



## Writing Testable Research Hypotheses: A Guided Student Activity

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## Empirical Basis of This Activity

A key component of any undergraduate Psychology program is learning to effectively communicate psychological concepts in writing, as exemplified by Goal 4.1 of the American Psychological Association's (APA's) Guidelines for the Undergraduate Psychology Major, Version 2.0 (2013). Though there are many factors that contribute to effective scientific writing, one specific skill that must be attained is that of writing a testable hypothesis. Not only is this skill necessary for effective communication, but it also contributes to students being able to become successful researchers, as reflected in Goal 2.4 of the Guidelines (APA, 2013). Therefore, this skill is highly necessary for any undergraduate Psychology major to master prior to graduation.

As argued by Ambrose and colleagues (2010), students may tend to overestimate their understanding of foundational ideas if they have any prior understanding of those ideas at all. When applying this idea to writing hypotheses, this may indicate that students are likely to overestimate their ability to write their own hypotheses successfully if they are familiar with reading hypotheses in other work. Because of this, it is of paramount importance that instructors not only give explanations for the concepts that are used within a testable hypothesis, but also offer students the ability to practice applying those concepts for themselves in writing their own hypotheses. Such an approach allows students to understand the strengths and weaknesses of their drafted hypotheses without receiving feedback that is solely related to the context of a single research paper, and therefore unhelpful in learning this skill at large (Willingham, 1990). Further, the feedback instructors provide to students in response to these practiced hypotheses ensures that students will have an appropriate level of prior knowledge about how to appropriately write testable hypotheses *before* attempting to do so in a research paper. The scaffolded nature of this approach is likely to help with students' long-term retention of this ability, given that it has been shown to aid in retention of other skills pertaining to scientific, APA-style writing (Jorgensen & Marek, 2013).



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Though there are many general resources about scientific writing available, few activities have been published to teach undergraduate students how to write testable hypotheses, specifically. The published activity with the most similar aim to that of the present activity had a two-fold purpose of improving students' abilities to write both research questions and hypotheses, but only showed direct improvement in improving the quality of the research questions (Strangman & Knowles, 2012). Therefore, the present activity seeks to fill the gap in available exercises to explicitly teach this valuable skill. It engages students in active learning of these concepts, which has been found to be a more effective approach to teaching research-related competencies than passive instruction on this topic (LaCosse et al., 2017). Further, it provides students with a low-stakes opportunity to learn this foundational skill before needing to apply it to the research process in a high-stakes format such as a research paper. Finally, it provides the instructor with an additional assessment technique to determine the level of comprehension students have regarding both testable hypotheses and the concepts that must be applied to write them successfully.



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## Assignment Purpose and Overview

The purpose of this assignment is to give students both a clear explanation of what comprises a testable research hypothesis, as well as a structure and process they may use for writing their own hypotheses. Please note that while this activity does detail each individual component of research hypotheses, it does *not* address writing null and/or alternative hypotheses. (This will be an important distinction for students to understand, as well.)

This assignment was developed over multiple semesters of teaching an initial course for Psychology majors on research methods and scientific writing. In this course, the need for clarification on the actual process of writing testable research hypotheses was quickly apparent in students' initial drafts of the Introduction sections of their research papers. Though this course has always explained the concepts that must be reflected in a testable research hypothesis, which students were generally able to understand well, it was clear that students were nonetheless struggling to successfully apply those concepts in writing their own research hypotheses. Upon developing, implementing, and refining this assignment over approximately three years, I can anecdotally report a substantial improvement in students' initial attempts at their own research hypotheses once they have successfully completed this assignment. Even those who do still need further assistance in forming their own hypotheses after having completed this assignment are typically able to understand their mistakes much quicker when discussed in light of the structure given here, making this part of the writing process more efficient for both students and instructors.

The first portion of this activity consists of the instructor walking students through an example of how one could use this structure to write both an experimental and correlational research hypothesis. Afterward, students are then asked to practice this same structure using new variables that they may select from a list of options. (More detail about this process is given in the remainder of this activity guide.)

