Experimental Research Design — 6 mistakes you should never make!

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Since school days' students perform scientific experiments that provide results that define and prove the laws and theorems in science. These experiments are laid on a strong foundation of experimental research designs.

An experimental research design helps researchers execute their research objectives with more clarity and transparency.

In this article, we will not only discuss the key aspects of experimental research designs but also the issues to avoid and problems to resolve while designing your research study.

What Is Experimental Research Design?

Experimental research design is a framework of protocols and procedures created to conduct experimental research with a scientific approach using two sets of variables. Herein, the first set of variables acts as a constant, used to measure the differences of

the second set. The best example of experimental research methods is quantitative research.

Experimental research helps a researcher gather the necessary data for making better research decisions and determining the facts of a research study.

When Can a Researcher Conduct Experimental Research?

A researcher can conduct experimental research in the following situations —

1. When time is an important factor in establishing a relationship between the cause and effect.
2. When there is an invariable or never-changing behavior between the cause and effect.
3. Finally, when the researcher wishes to understand the importance of the cause and effect.

Importance of Experimental Research Design

To publish significant results, choosing a quality research design forms the foundation to build the research study. Moreover, effective research design helps establish quality decision-making procedures, structures the research to lead to easier data analysis, and addresses the main research question. Therefore, it is essential to cater undivided attention and time to create an experimental research design before beginning the practical experiment.

By creating a research design, a researcher is also giving oneself time to organize the research, set up relevant boundaries for the study, and increase the reliability of the results. Through all these efforts, one could also avoid inconclusive results. If any part of the research design is flawed, it will reflect on the quality of the results derived.

Types of Experimental Research Designs

Based on the methods used to collect data in experimental studies, the experimental research designs are of three primary types:

1. Pre-experimental Research Design

A research study could conduct pre-experimental research design when a group or many groups are under observation after implementing factors of cause and effect of the research. The pre-experimental design will help researchers understand whether further investigation is necessary for the groups under observation.

Pre-experimental research is of three types —

1. One-shot Case Study Research Design
2. One-group Pretest-posttest Research Design
3. Static-group Comparison

2. True Experimental Research Design

A true experimental research design relies on statistical analysis to prove or disprove a researcher's hypothesis. It is one of the most accurate forms of research because it provides specific scientific evidence. Furthermore, out of all the types of experimental designs, only a true experimental design can establish a cause-effect relationship within a group. However, in a true experiment, a researcher must satisfy these three factors —

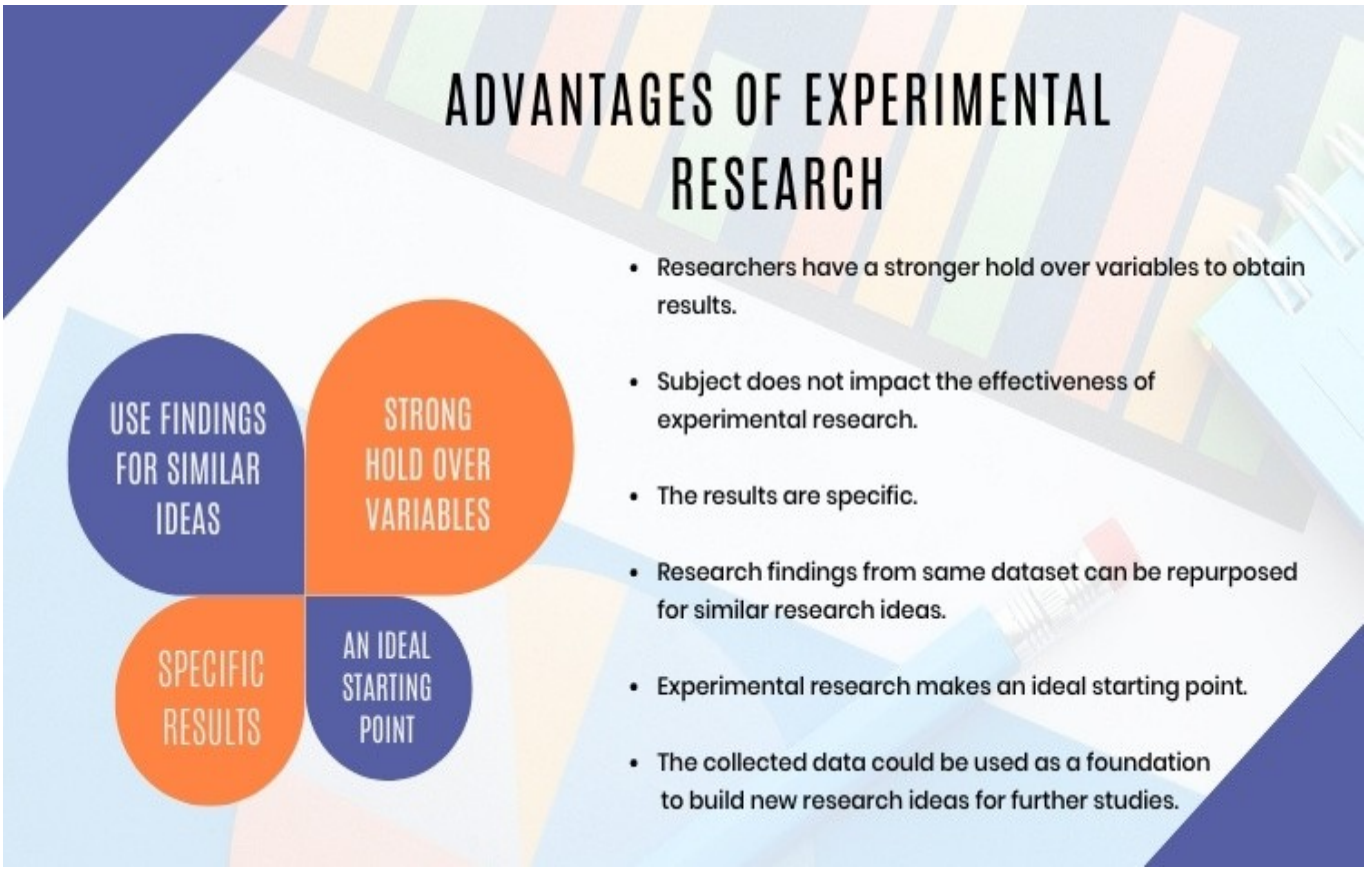
1. There is a control group that is not subjected to changes and an experimental group that will experience the changed variables
2. A variable that can be manipulated by the researcher
3. Random distribution of the variables

