zero.	Total points are **equal to or greater than 34**, with no scores equal to one.
Proficient	Total points are within the **75 – 55 range**, with no scores equal to zero.	Total points are within the **24 – 33 range,** with no **scores equal to one.**
Limited Knowledge	Total points are within the **54 – 40 range.**	Total points are within the **18 - 23 range**.
Unsatisfactory	Total points are **equal to or less than 39**.	Total points **are equal to or less than 17.**

- An overall score **equal to or less than 17** on the Biology I Performance Level Rubric is required for the student to score Unsatisfactory on the Biology I End of Course Project.
- An overall score **within the 18 – 23 range** on the Biology I Performance Level Rubric is required for the student to score Limited Knowledge on a Biology I End of Course Project.
- An overall score **within the 24 – 33 range** on the Biology I Performance Level Rubric is required for the student to score Proficient on a Biology I End of Course Project.
- An overall score **equal to or greater than 34** with **no scores equal to one** on the Biology I Performance Level rubric is required for the student to score Advanced on a Biology I end of Course Project.