The Replication Crisis in Psychology

Instructor Manual

Editors: Dr. Regan A. R. Gurung and Dr. Aaron Richmond
Contributing Authors: Dawn Albertson, Bethany Fleck, Travis Heath, Phil Kreniske, Linda Lockwood, Kristy Lyons, Aliza Panjwani, Janet Peters, Kasey Powers, Amanda Richmond, Anna Ropp, Jeremy Sawyer, Raechel Soicher, Sunda Friedman TeBockhorst, Courtney Rocheleau

The purpose of this instructor resource module is to provide a guide on how to teach a lesson on the replication crisis in psychology. Specifically, I have designed an inquiry-based lesson that starts with some direct instruction then transitions into an inquiry-based activity to get students to research this new and exciting topic in psychology. Throughout this module, you will find a list of learning objectives, class design recommendations, identified difficult terms, a detailed description (e.g., step-by-step) of how to conduct the lesson, activities and demonstrations along with several other supporting materials. I hope that the information provided and the lesson constructed will assist you in teaching an engaging, enjoyable, and effective lesson.

Learning Objectives

Content Specific Learning Objectives:

- Define “replication”
- Explain the difference between exact and conceptual replication
- List 4 explanations for non-replication
- Name 3 potential solutions to the replication crisis

Relevant APA Learning Objectives (Version 2.0)

- Describe key concepts, principles and overarching themes in psychology (1.1)

- Describe applications of psychology (1.3)
- Interact effectively with others (4.3)

Abstract

In science, replication is the process of repeating research to determine the extent to which findings generalize across time and across situations. Recently, the science of psychology has come under criticism because a number of research findings do not replicate. In this module we discuss reasons for non-replication, the impact this phenomenon has on the field, and suggest solutions to the problem.

Class Design Recommendations

This instructor's manual module can be presented in one 75-minute class. However, as this topic is new and ever-expanding, it may be possible that the lesson could be increased into two separate class sessions if necessary depending on how in-depth you make the content and activities. Please also refer to the Noba PowerPoint slides that accompany this outline for the lesson materials.

Topic Outline

- The Disturbing Problem
- What is Replication?
    - Exact Replication
    - Conceptual Replication
- Enormity of the Current Crisis
- Examples of Non-Replications in Psychology
- Reasons for Non-Replication
    - Falsified data
    - Sample size

    - Cultural and generational effects
    - Poor replications
- In Defense of Replication Attempts
- Solutions to the Problem
    - Dissemination of Replication Attempts
    - More Systematic Programs of Scientific Research
    - Textbooks and Journals

Module Outline

- **The Disturbing Problem:**The field of psychology is facing a crisis that potentially threatens the credibility of our field. That is, the replication crisis. Specifically, the problem is that ¼ to ¾ (this number is debated) of psychology studies are difficult, if not impossible, to replicate. This leads to distrust of the field, because it causes the view of either sloppy research practices or (the sin of all sins) the perception of falsified data.
- **What is Replication?**Replication is the repetition of findings previously presented or published. Replication is divided into two types. Exact replication, also known as direct replication, is when scientists attempt to replicate the findings of a previous study using the exact same procedures and methods used in the original study. The second type of replication is conceptual replication. This occurs when scientists attempt to replicate the study with the same hypothesis but have different designs, measures, and procedures. Both types of replication are important to conduct because exact replication tells us whether the original study results are true and conceptual replication informs us that the theory behind the original study is either accurate or inaccurate and allows us to generalize the findings.
- **Enormity of the Current Crisis:**There is some debate as to the enormity of the crisis, but as one study reported the percentage of replicated findings range from 23% to 53% with an average of 36%. It may be helpful to discuss the percentages based on exact vs. conceptual replication.
- **Examples of Non-Replications in Psychology:**The purpose of this section is to provide

concrete examples of non-replicated studies. Two main examples are provided of how results from one study have been difficult to replicate. These include a priming study by Dijksterhuis and van Knieppenberg (1998) in which they primed students to be more "intelligent." There have multiple attempts to replicate their findings with no success. Another example is that of spatial distance priming of emotional closeness to their families (Williams & Bargh, 2008). This study was also very difficult to replicate. You may want to research other examples if you feel that they are more interesting/important than these two.