This type of experimental research is commonly observed in the physical sciences.

3. Quasi-experimental Research Design

The word "Quasi" means similarity. A quasi-experimental design is similar to a true experimental design. However, the difference between the two is the assignment of the control group. In this research design, an independent variable is manipulated, but the participants of a group are not randomly assigned. This type of research design is used in field settings where random assignment is either irrelevant or not required.

The classification of the research subjects, conditions, or groups determines the type of research design to be used.



Advantages of Experimental Research

Experimental research allows you to test your idea in a controlled environment before taking the research to clinical trials. Moreover, it provides the best method to test your theory because of the following advantages:

1. Researchers have firm control over variables to obtain results.
2. The subject does not impact the effectiveness of experimental research. Anyone can implement it for research purposes.
3. The results are specific.
4. Post results analysis, research findings from the same dataset can be repurposed for similar research ideas.
5. Researchers can identify the cause and effect of the hypothesis and further analyze this relationship to determine in-depth ideas.
6. Experimental research makes an ideal starting point. The collected data could be used as a foundation to build new research ideas for further studies.

6 Mistakes to Avoid While Designing Your Research

There is no order to this list, and any one of these issues can seriously compromise the quality of your research. You could refer to the list as a checklist of what to avoid while designing your research.

1. Invalid Theoretical Framework

Usually, researchers miss out on checking if their hypothesis is logical to be tested. If your research design does not have basic assumptions or postulates, then it is fundamentally flawed and you need to rework on your research framework.

2. Inadequate Literature Study

Without a comprehensive research literature review, it is difficult to identify and fill the knowledge and information gaps. Furthermore, you need to clearly state how your research will contribute to the research field, either by adding value to the pertinent literature or challenging previous findings and assumptions.

3. Insufficient or Incorrect Statistical Analysis

Statistical results are one of the most trusted scientific evidence. The ultimate goal of a research experiment is to gain valid and sustainable evidence. Therefore, incorrect statistical analysis could affect the quality of any quantitative research.

4. Undefined Research Problem

This is one of the most basic aspects of research design. The research problem statement must be clear and to do that, you must set the framework for the development of research questions that address the core problems.

5. Research Limitations

Every study has some type of limitations. You should anticipate and incorporate those limitations into your conclusion, as well as the basic research design. Include a statement in your manuscript about any perceived limitations, and how you considered them while designing your experiment and drawing the conclusion.

6. Ethical Implications

The most important yet less talked about topic is the ethical issue. Your research design must include ways to minimize any risk for your participants and also address the research problem or question at hand. If you cannot manage the ethical norms along with your research study, your research objectives and validity could be questioned.

Experimental Research Design Example

In an experimental design, a researcher gathers plant samples and then randomly assigns half the samples to photosynthesize in sunlight and the other half to be kept in a dark box without sunlight, while controlling all the other variables (nutrients, water, soil, etc.)

By comparing their outcomes in biochemical tests, the researcher can confirm that the changes in the plants were due to the sunlight and not the other variables.

Experimental research is often the final form of a study conducted in the research process which is considered to provide conclusive and specific results. But it is not meant for every research. It involves a lot of resources, time, and money and is not easy to conduct, unless a foundation of research is built. Yet it is widely used in research institutes and commercial industries, for its most conclusive results in the scientific approach.

Have you worked on research designs? How was your experience creating an experimental design? What difficulties did you face? Do write to us or comment below and share your insights on experimental research designs!

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