Understanding and Developing a Rationale and Hypotheses for an Experiment

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Overview

This proposal describes a teaching resource that is used to help students understand and apply the importance of having a rationale when writing up a research proposal in Research Methods course. This exercise was designed with threshold concepts in mind, and was set up to change the students thinking and approach to writing the introduction of their proposal to include a strong rationale. This exercise is designed to be flexible, and can be done with discussion in under 30 minutes (15-20 min is ideal), and could be modified to be done in a lab setting or during lecture. There is evidence from my courses that this is an effective exercise in increasing student understanding and application in their proposals.

Alignment with APA's Guidelines for the Undergraduate Psychology Major: Version

Goal 2: Scientific Inquiry and Critical Thinking

Outcomes

2.1 Use scientific reasoning to interpret psychological phenomena
2.3 Engage in innovative and integrative thinking and problem solving
2.4 Interpret, design, and conduct basic psychological research

Indicators

2.1A Describe the value and limitation of using theories to explain behavioral phenomena

2.1B Develop plausible behavioral explanations that rely on scientific reasoning and evidence rather than anecdotes or pseudoscience

2.3A Describe problems operationally to study them empirically

2.4C Accurately identify key research concepts in existing and proposed research projects

2.4D Design and conduct complex studies to confirm a hypothesis based on operational definitions

Status

This is an evidence-based practice

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Topic
Research Methods Writing a Research Proposal

Assignment type
Guided worksheet assignment with discussion

Assessment dimensions
The assessment was to use the parts of the rubric for grading the research proposals that assessed rationale and use of theory. Note this is a post assessment that is done well after the assignment is done in class or in section (generally this assignment is done in week 3 or 4 of 10 week quarter, and the assessment (paper grading rubric) is during finals week after the class has ended).

Instructions

1) Split the students into pairs (can be done in lab/section or in class).
2) Get the attention of everyone in the class as steps 2-5 are meant to be done as a whole group discussion led by the instructor. Introduce the 2x2 experiment described in the table below (2 Authority x 2 Type of Feedback on self-esteem) to the class by writing it on the board or presenting it in PowerPoint.
3) Solicit the class for suggestions on the hypothesis for the main effect of Authority on Self Esteem. Write the hypotheses on the board or have it show up on the next PowerPoint slide.
    a. Note that it is easier to keep the hypothesized direction of change the same for all of the hypotheses (e.g. if the student predict a reduction in self-esteem make sure all the hypotheses are phrased in the correct order where they predict reductions in self-esteem.)
4) Solicit the class for suggestions on the hypothesis of the main effect of Feedback on Self Esteem. Write the hypothesis on the board or present on PowerPoint.
5) Solicit suggestions for a meaningful interaction hypothesis—noting there is more than one way to express these. Write the interaction hypothesis on the board or present on PowerPoint.
6) Spend 2 minutes reminding the students what a rationale is (as you have covered it before in lecture). Next instruct them to discuss in pairs the answer to the question 4 and to write down their answers on the worksheet. Make sure you point out the example answer provided to them on the worksheet, and then ask the students to come up with 2 or 3 more examples of previous research to look for given the design of the study.
7) Bring the whole class back after about 5 min of discussion and ask for suggestions from the students to share with the whole class.
8) Next talk for 2 min about the importance of linking your rationale to the hypotheses (make sure the hypotheses are still on the board or are listed on the PowerPoint for the students' visual reference). Go over the example listed on the worksheet so they have a model for what you are asking them to do. Ask them to discuss what links they would make in pairs for 5-7 minutes and to write their answers on the worksheets.
9) Bring the whole class back and ask for suggestions to share. Check for questions here as well.

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a. Notes: I have noticed that at this point the students have more complex questions about the hypotheses and rationale that can be answered for the whole class during the discussion at the end. I have also found it useful to read over the worksheets after the class. When you read the worksheets consider and assess the students' level of complex thought and ability to make links between theory, research, and hypotheses. Makes sure you share your observations (leading with the positive) with the whole class the next time you see the students.

Scoring Rubric

Criteria	Points	
• Reviews literature on topic ○ Presents other research findings briefly (i.e. what did they do, what did they find & why was it important). Does not present specific statistics • Rationale—Use previous research and theory to make an argument for your hypothesis (not just a series of summaries) Presents research from minimum of 4 other citations	10	9-10 points Meets all criteria in an exemplary way, including having a strong clear rationale 7-8 points Meets all criteria in a strong way Rationale is good, but may be missing some connections or rely on summaries rather than using research findings as arguments 5-6 points Does not meet all criteria in a way that is clear and concise (e.g. lit review is not complete) and/or rationale is weak 3-4 points Does not meet criteria and is very weak or has major issues with both the literature review or rationale 1-2 points Does not meet criteria and is missing a rationale or literature review

• Describes theoretical focus in the paper
  ○ Explicitly explains current ideas about possible reasons/mechanisms for behavior
  ○ Connect to other research and to current study hypotheses (Rationale)
Uses at least 2 citations for theory
	10	9-10 points
		Meets all criteria in an exemplary way, including having a strong theoretical basis and clear connections being made between concepts to link the rationale to hypotheses
		7-8 points
		Meets all criteria in a strong way
		Theory is missing some connections or connections are weak or don't lead to hypotheses clearly
		5-6 points
		Does not meet all criteria in a way that is clear and concise (e.g. incomplete

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		theoretical background) and/or links and rationale/hypotheses are weak or incorrect 3-4 points Does not meet criteria and is very weak or has major issues with both theory or rationale and hypotheses 1-2 points Does not meet criteria and is missing a theory or rationale leading to hypotheses

References

Meyer, J., & Land, R. (2006). *Overcoming barriers to student understanding: Threshold concepts and troublesome knowledge*. Routledge.

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In Class Worksheet

Rationale and Hypothesis Exercise

USE THIS EXAMPLE FOR THIS EXERCISE

IV 1 =Type of Feedback	Positive Feedback	Negative Feedback
IV 2= Authority	Professor/High Authority	Student/Low Authority
DV1 =State Self Esteem		

1) What is the hypothesis for the main effect of Authority on State Self Esteem?

2) What is the hypothesis for the main effect of Type of Feedback on State Self Esteem?

3) What is the hypothesis for the interaction between Authority and Type of Feedback on Self Esteem?

Rationale
4) If you were to write up this experiment given your hypotheses, what would be some previous research you would look for?
Example: Research that shows that students are sensitive to feedback from a professor more than from a peer.

Link Rationale & Hypotheses

Make some specific links between:

1. Previous research and theory
   Example: Previous research shows that students are more sensitive to feedback given by a professor compared to peer feedback so in this experiment we expect the feedback given by the professor to have a greater impact on the students' self-esteem compared to feedback that is given by a peer.

2. Theory and hypotheses

3. Previous research and hypotheses

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