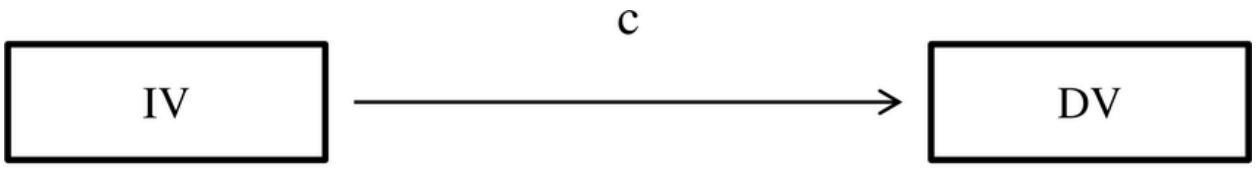
SUBMITTED BY: VINCENT SANTOS VICTORIE ALVIN R. DELOS SANTOS	**SUBMITTED TO:** PROF: RUSSHIA MARY DAPHNE GOLLA
YR/SEC: 4D-BSIT	**SUBJECT:** IT 17 **(**QUANTITATIVE METHODS)

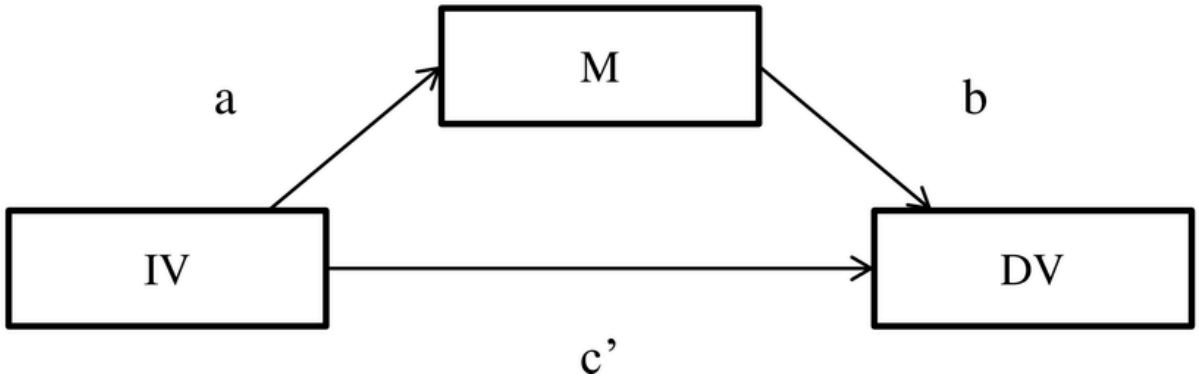
Experimental Design and Real Life Sample Problem.

Experiments: Are used to study causal relationships. You manipulate one or more independent variables and measure their effect on one or more dependent variables.

Experimental design: Create a set of procedures to systematically test a hypothesis. A good experimental design requires a strong understanding of the system you are studying.

Key Terms:





Independent Variable (IV): The variable manipulated or controlled by the researcher.

Dependent Variable (DV): The outcome variable measured to observe the effect of changes in the IV.

Control Group: A group in an experiment that does not receive the treatment or manipulation, serving as a baseline.

Randomization: The process of randomly assigning participants to groups

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to ensure unbiased distribution.

Confounding Variable: An external variable that may affect the **Dependent Variable (DV)** but is not the focus of the study.

There are five key steps in designing an experiment:

1. Consider your variables and how they are related
2. Write a specific, testable hypothesis
3. Design experimental treatments to manipulate your independent variable
4. Assign subjects to groups, either between-subjects or within-subjects
5. Plan how you will measure your dependent variable

For valid conclusions, you also need to select a representative sample and control any extraneous variables that might influence your results. If random assignment of participants to control and treatment groups is impossible, unethical, or highly difficult, consider an observational study instead. This minimizes several types of research bias, particularly sampling bias, survivorship bias, and attrition bias as time passes.

Objective

The primary objective of this experimental design case study is to predict the value of a dependent variable based on changes in an independent variable. By carefully controlling for confounding factors, the study seeks to establish a cause-and-effect relationship.

Sample Problems

Problem 1: the impact of study hours on students' test scores.

Scenario: A research wants to determine if increasing the number of study hours improves test scores among students.

Independent Variable (IV): Study hours

Dependent Variable (DV): Test scores

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Experimental Design: Participants are randomly assigned to three groups: 2 hours, 4 hours, and 6 hours of study daily. The test scores of each group are measured after one week. A control group (no additional study hours) is included for comparison.

Outcome: The analysis predicts how test scores improve with increasing study hours.

Problem 2: The Impact of Advertising Budget on Product Sales

Scenario: A smartphone-maker company seeks to determine if increasing its advertising budget leads to higher product sales.

Independent Variable (IV): Advertising budget

Dependent Variable (DV): Product sales (in units)

Experimental Design: Randomly selected regions are allocated different advertising budgets: $500, $1,000, and $2,000 per month. Sales data is collected over a 3-month period for analysis.

Outcome: A prediction model predicts that increasing advertising budgets will result in higher smartphone sales.

Problem 3:
The Effect of Sleep Quality on Productivity Levels of an Employee in a BPO Company.

Scenario: An BPO Company explores whether better sleep quality enhances employees' productivity at work.

Independent Variable (IV): Sleep quality (measured via a sleep tracker)

Dependent Variable (DV): Productivity (measured by task completion rates)

Experimental Design: Employees are grouped into those who improve their sleep quality (via sleep training programs) and those who do not. Productivity metrics are tracked for one month.

Outcome: The study assesses if better sleep directly correlates with increased productivity.

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Conclusion:

Experimental design plays a important role in quantitative methods by allowing researchers to explore causal relationships between variables. By manipulating independent variables and measuring their effects on dependent variables, researchers can make predictions and derive actionable insights of data. The sample problems highlight real-world applications, such as studying the effects of study habits on academic performance, the influence of marketing budgets on sales, and the impact of sleep on productivity.

Researchers may minimize biases, manage confounding variables, and provide reliable predictions by using well-structured experimental designs. This helps significantly in evidence-based decision-making across a variety of topics.