

KEY STEPS IN THE RESEARCH PROCESS

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There are several important aspects to research methodology. This is a summary of the key concepts in scientific research and an attempt to erase some common misconceptions in science. At last, I conclude and generalize it to the real world.

Formulating a Research Problem

An essential early step in the process of research is to find a research problem. This helps focus the research process so that they can draw conclusions reflecting the real world in the best possible way. The nature of your problem will, in its turn, influence the form of your research.

Hypothesis

In research, a hypothesis is a suggested explanation of a phenomenon. A null hypothesis is a hypothesis which a researcher tries to disprove [1]. Normally, the null hypothesis represents the current view/explanation of an aspect of the world that the researcher wants to challenge.

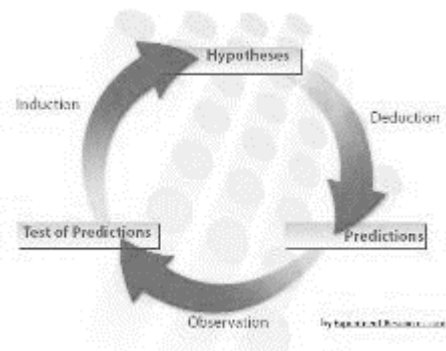
A scientific theory or law represents an hypothesis, or a group of related hypotheses, which has been confirmed through repeated experimental tests.

The word model is reserved for situations when it is known that the hypothesis has at least limited validity.

Variables

A variable is something that changes. It changes according to different factors. Researchers are often seeking to measure variables. An example, temperature is a variable. The temperature varies according to other variable and factors. In research, you typically define variables according to what you're measuring. There are many types of variables, discrete, continues, binary, confounding etc.

For example, Confounding variables obscure the effects of another variable. If one elementary reading teacher used a phonics textbook in her class and another instructor used a whole language textbook in his class, and students in the two classes were given achievement tests to see how well they read, the independent variables (teacher effectiveness and textbooks) would be confounded. There is no way to determine if differences in reading between the two classes were caused by either or both of the independent variable.



Choosing the Research Method

The selection of the research method is crucial for what conclusions you can make about a phenomenon [1]. It affects what you can say about the cause and factors influencing the phenomenon. It is also important to choose a research method which is within the limits of what the researcher can do.

Choosing the Measurement

Choosing scientific measurements are also crucial for getting the correct conclusion. Some measurements might not reflect the real world, because they do not measure the phenomenon as it should.

Results

Significance Test

To test a hypothesis, a quantitative research uses significance tests to determine which hypothesis is true. A significance test can show whether the null hypothesis is more likely to be true than the research hypothesis. The t-test (also called the Student's T-Test) is one of the many statistical significance tests, which compares two supposedly equal sets of data to see if they really are alike or not. The t-test helps the researcher to conclude whether a hypothesis is supported or not.

Drawing Conclusions

Drawing a conclusion is based on several factors of the research process, not just because the researcher got the expected result. It has to be based on the validity and reliability of the measurement; how good the measurement was to reflect the real world and what more could have affected the results.

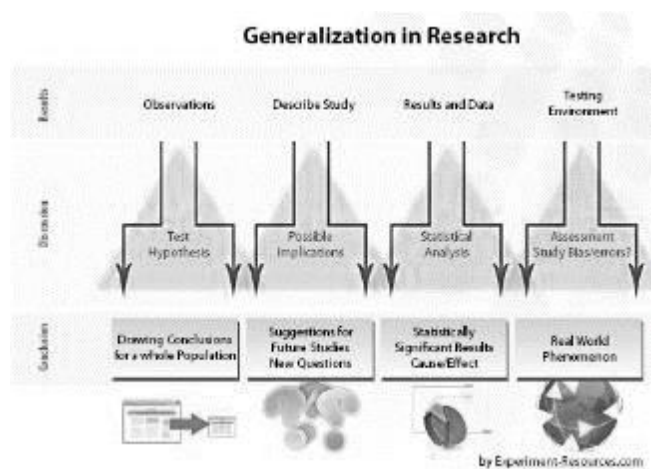
The observations are often referred to as 'empirical evidence' and the logic/thinking leads to the conclusions. Errors of the observations may stem from measurement-problems, misinterpretations, unlikely random events etc.

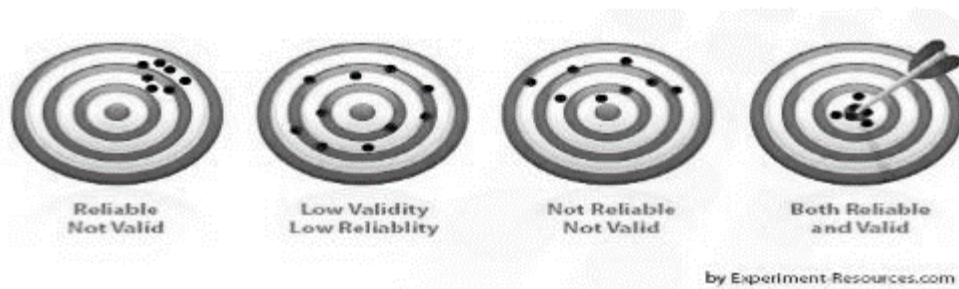
Generalization

Generalization is to which extent the research and the conclusions of the research apply to the real world. It is not always so that good research will reflect the real world, since we can only measure a small portion of the population at a time.

Validity and Reliability

Validity refers to what degree the research reflects the given research problem, while Reliability refers to how consistent a set of measurements are [2].





A definition of reliability may be "Yielding the same or compatible results in different clinical experiments or statistical trials" (the free dictionary). Research methodology lacking reliability cannot be trusted. Replication studies are a way to test reliability. Both validity and reliability are important aspects of the research methodology to get better explanations of the world.

Errors in Research

Logically, there are two types of errors when drawing conclusions in research:

Type 1 error: reject the null hypothesis when it is true

Type 2 error: fail to reject null hypothesis when it is false

References

1. Gall, M. D., Gall, J. P., & Borg, W. R. (2006). Educational research: An introduction (8th ed.). Boston: Allyn & Bacon
2. Golafshani, N., (2003) Understanding Reliability and Validity in Qualitative Research University of Toronto, *The Qualitative Report*, 567-607