

## **General Education Assessment Natural Sciences Action Plan**

Please interpret the findings and provide a specific action plan that can be implemented to improve or reinforce student learning as a result of the assessment process. The action plan should address the area(s) in need of improvement or reinforcement. The plan does not have to be limited to general education student learning but could include departmental initiatives designed to improve student success.

### **Part One: Results Discussion / Reflection**

**Geology:** The General Education Assessment in Geology was conducted in the GEOL1501 – Dynamic Earth, an introductory level laboratory course. The results from the assessment indicate that a majority (>70%) of students either met or exceeded expectations for competency outcomes 1 and 2. In contrast 39% and only 35% of students either met or exceeded expectations for competency outcomes 3 and 4, respectively. More significantly, as many as 40% of students scored “minimal” for competency outcome 4 compared to 6% of students for competency outcome 3. These results suggest that the students were much better at mastering facts, but they were less so at applying the facts. The faculty noted that there may also have been poor alignment of content covered in the activities (as well as means of assessment) to competency outcome 4 (Describe how scientific data and advances in science relate to societal issues).

**Biology:** Greater than 80% of students met or exceeded expectations for learning outcomes 1, 2, and 4. For learning outcome 3, 64% of students met or exceeded expectations. The third outcome relates to the scope and limits of science and how scientific inquiry is based on investigation of evidence from the natural world. When examining the data more closely, it appears that only 53% of students met or exceeded this third learning outcome in Biol 1101 while 80% of students met or exceeded this outcome in Biol 1201. Therefore, changes in Biol 1101 on this topic are most likely to produce improved outcomes. Students in Biol 1101 struggled most with justifying the evidence they used, placing that evidence in the context of science, and discussing differences in the claims and evidence they used compared to that used by their peers.

**Physics:** Over 90% of the students in PHYS 1251 and PHYS 1261 met or exceeded expectations on SLO1 (PHYS 1251: 93%, PHYS 1261: 94%) and SLO2 (PHYS 1251: 93%, PHYS 1261: 100%). On SLO3 74% of PHYS 1251 students and 86% of PHYS 1261 students met or exceeded expectations. This indicates that the students improved as they progressed through the physics lab sequence but also reveals an area where we can make changes to improve the outcome. The students in PHYS 1251 could improve in the areas of Justification (79% met or exceeded expectations) and Agreement with Peers (where they reflect on the other groups' results, 78% met or exceeded expectations). We will make changes to address these topics. SLO4 was not measured for PHYS 1251 or PHYS 1261.

**Chemistry:** The criterion for success was set as a score of greater than 2.0 (Meets Expectation) by 80% of the students. Thus, the criterion for success was met for all four

learning outcomes. Students performed the best on SLO4 (Societal Issues), with 96% of the students scoring Meets Expectation or Exceeds Expectation. Please note that this outcome was assessed in CHEM 1161 only. Lower scores were observed in SLO3 (Scientific Inquiry), with 85% of the students scoring “Meets Expectation” or “Exceeds Expectation.” However, this still met the criterion set for success. In both CHEM 1151 and CHEM 1161 scores were roughly split 50:50 between meets and exceeds expectations for Linking Science Concept to Question and Justification of Evidence. These two rubric items are correlated, understanding how the science concept can answer the questions is necessary for the justification. This is a known challenge for developing proficiency with arguing from evidence.

## **Part Two: Action Plan**

Please describe what actions you will take as a result of the assessment in the following four areas.

### **a. Pedagogical / Curriculum**

**Geology:** To address the concern that students were better at mastering facts, but they were less so at applying the facts, the faculty will rely, in part, on a newly created Argument Driven Inquiry (ADI) model that was first implemented in Spring 2023. This activity was intended to be used as a 3-week module in GEOL1501 – Dynamic Earth. The module is designed to help students master concepts pertaining to surface water-groundwater interactions, and then apply those concepts in a real-world scenario. Results from the module may be used to determine whether additional ADI modules should be developed and phased into the rotation of activities in the GEOL1501 labs. To address poor alignment of content with competency outcome 4, the faculty will add “GEOL1010 - Geology Goes to Hollywood” to the assessment plan. The student learning outcomes in this course were designed to align with the competency outcomes of the General Education Assessment Plan from the onset. The faculty believe using various instruments in GEOL1010 will provide more robust results to adequately address competency 4.

**Biology:** We will add an exercise in Biol 1101 to address student learning outcome 3, the outcome with the lowest percent of students in Biology meeting expectations (64%). This exercise will require students to use example data to practice explicitly justifying evidence, placing that evidence in a scientific context, and discussing differences in claims and evidence used by various individuals. Having an opportunity to walk through these steps with example data will hopefully clarify to the students what is needed when they are discussing their own data collected in experiments throughout the semester.

**Physics:** We will add more material and examples of justification of experimental results to the lab manual, and to the “Peer review” videos for each investigation. These videos are posted to help students with their peer reviews, but many students also use them to help them write their lab reports. We will also add material on the importance of discussing agreement (or disagreement) with peers in the lab reports.

**Chemistry:** We will add supplementary materials on linking the science concept to the questions and how that provides the basis for the justification. We will also add material

on the importance of discussing agreement (or disagreement) with peers in the lab reports. We may add a post argumentation observation sheet for students to use during the whiteboard session.

### **b. Student Support Services**

Tutoring services and study skills workshops are available to students in all General Education science courses through the Pirate Academic Support center. These services will be advertised to students. In addition, some departments (e.g., Biology and Chemistry) use trained undergraduate Learning Assistants in their classes to provide additional opportunities for student help beyond what the instructor can offer.

### **c. Faculty Development**

Faculty in all units will be encouraged to seek the support of ECU's Office for Faculty Excellence and apply to participate in opportunities regarding support for course redesign or curriculum best practices.

**Biology:** We will spend time in one of our initial weekly meetings with the lab instructors reviewing strategies to facilitate student development of these specific skills. We will also relate to the faculty in the accompanying lecture course the language we use in the labs and encourage them to try to incorporate skill-building activities into their lecture sections.

**Physics:** We will spend time in our weekly instructor/TA meetings emphasizing student development of the skills associated with SLO3.

**Chemistry:** We will share these findings with all new TA's in the summer training and weekly instructor/TA meetings emphasizing student connecting the question to the science concept, and how that feeds into the justification. We will discuss adding a post argumentation observation sheet for students to use during the whiteboard session.

### **d. Other Areas**

**Geology:** Other activities that the faculty will undertake include emphasizing the relevance of geology to students, and also highlighting the altruistic aspect of geology by emphasizing the different types of jobs geoscientists do.