**General Education Natural Science Outcome: FORM A: faculty report**

LSSU graduates will be able to incorporate empirical evidence in the analysis of the causes and consequences of natural phenomena.

This assessment maps to LSSU’s Institutional Learning Outcomes by addressing ILO 2: Use of Evidence.

**Target Outcomes:**80% of students will achieve Level 1 or higher.

 60% of students will achieve Level 2 or higher.

**Bloom’s Taxonomy Level for Assessment:** *Analysis / Evaluation*

 **EXPECTED**

**OUTCOME:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|   | **3 - Milestone**  | **2 – Milestone**  | **1 - Benchmark**  | **0 – Unacceptable**  |
| **Empirical Evidence** | Uses empirical evidence as the basis for conclusions about a natural phenomenon that are nuanced, complex, and/or apply knowledge from outside the system at hand.  | Uses empirical evidence as the basis for conclusions about a natural phenomenon requiring simple deductive, inductive, or abductive reasoning | Uses empirical evidence as the basis for conclusions about a natural phenomenon requiring simple fact recall. | States a conclusion that is ambiguous, illogical, or unsupported by the available empirical evidence.  |

**Assessment Results**

**Course: Semester:**

**Number of Course Sections: Instructor:**

**Total number of students completing the assessment**:

**Assessment Method** (*i.e., exam questions, presentation, research paper, etc*.): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Indicate the number of students who met or exceeded the expected outcome:**

(*Note:* Recording data for those who scored below the expected outcome may also be useful for assessment).

**EXPECTED**

**OUTCOME:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|   |   | **3** | **2**  | **1** | **0** |
| **Empirical Evidence** |   |   |   |   |

**Summarize the students’ strengths related to the outcome as evidenced in their work.**

**Summarize the students’ weaknesses related to the outcome as evidenced in their work.**

**Summarize the strengths and weaknesses of how your assessment method measured this General Education outcome.**

(*Examples of Natural Science Outcome assessment reporting follow*)

**Natural Science Examples**

*OUTCOME:* LSSU graduates will be able to incorporate empirical evidence in the analysis of the causes and consequences of natural phenomena.

**Summarize the students’ strengths related to the outcome as evidenced in their work.**

|  |  |
| --- | --- |
| **Assessment Method** | **Example Summary** |
| Exam Questions | Students were successful in incorporating empirical evidence into their analyses of the causes and consequences of natural phenomena, both in calculating oxidation numbers of various substances and in identifying oxidation/reduction in described chemical reactions. |
| Open Inquiry Papers | Students completed an Open Inquiry research project using their own data to draw conclusions. Students demonstrated the ability to incorporate empirical evidence in the analysis of the causes and consequences of natural phenomena by designing and conducting an experiment, collecting data, presenting their data in a table or graph, and drawing reasonable conclusions based on those results. |
| Lab Assignment/Report | Students were able to correctly complete the data table based upon what they observed during the virtual lab, to successfully answer the questions relating to the specific heat of water, and to successfully calculate the specific heat of aluminum. Students demonstrated they were able to incorporate empirical evidence in the analysis of the causes and consequences of natural phenomena. |

**Summarize the students’ weaknesses related to the outcome as evidenced in their work.**

|  |  |
| --- | --- |
| **Assessment Method** | **Example Summary** |
| Exam Questions | Students who did not complete the preparatory assigned homework problems did not do well. Some were unable to perform order of operations math. They were unable to incorporate empirical evidence to analyze the causes and consequences of natural phenomena.  |
| Open Inquiry Papers | Primarily freshmen students seemed to have difficulty understanding why it is better to take more than one measurement and compare the averages across groups, and some struggled to understand why it is necessary to apply statistical tests to data before drawing conclusions. Thus, they were less able to incorporate empirical evidence to analyze the causes and consequences of natural phenomena. |
| Lab Assignment/Report | Only a couple students had difficulty correctly relating the change in heat of water to the change in heat of the aluminum. This meant that those students were less successful incorporating empirical evidence to analyze the causes/consequences of natural phenomena. |

**Summarize the strengths and weaknesses of how your assessment method measured this General Education outcome.**

|  |  |
| --- | --- |
| **Assessment Method** | **Example Summary** |
| Exam Questions | Scores indicate that the selected final exam questions were a strong measure of assessment. Review of material prior to the exam and an extensive practice problem set provided prior to the exam were deemed valuable by the students and appeared to improve success for performance and results when incorporating empirical evidence to analyze the causes/consequences of natural phenomena. |
| Open Inquiry Papers | Strength: the assessment allows the instructor to evaluate the student’s understanding of the fundamental difference between a research hypothesis and a statistical hypothesis, and the importance of statistical testing when attempting to reach a scientific conclusion, specifically when incorporating empirical evidence to analyze the causes/consequences of natural phenomena. Weakness: the assessment did not include a qualitative research component.  |
| Lab Assignment/Report | Assessment questions are well connected to class discussions, homework problems, and previous exams, and the rubric is easy to use. Lab report questions require demonstrated knowledge of basic thermodynamic characteristics of particular reactions, and an ability to incorporate empirical evidence to analyze the causes and consequences of natural phenomena. In the future, I would like to design the questions to be more related to one another, rather than simply all related to the same subject covered in the course lectures. |