- **Reasons for Non-Replication:**There are a whole host of reasons why findings are not replicated. However, most reasons for non-replication center on falsified data, sample sizes, culturally and generationally specificity of data, and poorly designed replications. There have been a number of cases where psychologist faked or falsified data (e.g., Diederik Stapel, Marc Hauser, Karen Ruggiero) which caused a non-replication effect. This is obviously the most egregious reason for non-replication. Sample size also may cause non-replication. Meaning, many studies have such small sample sizes that they are not very representative of the larger population. Another reason for non-replication is that sometimes specific findings are related to specific culture and generations and thus are difficult to replicate because culture and generations change. The final reason for non-replication actually has to do with the scientists replicating the study, not the actual study itself. In other words, if the replication is poorly done with a small sample size it may not provide evidence of replication or not because of the flaws with the replication study.
- **In Defense of Replication Attempts:**There are several reasons why scientists should replicate findings. First, failure does not have to be a bad thing. Good science is testing a hypothesis. It is one study, one experiment. When those findings don't replicate that is important information to the theory and field of study. It's ok. Relatedly, science is exploratory and risky and good science should encourage these two things. With this in mind, it is logical to observe that some findings just won't be replicated because of the encouraged exploratory and risky nature of science. Invariably, and something all psychologist can likely agree upon, is that replication of findings improve or strengthens the science of psychology. Period.

- **Solutions to the Problem:**There are three predominate solutions to the replication crisis. First, Dissemination of Replication Attempts is paramount and increasing. There are now several outlets for replication studies (e.g., Center for Open Science, Plos One: Public Library of Science, The Replication Index, etc.) Second, there should be more systematic programs of scientific research. In general, the academic cultural system is predominately set up to reward and promote research that is flashy and new. However, to replicate findings, this involves a programmatic and repetitious approach to research, which is less flashy, new

and subsequently rewarded. The final solution is our textbooks and journals. Some journals discourage replication studies and discourage multiple experiments (i.e., replication) within articles. Consequently, these findings are more difficult to replicate because of editorial and journal policies. This effect spills over into textbooks, in that there are many instances of inaccurate findings being reported and taught in textbooks.

Difficult Terms

Conceptual replication
Confederate
Direct replication
Exact replication
Fake data
False positive
Falsified data
Priming
Sample sizes

Lecture Frameworks

Overview: Because this is such a nuanced topic, I think this is a prime example to create an inquiry-based lesson to explore the replication crisis in psychology. As such, this is a short 75-minute lesson that requires students to do some out or in class research (depending on your institution and class location and type). The first part of the lesson (approximately 35-40 minutes) will be the direct instruction of the replication crisis in psychology. The second part of the lesson (35-40 minutes) is an inquiry-based learning that activity that requires students (in groups) to formulate hypothesis, conduct research, make conclusions, present findings, retest conclusions of two separate questions within the replication crisis content.

- **Introduction and warm up activity-What do you see?**: Use this warm up activity to introduce the replication crisis in psychology. The activity is described in the Activities and Demonstrations section.
- **Direct Instruction of the Disturbing Problem**: Present the material and ask students clarifying questions. Refer to PowerPoint slides, IM Module Outline, and the Noba the

Replication Crisis in Psychology Module to provide a clear definition of this content for the students.

- **Direct Instruction of What is Replication:**Present the material and ask students clarifying questions. Refer to PowerPoint slides, IM Module Outline, and the Noba the Replication Crisis in Psychology Module to provide a clear definition of this content for the students.

- **Direct Instruction of Enormity of the Current Crisis:**Present the material and ask students clarifying questions. Refer to PowerPoint slides, IM Module Outline, and the Noba the Replication Crisis in Psychology Module to provide a clear definition of this content for the students.

- **Direct Instruction of Examples of Non-Replications in Psychology:**Present the material and ask students clarifying questions. Refer to PowerPoint slides, IM Module Outline, and the Noba the Replication Crisis in Psychology Module to provide a clear definition of this content for the students.

- **Direct Instruction of Examples of in the Defense of Replication Attempts:**Present the material and ask students clarifying questions. Refer to PowerPoint slides, IM Module Outline, and the Noba the Replication Crisis in Psychology Module to provide a clear definition of this content for the students.

- **Direct Instruction of Solutions to the Problem:**Present the material and ask students clarifying questions. Refer to PowerPoint slides, IM Module Outline, and the Noba the Replication Crisis in Psychology Module to provide a clear definition of this content for the students.

- **Inquiry-Based Learning Activity**: To wrap up this lesson (and to model scientific reasoning skills) students should engage in an inquiry-based activity to investigate various issues within and surrounding the replication crisis in psychology. See Activity and Demonstrations section below for a complete description on how to implement this activity in your classroom.

Activities & Demonstrations

Warm Up Activity-What do you see?: The purpose of this activity is to introduce and demonstrate the replication crisis in psychology.

