

TWU Core Objectives Empirical/Quantitative Skills Rubric

Objective (Primary)	Objective (Secondary)	Criteria	3	2	1
Working with Data & Visualizations					
The following criteria apply to exercises or challenges in which students must interpret, transform, represent, or calculate based on qualitative or quantitative material.					
Empirical/ Quantitative	Critical Thinking	Calculation	Calculations attempted are successful and sufficiently comprehensive to solve the problem or test scientific hypotheses.	Calculations attempted are either unsuccessful or represent only a portion of the calculations required to comprehensively solve the problem or test hypotheses.	Does not meet level 2. For example: Calculations are attempted but are neither successful nor comprehensive.
Critical Thinking	Empirical/ Quantitative	Evidence Analysis <i>This criterion applies to analysis of any kind of evidence, including qualitative.</i>	Effectively organizes evidence to reveal important patterns, differences, or similarities related to focus.	Organizes evidence, but the presentation is not effective in revealing important patterns, differences, or similarities.	Does not meet level 2. For example: Evidence is listed, but is not organized and/or is unrelated to focus.
Empirical/ Quantitative	Communication	Interpretation <i>Ability to explain information presented in mathematical or empirical forms (e.g., results of scientific studies, empirical reports, equations, graphs, diagrams, tables, words)</i>	Provides accurate explanations of information presented in empirical or mathematical formats. Makes reasonable inferences based on that information. For example, accurately explains trends in data, has a reasonable understanding of relationships among variables, and makes reasonable predictions regarding what the data suggest about future events.	Provides accurate explanations of information presented in empirical or mathematical formats. For instance, accurately explains trend data shown in a graph or accurately explains the outcomes of a study.	Does not meet level 2. For example: Attempts to explain the information presented in empirical or mathematical formats, but draws incorrect conclusions about what the information means. <i>For example, misinterprets outcomes, trends, and relationships.</i>
Empirical/ Quantitative	Critical Thinking	Representation <i>Ability to convert relevant information into various mathematical forms (e.g., equations, graphs)</i>	Skillfully converts relevant information into an insightful mathematical portrayal in a way that contributes to a further or deeper understanding.	Converts relevant information into a mathematical portrayal that is appropriate or accurate.	Does not meet level 2. For example: Resulting mathematical portrayal may be inappropriate or inaccurate, or may focus on information irrelevant to the problem.
Critical Thinking	Empirical/ Quantitative	Textual Analysis <i>Interacting with texts in parts and as wholes (the term text refers here to any communicative artifact the student might analyze, including film, symbols, or speech)</i>	Identifies relations among ideas, text structure, or other textual features, to evaluate how they support an advanced understanding of the text as a whole.	Recognizes relations among parts or aspects of a text, such as effective or ineffective arguments or literary features, in considering how these contribute to a basic understanding of the text as a whole.	Does not meet level 2. For example: Identifies aspects of a text (e.g., content, structure, or relations among ideas) but does not effectively synthesize textual evidence in support of an understanding of the text as a whole.

Problem-Solving Activities

The following criteria apply to activities in which students identify problems affecting the world or a community and attempt to solve those problems, or in which they attempt to come up with hypotheses to explain phenomena or trends.

(The term *problem* here doesn't refer to math problems.)

Critical Thinking	Empirical/ Quantitative	Define Problem <i>Does the student adequately explain what the problem is and factors might be contributing to it?</i>	Demonstrates the ability to construct a clear, adequately detailed problem statement with evidence of most relevant contextual factors. Statement may be insightful.	Develops a clear problem statement with evidence of some relevant contextual factors, but statement needs more revision or refinement. Example: Statement may be overlooking an important factor.	Does not meet level 2. For example: Problem statement is unclear about the problem or struggles to identify contextual factors.
Critical Thinking	Empirical/ Quantitative	Evaluate Outcomes <i>If the student has attempted a solution to the problem, how well does the student evaluate the results? (Note: Only choose this criterion if students were expected to attempt a solution and evaluate it.)</i>	Reviews results of an attempted solution according to criteria appropriate to the solution's goals, and identifies specific areas where further work is needed.	Reviews results of an attempted solution according to criteria appropriate to the solution's goals, though some of those criteria may be unconvincingly addressed. Considers the need for further work.	Does not meet level 2. For example: Reviews results of an attempted solution superficially. May not consider need for further work, or else may not have appropriate criteria for evaluating the outcomes.
Critical Thinking	Empirical/ Quantitative	Evaluate Potential Solutions <i>How effectively does the student evaluate previous attempts to solve the problem?</i>	Evaluation of solutions effectively and insightfully covers history of problem, logic/reasoning, feasibility of solution, and impacts of solutions.	Evaluation of solutions at least briefly addresses the following: history of problem, logic/reasoning, feasibility of solution, and impacts of solution.	Does not meet level 2. For example: Evaluation of solutions is superficial and may neglect one or more of the following: history of problem, logic/reasoning, feasibility of solution, or impacts of solution.
Critical Thinking	Empirical/ Quantitative	Propose Solutions/Hypotheses <i>How effectively does the student create and frame proposed hypotheses or solutions to the problem?</i>	Proposes one or more solutions/ hypotheses that indicate comprehension of the problem. Solutions/ hypotheses are sensitive to contextual factors, including ethical, logical, or cultural dimensions.	Proposes one solution/hypothesis that is "off the shelf" rather than individually designed to address the specific contextual factors of the problem.	Does not meet level 2. For example: Proposes a solution/ hypothesis that is difficult to evaluate because it is vague or only indirectly addresses the problem statement.

Empirical or Quantitative Research Projects

The following criteria apply to projects involving research design, the designating of assumptions, and conclusions that apply findings.

Empirical/ Quantitative	Critical Thinking	Application / Analysis <i>Ability to make judgments and draw appropriate conclusions based on the results of scientific studies or the quantitative analysis of data, while recognizing the limits of this analysis and inference</i>	Uses empirical results or quantitative analysis of data as the basis for competent, thoughtful judgments, drawing appropriately qualified, insightful, and reasonable conclusions from this work.	Uses empirical results or quantitative analysis of data as the basis for limited (without inspiration or nuance, ordinary) judgments, drawing plausible conclusions from this work.	Does not meet level 2. For example: Uses empirical results or quantitative analysis of data as the basis for conclusions, but conclusions are not plausible.
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Empirical/ Quantitative	Critical Thinking	Assumptions <i>Ability to make and evaluate important assumptions in estimation, theorizing, modeling, and generalizing results</i>	Explicitly describes assumptions and provides compelling rationale for why each assumption is appropriate. Shows awareness that confidence in final conclusions is limited by the accuracy of the assumptions.	Explicitly describes assumptions and provides compelling rationale for why assumptions are appropriate.	Does not meet level 2. For example: Explicitly describes assumptions but rationale for them is not compelling.
Personal Responsibility	Empirical/ Quantitative	Research Design	All elements of the methodology or theoretical framework are skillfully developed. Appropriate methodology or theoretical frameworks may be synthesized from across disciplines or from relevant sub-disciplines.	Critical elements of the methodology or theoretical framework are appropriately developed. However, more subtle elements are ignored or unaccounted for.	Does not meet level 2. For example: One or two critical elements of the methodology or theoretical framework are missing, incorrectly developed, or unfocused.