**Scientific Reasoning Rubric**

Community College of Philadelphia defines scientific reasoning as the interpretation of measurable and/or observable information through inference and analogy to develop hypotheses and draw conclusions.

| **Skills** | **Beginning** | **Developing** | **Competent** | **Accomplished** |
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| **Student can describe methods of scientific inquiry and apply them to investigating, questioningand solving problems** | The student cannot:Identify a scientific problemRecognize that problems have solutionsRecognize the definition of an hypothesis | The student can:Identify and clearly state a scientific problemSelect one possible solution to the problemSelect a hypothesis appropriate to the problem | The student can:Restate the scientific problem in a question formatPredict one or more possible solutions to the problemGenerate a testable hypothesis appropriate to the problem | The student can:Develop a proper research questionEvaluate alternate solutions to the problemPropose how to evaluate a hypothesis appropriate to the problem |
| **Student can describe and carry out experimental procedures.** | The student**cannot:**Recognize the purpose/ bjective of an experimentDetermine the materials needed to complete the experimental procedureRecognize experimental variables | The student can:State the purpose/ objective of the experiment in their own wordsDetermine the materials needed to complete the procedureDifferentiate between independent and dependent variables | The student can:State the purpose/ objective of the experiment in their own wordsDetermine the materials needed to complete the procedureDifferentiate between independent, dependent, and confounding variables and controlsDescribe the relationship between the experimental steps | The student can:Explain the purpose/ objective of the experiment in their own wordsDetermine the materials needed to complete the procedureSelect the experimental variables and controlsManipulate the experimental variables and controlsSuggest modifications of the experimental design, as appropriate |
| Student can perform laboratory tasks appropriate to the field. | The student**cannot:**Obey safety rules and handle lab equipment safelyFollow written proceduresIdentify scientific tools appropriate to the taskWork independently | The student can, with frequent reminders:Obey safety rules and handle lab equipment safelyFollow written procedures accuratelyEmploy scientific tools with proper techniqueMeasure and record data | The student can independently:Obey safety rules and carefully handle lab equipmentFollow written procedures accuratelyEmploy scientific tools with proper techniqueMeasure and record data with minimal errors | The student takes initiative to:Obey safety rules and carefully handle lab equipmentFollow written procedures accuratelyEmploy scientific tools with proper techniqueMeasure and record data accurately |
| Student can interpret and communicate scientific information using written, oral and/or graphical means | The student**cannot:**Interpret quantitative information from tables and graphs using basic vocabulary | The student can:Interpret quantitative information from tables and graphs using vocabulary appropriate to the disciplineConstruct data tables and represent information graphically | The student can, with few errors:Interpret quantitative information from tables and graphs results using technical vocabularyIndependently construct data tables and represent information graphically.Communicate experimental or investigative results | The student can, with few to no errors:Accurately interpret quantitative information using highly technical vocabulary and make appropriate inferencesIndependently construct data tables and represent information graphicallyClearly communicate experimental or investigative resultsDraw logical conclusions from collected data |
| Student can describe and analyze one or more relationships among science, technology and society and demonstrate an understanding of scientific applications in everyday life | The student**cannot:**Identify a technological breakthrough and its connection to science | The student can:Identify a technological breakthrough and its connection to sciencePlace a technological breakthrough in an historical contextExplain some of its impacts on society | The student can:Identify a technological breakthrough and its connection to sciencePlace a technological breakthrough in an historical contextExplain some of its impacts on societyExplain one or more scientific principles behind a technology | The student can:Identify a technological breakthrough and its connection to sciencePlace a technological breakthrough in an historical contextExplain and analyze some of its impacts on societyExplain one or more scientific principles behind a technologyDescribe examples or possible future developments related to science, technology and society |
| Student can demonstrate logical reasoning in explaining natural phenomena, experimental procedures or outcomes, and/or application of scientific or technological concepts. | The student struggles to:Identify logical explanations for observed phenomena | The student can:Identify logical explanations for observed phenomenaIdentify fallacies or illogical conclusions based on observations | The student can:Identify possible alternative logical explanations for observed phenomenaIdentify fallacies or illogical conclusions based on observations or data | The student can:Develop possible alternative logical explanations for observed phenomenaDescribe fallacies or illogical conclusions based on observations or dataEvaluate claims based on observation, experimentation or data presented |