- Time: 5 minutes
- Materials: PowerPoint slide with activity questions.
- Directions:
    - Tell students that you are driving down a road and they see this alongside…
        - Pirate
        - Couple holding hands
        - Pirate
        - Pirate
        - Man cutting tree
        - Pirate

- Now ask them, based on what you saw in the pictures, what do you think the next person you would see along side the road?
- Then discuss and explain how this is a metaphor for the replication crisis in psychology. Use it to jumpstart your discussion on the topic.

Inquiry-Based Learning Activity: The purpose of this activity is to first conclude the lesson with an active learning technique, and to expand student's knowledge, from a critical thinking perspective, of the replication crisis in psychology. It is based on the work of Richmond and colleagues (2015) and Zachary (1985).

- Time: 30 minutes in and out of class (e.g., computer lab or on their laptops).
- Materials: PowerPoint slide with activity questions.
- Directions:
    - Assign students into groups of 2-3 students.
    - Step 1: Problem Definition. This step requires students to be prompted with a problem or question definition. You can use many different questions or problems that you choose. I have created two that seem to be plausibly researched in a short period of

time. Ask students to select one question/problem to research. See below:

- Do the failures of replication shake your confidence in what you have learned about psychology? Why or why not?
- How much of a replication crisis do think there is?

- Step 2: Hypothesis Formation. Ask students to formulate a hypothesis to the question/problem. Have them brainstorm then come up with two-three hypothesis and select one.
- Step 3: Collect data and evaluate your hypothesis. Turn students loose on collected data to evaluate their hypothesis. They can use their smart phones, go to a computer lab, or what ever means necessary to evaluate their hypothesis.
- Step 4: Draw your conclusion. Have students, in their groups, discuss the data that they collected. Inform them to listen to all sides and group members. Have them formulate 203 conclusions. Then have them select one conclusion, that they all agree upon, that has the most support.
- Step 4.5: Have students present their findings to the class. This could be in many shapes and forms. Just have them restate their hypothesis and what they found.
- Step 5: Test your conclusion against new data. Have students discuss whether there were consistent or inconsistent findings among the group. Have them explain why or why not. Use this discussion as a way to wrap up and reinforce the lesson.

Additional Activities

Thompson, W. B., & Fisher-Thompson, D. (2013). Analyzing data from studies depicted on video an activity for statistics and research courses. *Teaching of Psychology*, *40,* `39-142. doi:10.1177/0098628312475035

- This is an activity that involves watching video and analyzing and interpreting actual data. As this module is likely to be taught in the context of a statistics or research methods course, this activity may be useful to also teach other aspects within the course.

Discussion Points

- Why do scientists see replication by other laboratories as being so crucial to advances in science?
    - Anticipate some confusion about this question. First, they need a foundational knowledge of scientific literacy to answer the question. Second, they may need to understand the nuanced culture of psychology research to fully develop an opinion about how replication may be crucial to the field.
- Do the failures of replication shake your faith in what you have learned about psychology? Why or why not?
    - This is a great question that should be asked towards the end of the lesson because it requires some foundational knowledge to answer. Have students relate the question to what they have learned throughout their education of psychology theory.
- Can you think of any psychological findings that you think might not replicate?
    - This is a great question that can stimulate conversation. Have students research this topic and bring in a specific example. By doing this, you may be able to encourage students to independent investigate this topic.
- What findings are so important that you think they should be replicated?
    - The obvious answer is all findings should be replicated. But encourage students to explain why they think particular findings should be replicated.
- Why do you think quite a few studies do not replicate?
    - There are numerous directions this may go. It is likely having to do with one-time cultural situations. Or with very special populations (e.g., prisoners).
- How frequently do you think faking results occurs? Why? How might we prevent that?
    - This is a great question that you may not get truthful answers to. Try to think of different ways to approach this question to avoid the social desirability effect. You may go so far as to explain this effect and why students should provide forthright answers.

Outside Resources

Article: New Yorker article on the "replication crisis"
http://www.newyorker.com/tech/elements/the-crisis-in-social-psychology-that-isnt

Web: Collaborative Replications and Education Project - This is a replication project where students are encouraged to conduct replications as part of their courses.
https://osf.io/wfc6u/

Web: Commentary on what makes for a convincing replication.
http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2283856

Web: Open Science Framework - The Open Science Framework is an open source software project that facilitates open collaboration in science research.
https://osf.io/

Web: Psych File Drawer - A website created to address "the file drawer problem". PsychFileDrawer.org allows users to upload results of serious replication attempts in all research areas of psychology.
http://psychfiledrawer.org/

Evidence-Based Teaching

Richmond, A. S., Fleck, B., Heath, T., Broussard, J., & Skarda, B. D. (2015). Can inquiry-based instruction promote higher-level learning?. *Scholarship of Teaching and Learning in Psychology, 1,* 208-218. doi:10.1037/stl0000032

- This article describes the benefits of using inquiry-based instruction and how to apply it to your classroom practices. It can be used as a guide for future inquiry-based methods.

