Knowledge Outcomes Rubric - STEM Disciplines

Introduction

The University of Rhode Island STEM disciplines rubric was developed by faculty volunteers from the Subcommittee on the Assessment of General Education, along with staff from the Instructional Development Program and the Office of Student Learning, Outcomes Assessment and Accreditation.

The rubric articulates fundamental criteria for student proficiency in a knowledge area, with competency levels that illustrate how students may demonstrate progressively more sophisticated levels of attainment. The rubric is intended for institutional-level use in evaluating and discussing student learning, not for grading.

Definition

STEM - Science, Technology, Engineering and Math - courses are intended to advance competency in the use of scientific and mathematical thinking to understand the world and solve problems.

Framing Language

Student Learning Outcome:

Understand and apply theories and methods of the ***science, technology, engineering, and mathematical (STEM) disciplines***.

Students will:

- Recall and critically apply the methods of science.
- Recall and apply both theoretical and practical aspects of the STEM disciplines, including the design process.
- Make inferences from data to determine whether conclusions or solutions are reasonable.
- Recognize the role of STEM disciplines in solving addressing contemporary problems such as sustainability, the digital divide, management of data, poverty and hunger.

The STEM disciplines cover many fields and the rubric is intended to be general enough to apply to a range of approaches and assignments. While factual knowledge is recognized as important, the rubric concentrates on higher order tasks, such as information collection and analytical skills. In addition, the recognition of concepts relevant to a question is emphasized. The analysis sections of the rubric are designed to evaluate the student's ability to apply learned concepts, to deconstruct (analyze) a problem and synthesize solutions, and to critically evaluate claims and justify conclusions.

This rubric is recommended for use in evaluating either a collection of unique student work over the course term, or a series of exercises and assignments as part of a longer or more complex project which together fully addresses the STEM Student Learning Outcome. A collection of work could contain a wide variety of different types of work and might include: research papers, article summaries, lab reports, or exams.

URI Knowledge Outcomes Rubric – STEM Disciplines Full Coverage: Courses must address any 5 Elements. Partial Coverage: address any 3 of the Elements.			
Elements	**Competent**	**Approaches Competency**	**Beginning Competency**
Identifies facts, vocabulary, definitions, terms, concepts, people	Correctly identifies or recalls most or all (e.g. 80% or more) of the requested factual information	Correctly identifies or recalls much (e.g. 70%) of the requested factual information	Correctly identifies or recalls some (e.g. 69% or less) of the requested factual information
Recognizes concepts or tools relevant for application to a task	Selects most or all (e.g. 80% or more) relevant concepts for solving a problem; shows thorough awareness of what principles, methods, and concepts are relevant to a problem situation	Selects many (e.g. 70%) relevant concepts for solving a problem; grasps the main points for making the connections to the problem, but misses some	Selects few (e.g. 69% or less) of the relevant concepts for solving a problem; misses a number of useful connections of concepts and/or misses the main "key" that could unlock the problem
Asks questions or frame hypotheses relevant to the task	Poses a question (or questions) that can be addressed within the discipline; does this with a high degree of efficiency, accuracy, and thoroughness	Poses a question (or questions) that can be addressed within the discipline; does this with mixed or moderate degrees of efficiency, accuracy, and thoroughness	Misses the major discipline-linked question(s); focuses on irrelevant aspects; misses major aspects of the problem; and/or poses the wrong question
Collects information relevant to address the task – e.g. data; literature sources	Uses appropriate sources (literature or sample); cites/describes sources correctly; is careful, thorough, specific, accurate, and precise in recording and presenting information	Uses some appropriate sources; cites sources; is careful enough in recording and presenting information to have a reasonably accurate overall perspective on the problem	Misses the most important sources; uses inappropriate sources; does not cite, or incorrectly cites sources; is sloppy, imprecise, or incomplete in ways that may lead to a significantly distorted perspective on the problem
Analyzes: Applies concepts to address the task	Applies relevant concepts thoroughly and correctly to solve a problem	Applies some but not all of the relevant concepts to solve a problem; achieves only part of the correct answer after applying the concepts	Concepts are misapplied; incorrect use of concepts leads to incorrect answer
Analyzes: Deconstructs an argument by indicating claims and/or evidence and contextualizes evidence within theoretical framework	Correctly describes the logic and/or evidence used to convey an argument; distinguishes between facts and inferences; accurately compares and contrasts positions; effectively builds a cogent synthesis	Generally follows the reasoning of the argument but misses some elements of the argument; correctly describes some important aspects of the evidence and logic but not all; builds a reasonable synthesis but misses important points	Argument is misunderstood; synthesis is ill-conceived or not present
Analyzes: Evaluates support for claims and justifies conclusions	Critically evaluates and justifies conclusions by examining strengths and weaknesses of an argument	Demonstrates some ability to critically evaluate and justify conclusions by examining strengths and weaknesses of an argument; misses some important strengths or weaknesses	Does not take an evaluative position or takes a position on weak evidence; does not defend position when called for or conclusions are not supported by evidence

Innovates: Demonstrates innovative and creative thinking with regard to an idea, claim, question, form or performance	Creates a novel or unique idea, claim, question, form or performance using or recognizing creative risk-taking	Experiments with creating a novel or unique idea, claim, question, form or performance	Reformulates a collection of available ideas