### Learning Objectives

1. Understand the structure of writing a testable hypothesis.
2. Practice writing operational definitions for variables within the context of both experimental and correlational hypotheses.
3. Practice writing levels of independent variables in the context of experimental hypotheses.
4. Apply both directional and non-directional approaches to testable hypotheses.

### Instructions for Administering the Assignment

Students will first listen to the instructor's explanation of how to write a testable hypothesis, which will walk through an example of this process with two hypothetical variables. (See the supplemental slideshow included for this activity.) During this overview, the instructor will show how these variables can be used to construct both an experimental and a correlational hypothesis so that students will understand the necessary differences in approach based on varying one's study design. To help students follow along, the instructor will ask the students to complete the corresponding sections on the Pair #1 page of their handout. (Like the slideshow, the handout is also provided in the supplemental materials for this activity.) Finally, the presentation will conclude with some general tips about writing each type of hypothesis to help students ensure that their resulting predictions are truly testable.



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Following the instructor's presentation, students will then be asked to walk through this process on their own (or in small groups) for Pairs #2-4 on their handout, using the now-completed example on their Pair #1 page as a guide. (Please note that the variables included on the instructional slides are intentionally left out of the list of variable choices on the student handout so as to encourage students to write their own operational definitions and levels.) The instructor should remind students that each new variable selected should be one that was not already used as part of a previous pair, and that they should intentionally vary the directionality of the remaining hypotheses to practice both directional and non-directional approaches. As they work, the instructor(s) for the class should be available to answer questions that arise. After completing the assignment, students should submit their work to the instructor(s) and receive feedback on that work prior to writing their own hypothesis in a more formal assignment (such as a research paper).



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## Information for Instructors

This assignment is intended for undergraduate students who are beginning to learn (or are refreshing their memory on) the process of scientific writing. Therefore, this assignment may potentially be used at a variety of levels within undergraduate social sciences curriculum. For instance, this may be a tool for students in an introductory-level class to better understand some of the components of appropriate research hypotheses, or perhaps in a course that emphasizes scientific writing and/or research methods for those who are beginning their own engagement with research. For more senior students, this assignment may act as a refresher of a previously learned skillset prior to writing their capstone or research papers.

### Time Commitment

This activity (including its explanation) generally fits into a single 50-minute class period, though a few students may need extra time to finish the assignment at home. Once they have completed the Pair #1 and Pair #2 pages in the student handout, however, students are typically able to complete the final two pages without needing additional help. As described in the Instructions for Administering the Assignment section on the previous page, Pair #1 should be completed by the students as they follow along with your explanation of the instructional slides. Pairs #2-4 are therefore pages that they will complete on their own.

### Pre-requisite Knowledge Requirements

Students will need to understand each of the following before attempting the current activity for the present learning outcomes to be met successfully:

- The general purpose of hypotheses in research papers
- The difference between experimental and correlational studies (including the nature of the variables in each approach and the types of claims each intends to make)
- Operational definitions (what they are and how to write their own)
- Directionality of a prediction (what this means and how it differs between experiments and hypotheses)

### Importance of Explanation and Feedback

The instructor's role in both introducing the nature of the activity and providing feedback on students' resulting hypotheses will be pivotal to the usefulness of this assignment. Instructor slides are included for explaining the activity in the student handout, its components, and how to assemble these components into testable hypotheses. Without this explanation, it is likely that students will have too little guidance to base their work on and may fail to understand the connections between various elements of the hypotheses they are writing.

When assessing student work, one option is for the instructor(s) to provide feedback on all three pages that the students completed on their own (Pairs #2-4). If time permits, however, it may be advantageous for the instructor to instead correct one of these pairs, and then have the students work in small groups again to determine what corrections need to be made to the remaining pairs that were left ungraded. If this second option is chosen, it will be critical to have students submit their assignments once more to ensure that their own corrections were indeed both accurate and sufficient.



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## Overview of Supplemental Instructional Materials

Included in this activity are both the student handout and the instructor's slideshow. A pdf of each resource is provided, as well as a Microsoft Word version of the handout and a Microsoft PowerPoint version of the slideshow.





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