Zachry, W. H. (1985). How I kicked the lecture habit: Inquiry teaching in psychology. *Teaching of Psychology, 12,* 129–131. http://dx.doi.org/10.1207/s15328023top1203_3

- This article describes how to switch from pure lecture-based direct instruction to the inquiry method to teaching. Zachary gives several examples on how to incorporate inquiry-based teaching method into various psychology topics.

Links to ToPIX Materials

Can Psychology Reason Its Way Out of a Replication Crisis? By Newsy. This is a 2:30 minute video briefly discussing it.
https://www.youtube.com/watch?v=gDIpHbUaFJM

Errors riddled 2015 study showing replication crisis in psychology research, scientists say by the Washington Post.
https://www.washingtonpost.com/news/speaking-of-science/wp/2016/03/03/errors-riddled--2015-study-showing-replication-crisis-in-psychology-research-scientists-say/

Is Psychology's Replication Crisis Really Overblown? This is an interesting counter argument by the Science of Us group.
http://nymag.com/scienceofus/2016/03/is-psychologys-replication-crisis-really-overblown.html

Psychology's Replication Crisis Can't be Wished Away. This is an interesting article by the Atlantic that discusses the cost of the crisis.
http://www.theatlantic.com/science/archive/2016/03/psychologys-replication-crisis-cant-be--wished-away/472272/

Psychology's Replication Crisis Sparks New Debate. This is another source for the debate between crisis or no crisis.
https://www.sciencenews.org/article/psychologys-replication-crisis-sparks-new-debate

Teaching Topics

Teaching The Most Important Course
https://nobaproject.com/documents/1_Teaching_The_Most_Important_Course.pdf

Content Coverage
https://nobaproject.com/documents/2_Content_Coverage.pdf

Motivating Students
https://nobaproject.com/documents/3_Motivating_Students_Tips.pdf

Engaging Large Classes

https://nobaproject.com/documents/4_Engaging_Large_Classes.pdf

Assessment Learning
https://nobaproject.com/documents/5_Assessment_Learning.pdf

Teaching Biological Psychology
https://nobaproject.com/documents/6_Teaching_Bio_Psych.pdf

PowerPoint Presentation

This module has an associated PowerPoint presentation. Download it at https://nobaproject.com//images/shared/supplement_editions/000/000/227/The%0AReplication%20Crisis%20in%20Psychology.pptx?1475605218.

About Noba

The Diener Education Fund (DEF) is a non-profit organization founded with the mission of re-inventing higher education to serve the changing needs of students and professors. The initial focus of the DEF is on making information, especially of the type found in textbooks, widely available to people of all backgrounds. This mission is embodied in the Noba project.

Noba is an open and free online platform that provides high-quality, flexibly structured textbooks and educational materials. The goals of Noba are three-fold:

- To reduce financial burden on students by providing access to free educational content
- To provide instructors with a platform to customize educational content to better suit their curriculum
- To present material written by a collection of experts and authorities in the field

The Diener Education Fund is co-founded by Drs. Ed and Carol Diener. Ed is the Joseph Smiley Distinguished Professor of Psychology (Emeritus) at the University of Illinois. Carol Diener is the former director of the Mental Health Worker and the Juvenile Justice Programs at the University of Illinois. Both Ed and Carol are award- winning university teachers.

Acknowledgements

The Diener Education Fund would like to acknowledge the following individuals and companies for their contribution to the Noba Project: The staff of Positive Acorn, including Robert Biswas-Diener as managing editor and Peter Lindberg as Project Manager; The Other Firm for user experience design and web development; Sockeye Creative for their work on brand and identity development; Arthur Mount for illustrations; Chad Hurst for photography; EEI Communications for manuscript proofreading; Marissa Diener, Shigehiro Oishi, Daniel Simons, Robert Levine, Lorin Lachs and Thomas Sander for their feedback and suggestions in the early stages of the project.

Copyright

R. Biswas-Diener & E. Diener (Eds), Noba Textbook Series: Psychology. Champaign, IL: DEF Publishers. Retrieved from **http://noba.to/xpmjy8dr**

Contact Information:

Noba Project
www.nobaproject.com
info@nobaproject.com