INSIGHT ASSESSMENT

Advancing THINKING Worldwide

Seeing the Critical Thinking in a Scientific Investigation

Studying problems of great significance always requires critical thinking.

When preparing and carrying out a scientific investigation it is vital to focus the reasoning behind the design of the project and maintain a critical thinking perspective every step along the way. This is how we develop confidence in the findings of the project.

	The Language of Critical Thinking	The Language of Scientific Investigation
Define the problem.	**Analyze the problem systematically explain** why this problem is important and must be studied,. **Fair-mindedly analyze** the problem. **Infer** what will potentially be gained/lost if the problem persists.	Describe the phenomenon and provide the rationale for why it must be studied, Justify the need for a scientific investigation about this important problem. Science costs money, and scientists must share available resources.
	Comprehensively analyze and interpret what we already know about the problem. **Fairmindedly evaluate** the scientific merit of each study and **explain** why we can be confident about this current knowledge or why more inquiry is needed.	Review the research to date that is relevant to this problem and summarize its significance and importance. Provide a comprehensive summary of how this information relates to the problem.
	Either declare that the problem requires further **analysis** and **explain** why the knowledge gap is a threat, *or* declare that the problem is **well analyzed and well explained** and that **a possible solution has emerged from the analysis.**	*Either* declare that the proposed study will fill significant gaps in current knowledge *or* declare that the problem is well-understood, and based on what has been learned the investigator believes that it is now time to scientifically test a possible solution.
Design the study.	Describe what will be tested in the study. **Analyze available options** for testing **inferences** about **probable or possible solutions. Make an argument** for why one possible solution will be tested and how we will **deductively** know that the solution we tested did or did not resolve the problem.	Describe what will be tested in the study. Frame the hypotheses in a way that they can be tested with clear evidence (measurable, qualifiable, etc.). As is possible, frame these hypotheses using the 'null hypothesis' format so that study results can be reported in the clearest and most certain terms.
	Explain the steps of the investigation (what exactly will be done). Explain what will be measured, how it will be measured, and why these factors are logically relevant. **Explain** how **uncertainties** have been analyzed and **inferences** about potential risks to the study's validity and reliability of design have been anticipated and controlled. This includes an analysis of the score of the study (number of participants, protection of human subjects, study duration, etc.	Explain the study procedures in detail, and how each step of the process will be accomplished. Design a procedure to ensure that the data gathered will reveal the full range of possible observations. Construct and test any needed measuring devices. Explain how the study will deal with unexpected events that could threaten the planned procedures of the study or threaten the validity and reliability of the data collected. This includes establishing that basic design criteria are met (sample size, protection of human subjects, study duration, etc.).
	Make **logically grounded inferences** about the **likely consequences** of conducting the study. **Explain the basis for this prediction.**	Demonstrate how the study hypotheses are well framed, testable, and will provide needed new knowledge.

Conduct, evaluate and report the results of the study.	Conducting the study/experiment. Gather data as planned. **Evaluate** the process: **Interpret** what is occurring and **analyze** whether there are any unexpected events occurring that will **weaken the value of the logical relationships being tested**. Be **truth-seeking and systematic** in this evaluation. If there is an unexpected anomaly that threatens the study's strength of design (**logical integrity**), **re-analyze** procedures in relationship to the intended outcomes. **Evaluate** the available options to determine if there are any changes that should be made to retain the integrity of the study design. **Analyze and evaluate** these potential changes for **any threat of the introduction of bias.** If there is no threat to the validity and reliability of the study's results, adjust the study procedures to maintain the research plan. Remain **foresightful** as to possible procedural issues, **and guard against bias** until the data collection period is completed.	Conduct the study / experiment. Gather the data as planned. Monitor and evaluate the data collection process, analyzing whether there are any unexpected events occurring that will weaken the value of the logical relationships being tested. If there are unexpected events during the data collection period that threaten the study's strength of design, re-analyze procedures in relationship to the intended outcomes. Evaluate the available options to determine if there are any changes that should be made to retain the integrity of the study design. Analyze and evaluate these potential changes for any threat of the introduction of bias. If there is no threat to the validity and reliability of the study's results, adjust the study procedures to maintain the research plan. Remain foresightful as to possible procedural issues, and guard against bias until the data collection period is completed.
	Interpret and analyze the collected data in relationship to the proposed hypotheses. Demonstrate that the experimental conditions were satisfied, that the data were recorded correctly, that the appropriate **analyses** were used.	Interpret and analyze the collected data in relationship to the proposed hypotheses. Demonstrate that the experimental conditions were satisfied, that the data were recorded correctly, that the appropriate analyses were used.
	Infer and explain how the data collected relates to the study hypotheses. **Explain** what the collected information means in the context of the actual study. Demonstrate that the **interpretations** being made are logically sound **and justifiable**, **Fair-mindedly explain** the limitations of the current study, anticipating and attempting to prevent **inductive or deductive reasoning errors** by those who will learn of the study. Explain the **implications of the analyses**, and the applicability of the findings to relevant populations. **Truthfully** report weaknesses that limit the generalization of the study findings. If **logically supported**, make **inferences** as to where the next scientific investigation might further extend what is known or offer additional value for **resolving the problem** being studied.	Report the results of the study to communicate the findings to other investigators. Describe the data as it relates to the study hypotheses. Systematically address each of the research questions and report what the data says as to whether these hypotheses were supported or refuted. Demonstrate that the interpretations being made are logically sound and justifiable, Fair-mindedly explain the limitations of the current study, anticipating and attempting to prevent inductive or deductive reasoning errors by those who will learn of the study. Explain the implications of the analyses, and the applicability of the findings to relevant populations Truthfully report weaknesses that limit the generalization of the study findings. If logically supported, make inferences as to where the next scientific investigation might further extend what is known or offer additional value for resolving the problem being studied.