



Rappahannock Community College

2018-19 Report on Scientific Literacy

What does Scientific Literacy mean at RCC?

Scientific Literacy is the ability to apply the scientific method and related concepts and principles to make informed decisions and engage with issues related to the natural, physical, and social world.

RCC Degree graduates will recognize and know how to use the scientific method and to evaluate empirical information.

How are RCC degree graduates expected to use Scientific Literacy skills?

Student Learning Outcomes (SLOs) are defined to guide the instruction of Scientific Literacy skills.

RCC degree graduates will:

- a. generate an empirically evidenced and logical argument;
- b. distinguish a scientific argument from a non-scientific argument;
- c. reason by deduction, induction, and analogy;
- d. distinguish between causal and correlational relationships; and
- e. recognize methods of inquiry that lead to scientific knowledge.

How are RCC students doing?

RCC General Education Assessment

In Spring 2019, a sample of 120 degree graduates took an *RCC General Education Assessment* that included five Scientific Literacy items. All items were multiple choice. Two of the items had high success rates of 89% and 90%. Two other items posed more of a challenge for the students with 62% and 64% success. The fifth question was answered correctly by only 36% of the students. The question assessed student-learning outcome (SLO) d: RCC degree students will distinguish between causal and correlational relationships.

There was a misunderstanding of the terms positive and negative relationship. There were also students who chose answers that attributed cause as a result of the survey. From a survey such as this, cause cannot be a conclusion. A positive relationship indicates that two outcomes vary in the same directions, which is a correlational relationship.

Students performed best on the item that assessed SLO b: RCC degree students will distinguish a scientific argument from a non-scientific argument. Ninety percent of the students chose the correct answer d. The correct results of the assessment of the other SLOs were:

- SLO a: RCC degree graduates will generate an empirically evidenced and logical argument. – 90%
- SLO c: RCC degree graduates will reason by deduction, induction, and analogy. -- 62%
- SLO e: RCC degree graduates will recognize methods of inquiry that lead to scientific knowledge. -- 64%

Common Course Assessment

Scientific Literacy objectives are modeled, applied, and practiced across all science courses. Success in required science courses demonstrates mastery of these objectives. Formative assessment and successful completion of lab reports and graphing in biology courses indicate that students are showing improvements, but

post-test item analysis did not indicate the benchmark for scientific literacy was met. However, more students across sections correctly answered questions regarding the scientific method.

Students in Psychology 200 or 230 formulate a research proposal as a group activity. This supports SLOs a-d. The benchmark is for at least 71% of students to score 70% or better on the assignment. In Fall 2018, 100% of the students in Psychology 200 and 230 received grades greater than 70% on the assignment. Psychology students are also assessed on SLO d with final exam items:

- Which of the following research designs will allow cause-and-effect conclusions?
- A negative correlation means _____.

Ninety to 100 percent of students answered the items correctly.

Quantitative Literacy is necessary for success in Scientific Literacy. Overall, five of the mathematics classes met the 60% benchmark. Math 162, PreCalculus II, had an overall success rate of 54.1%, which was below the benchmark. This course is necessary for chemistry and physics. Analysis of the test items led to the conclusion that students should be allowed to use a formula sheet as is practiced in the workplace.

RCC Graduating Student Survey

Students confidence in their quantitative skills is measured each Spring on the *RCC Graduating Student Survey*. Students are asked to rate their ability when they entered RCC and now that they are graduating. One item assesses their Scientific Literacy confidence. When asked to rate their ability "To understand and apply the scientific method to make informed decisions," 40% marked excellent when they entered and 70% when they graduated. Seventeen percent said "fair" or "poor" at entry but only 1% at graduation.

How are assessment results used?

The science faculty assumes the main responsibility for scientific literacy but collaborates with all degree faculty to assure that students apply scientific literacy into all disciplines in preparation for their future studies and careers. The biology, chemistry, and physics faculty meet regularly, discuss the assessment results, and look for improved success of students. The entire Arts and Sciences for Transfer Degree faculty meet and review all general education assessments.

Some 2018-19 recommendations for improvement were:

- All sections of biology continue to include at least one inquiry lab or exercise, which requires students to identify and use the steps of the scientific method, formally assessed by the instructor and presented with an abstract or lab report; instructor feedback should be collected for these outcomes.
- Biology instructors will ask the students questions to help them derive ideas, reason by deduction, arrive at conclusions, and design their own experiments for scientific inquiry.
- In psychology classes, provide opportunity for students to work on scientific literacy skills individually as well as in groups.
- Mathematics faculty will provide a formula sheet or formula card in Math 162 classes as this course is very formula heavy.
- Mathematics faculty will work with faculty in chemistry and physics to identify areas of mathematical weakness evidenced in chemistry and physics and will supplement instruction to support those areas.