Chapter 10: Identifying the Independent and Dependent Variables in a Hypothesis

Independent Variable
It refers to the "cause" we are interested in investigating.

Dependent Variable
It refers to the "effect" we want to measure.

The independent variables can be developed into two different ways.

Lesson 10.1: Identifying Independent Variable

Two Types of Independent Variable
1. Non-manipulated Independent Variable
2. Manipulated Independent Variable

Non-manipulated Independent Variable
It is also refer to as "quasi-independent variable". Also, it is when we are interested in determining the effect of something that occurs naturally and doesn't require intervention by the researcher or statistician.

Manipulated Independent Variable
It is also refer to as "experimental independent variable". Also, it is where the researcher has to actively manipulate a variable by randomly setting up groups or assigning objects to a class.

Examples to Further Our Understanding

Example 1:
Let’s refer to one of the research hypothesis we stated in Chapter 9:
"Students taking mathematics in the morning have significantly higher achievement than students taking mathematics in the afternoon."

Question: What is the independent variable? What kind of independent variable it is?

Example 2:
"Male students skip significantly more days of class than female students."

Question: What is the independent variable? What kind of independent variable it is?

Example 3:
"College freshmen have significantly lower grade point averages than students in other classes."

Question: What is the independent variable? What kind of independent variable it is?

Example 4:
"Teachers with a master’s degree earn significantly more than teachers with only a bachelor’s degree."

Question: What is the independent variable? What kind of independent variable it is? What is the dependent variable?
**General Conclusion:** To sum it up, the above-mentioned examples are perfect example of non-manipulated independent variable since the researcher played no part in determining which subject were in either group.

**Another Examples to Further Our Understanding**

**Example 5:**
"Students taking accounting in a computer-based format will have significantly higher achievement than students taking accounting in a lecture-based format."

**Question:** What kind of hypothesis is it? What is the independent variable? What kind of independent variable it is?

**Example 6:**
"An after-lunch nap will have significantly higher effect on the behavior of children in kindergarten."

**Question:** What kind of hypothesis is it? What is the independent variable? What kind of independent variable it is?

**General Conclusion:** In other cases, the researcher has to actively assign participants to one group or another in order to test the stated hypothesis. Hence, the above-mentioned examples met the criteria for a manipulated independent variable.

**Lesson 10.2: Levels of the Independent Variable**

The levels of the independent variable are nothing more than the values that the independent variable can represent. This can be best explained by examples:

**Previous Example 1:**
"Students taking mathematics in the morning have significantly higher achievement than students taking mathematics in the afternoon."

Here, we know that it has a non-manipulated independent variable and it is the time of day the instruction is delivered. By that, what are levels of independent variable? How many are they?

**Previous Example 5:**
"Students taking accounting in a computer-based format will have significantly higher achievement than students taking accounting in a lecture-based format."

Here, we know that it has a manipulated independent variable and it is the type of instruction. Now, what are levels of independent variable? How many are they?

**Note:**
We should not assume that all independent variables have only two levels. Theoretically, an independent variable can have an infinite number of levels but, in reality, seeing an independent variable with more than four or five levels is unusual. But, whether they are manipulated or not manipulated, independent variables must have at least two levels, and we are interested in determining the "effect" that each of these levels has on our dependent variable.
Lesson 10.2: Identifying Dependent Variable

**Dependent variable** might include such things as academic achievement, sales, grade point average, weight, height, income, or any of the other myriad things about which we like to collect data.

**Example 7:**
"Businesses that advertise only on television will have significantly higher sales than businesses that advertise only in print or only on the radio."

**Question:** What relationship are we trying to investigate? What kind of hypothesis is this? What is the independent variable? What kind of independent variable? What are levels of independent variable? How many are they? What is the dependent variable?

**Example 8:**
"Customer satisfaction for airlines that charge customers for checking their bags will be significantly lower than customer satisfaction of airlines that do not charge for bags that are checked in."

**Question:** What relationship are we trying to investigate? What kind of hypothesis is this? What is the independent variable? What kind of independent variable? What are levels of independent variable? How many are they? What is the dependent variable?

**Example 9:**
"There will be a significant difference in the amount of rainfall in each of the four seasons."

**Question:** What relationship are we trying to investigate? What kind of hypothesis is this? What is the independent variable? What kind of independent variable? What are levels of independent variable? How many are they? What is the dependent variable?

**Example 10:**
"There will be a significant difference in the number of absences and dropouts between students in a rural school district, students in a suburban school district, and students in an urban school district."

**Question:** What relationship are we trying to investigate? What kind of hypothesis is this? What is the independent variable? What kind of independent variable? What are levels of independent variable? How many are they? What is the dependent variable?

**Let's Practice:**

**Direction:** Let's start by looking at the following hypotheses. Read each one and then identify the independent variable and its levels; then explain why the levels are either manipulated or non-manipulated. Following that, identify the dependent variable and the type of data it represents.

1. There will be significant difference in motivation scores between students in online programs and students in traditional programs.
2. The rankings of favorite sporting activities will be significantly different between Mexico, the United States and Canada.
3. There will be a significant difference in the number of females in computer science classes between students in the United States, France, and Russia.
4. Administrative assistants who work in cubicles are significantly less productive than administrative assistants who work in enclosed offices.