Guidelines for Hypothesis-Driven Research

Hypotheses play a pivotal role in the scientific thinking process, forming the bedrock of most professional scientific pursuits. Such endeavors are inherently hypothesis-driven, seeking to address specific, measurable, and answerable questions. A well-constructed hypothesis exhibits key attributes, including clarity, testability, and falsifiability, and serves as a cornerstone for designing a precise set of experiments.

When evaluating whether your manuscript contains a coherent and well-formed hypothesis, consider checking if it satisfies the following five criteria:

1. Original

While your hypothesis does not have to be entirely novel within the broader context of your research topic, it should not be obvious based on background information or the experimental setup. The hypothesis and the experimental design to test it must be developed by you. Prescribed or assigned projects, such as those given in an AP biology course, are not acceptable.

2. NOT discovery or descriptive

In descriptive research, data is collected without a specific question in mind, and discovery science, involves analyzing extensive experimental data to identify new patterns or correlations. Newfound observations can subsequently lead to hypothesis formation and other scientific methodologies. Examples of discovery or descriptive research include inventions, explanations of engineered designs like programs or algorithms, exploration of large datasets for potential targets, or the characterization of a new species.

To assess whether your research is hypothesis-driven, consider examining the experimental setup. Identify the independent and dependent variables in the experiment. Do the results of the dependent variable address the scientific question? Additionally, ensure that positive and negative control groups are included.

3. NOT Overly Complex:

Testing hypotheses with words like “and” and “or” can be challenging, as one part may be true while the other may not be. When formulating a hypothesis with multiple components, ensure that your experiments directly test the entire hypothesis. Any further implications that cannot be directly tested should be discussed in the discussion section.

4. NOT Overly General:

A hypothesis serves as a proposed explanation or prediction for a specific phenomenon or relationship between variables. It should be precise and concise, stating the expected outcome of the experiment and the variables involved.

Specificity in the hypothesis is crucial for guiding the research process, ensuring that the study remains focused and capable of yielding valuable insights. If a hypothesis is too general, it becomes vague and ambiguous, leading to difficulties in designing appropriate experiments and obtaining meaningful results.

5. It does NOT Misdirect to the Researcher:

The hypothesis needs to focus on the experimental system rather than the capabilities or intentions of the researcher. The purpose of a hypothesis is to propose a testable explanation for a specific phenomenon or relationship between variables within the scope of the research question.

When a hypothesis misdirects to the researcher, it becomes less objective and scientific. It should not involve the personal opinions, desires, or abilities of the researcher. Instead, it should be based on empirical evidence and measurable factors that can be observed and tested through experiments.