



# ACTION RESEARCH

## SESSION 3.1

# DESIGNING AN EXPERIMENTAL ACTION RESEARCH



# Objectives

At the end of the session, teachers should be able to:

- 1 describe experimental research design;
- 2 differentiate three different types of experiments; and
- 3 determine the appropriate type of experiment for given Action Research topics.



# Key Understandings

- 1 Experimental research design determines causation or cause-and-effect relationship between variables.
- 2 Experimental research design involves manipulation of an independent variable to see its effect on a dependent variable.
- 3 There are three types of experiments: pre-experiments, quasi-experiments, and true experiments.
- 4 All experiments involve manipulation of an independent variable.
- 5 Pre-experiments do not have control group nor randomization of participants.
- 6 Quasi-experiments have a control group, but do not use randomization of participants.
- 7 True experiments have a control group and use randomization of participants.

# Materials

- Laptop
- LCD projector
- Metacards
- Marking pens
- Whiteboard markers
- Masking tape
- Copies of Activity Sheet 1 entitled

“Purpose and Types of Experimental Research”

- Large printed copies of the “Purposes of Experiment” (from Activity Sheet 1); separate sheet for each situation
- Summary poster of “Comparison of Three Types of Experiments”
- Copies of instructions for activity under Application, including the research topics and table for responses
- Large poster showing the table for activity under Application with adequate spaces for the participants to write their responses on



### TIME ALLOTMENT

2 hours or 120 minutes

## References

**Center for Innovation in Research and Teaching. n.d. *Type of Experimental Research.***

**Arizona: Grand Canyon University.** Accessed May 12, 2018. [https://cirt.gcu.edu/research/development/resources/research\\_ready/experimental/design\\_types](https://cirt.gcu.edu/research/development/resources/research_ready/experimental/design_types).

**Complete Dissertation. n.d. *Experimental Research Designs. Statistics Solution.***

Accessed May 12, 2018. <http://www.statisticssolutions.com/experimental-research-designs/>.

**Trochim, William M.K. (1999) 2008. *The Research Methods Knowledge Base.*** Mason, OH: Atomic Dog Publishing, Inc.

# Introduction

Begin the learning session with a greeting. Say: “Good morning, everybody. Welcome to our fourth LAC session on Action Research. I am \_\_\_\_\_, your LAC facilitator.

Today, we will have an activity that will help us understand what experimental design is. Also, we will be differentiating the three types of experiments. Finally, we will be determining the type of experimental research design given an Action Research question.

Experimental design is only the first of five types of research design that we will be tackling in our series of LAC sessions on Action Research. The first two types of research design, experimental and qualitative, are both applicable when an intervention (“action”) is implemented in order to solve a problem or issue. The remaining three types of research designs, causal-comparative (or ex-post facto), correlational, and survey, can be used when you, as Action Researcher, are at the first Stage of the Action Research framework (Assessing the situation). Prior to implementing an intervention, you may want to find out what the current state of affairs is in relation to your Action Research topic. You may use a causal-comparative study, a correlational method, or a survey to provide you with baseline data before you execute your intervention.

It is necessary for you as an Action Researcher to determine the research design of your study because it ‘provides the glue that holds the research project together (Trochim, 2005).’ It is used to ‘structure’ the research, such that all the major parts work together in addressing the research question. The research design is like a recipe that provides the Action Researcher with the components of the study and the plan for successfully carrying it out.

Before we proceed to our first activity, let me first unlock some terms.

- Manipulation of independent variable refers to the provision of an intervention or treatment to a group of students.
- Experimental group is the group that receives the intervention or

treatment.

- Control group is the group that does not receive the intervention or treatment.
- Randomization is the process of selecting participants in such a way that every member of the population of participants has equal chance of being selected. It also refers to the assignment of groups to experimental conditions. Groups formed have equal chance of being assigned as either experimental group or control group.

## Activity (10 minutes)

Lead the conduct of the pre-discussion activity that aims to help participants distinguish different types of experiments by examining specific examples. Observe the following directions.

- 1 Divide the participants into groups with four to five members each.
- 2 Post the three types of experiments on the board (pre-experiment, quasi-experiment, and true experiment) as shown below.

Pre-experiment

Quasi-experiment

True Experiment

- 3 Ask the participants to choose from the word bank on the board the name of the experiment described on the worksheets distributed to them (see next instruction). Let them select the type of experiment used given the purpose and condition in each situation.
- 4 Distribute copies of the following activity sheet to the groups.

## ACTIVITY SHEET 1. PURPOSE AND TYPES OF EXPERIMENTAL RESEARCH

Item No.	Purpose of Experiment	Details	Type of Experimental Research
1	To determine if the use of manipulatives will help Grade 8 students understand concepts in Geometry	<ul style="list-style-type: none"> <li>• Application of the intervention (manipulatives)</li> <li>• Only two sections in Grade 8</li> <li>• Section Mahogany is assigned as experimental group; students will be using manipulatives in Geometry class</li> <li>• Section Narra is assigned as control group; students will be taught Geometry without manipulatives</li> </ul>	
2	To study the gains in performance of a class of Grade 10 student volunteers after an intensive 20-day summer workshop on English grammar	<ul style="list-style-type: none"> <li>• Only one group is involved composed of students who wanted to join the workshop and who lived close to the school</li> <li>• Implementation of the intervention (intensive workshop on English grammar)</li> </ul>	
3	To determine if the integration of video clips in teaching Science is effective in improving the academic performance of one Grade 5 section, which is selected randomly from 10 heterogeneous sections, in comparison with that of another Grade 5 section, also selected randomly, that receives only the traditional lecture-discussion instructional approach	<ul style="list-style-type: none"> <li>• Employment of video clips in instruction for one section randomly assigned as the experimental group;</li> <li>• Classroom lecture and discussion for the other section also randomly assigned as the control group</li> </ul>	

1. Ask the participants to compare the three situations and decide which one would be considered a pre-experiment, a quasi-experiment, and a true experiment. Make sure that they read and understand the conditions found in each experimental situation so they can match it with the type of experiment. Have them write their answer on the space provided.
2. After 10 minutes, call for representatives from each group to share their

answers. Post each purpose of experiment under the correct category. The following are the answers:

- 1) Manipulatives-Quasi-experimental
- 2) Summer Workshop-Pre-experiment
- 3) Video clips-True Experiment.

## Analysis (20 minutes)

Proceed to the processing of the results of the activity by asking the participants the following guide questions.

1. All of the studies in Activity Sheet 1 are experiments. What do you see as the common feature among the three studies that makes them all experiments? What then can you say is the major distinction of experiments?
2. Compare and contrast the three experimental studies in terms of the following:
  - a. manipulation or implementation of an independent variable
  - b. presence of a control group
  - c. use of randomization in selecting participants and assigning them to experimental or control groupWhat then are the similarities and differences among the three Experiments?
3. The three types of experiment are pre-experiment, quasi-experiment, and true experiment. Among the three situations in the activity sheet, which one employs pre-experiment? What makes you say so? Which situation applies quasi-experiment? Why do you say so? Which situation uses true experiment procedure? Explain your answers.

Summarize the outcome of the discussion by coming up with definitions for each of the three types of experiments.

## Abstraction (60 minutes)

### UNDERSTANDING EXPERIMENTAL DESIGN

Experimental design is an Action Research design that determines causation or cause-and-effect relationship between variables. Its distinctive feature is the manipulation of an independent variable to see its effect on a dependent variable.

### TYPES OF EXPERIMENTAL STUDIES

There are three basic types of experimental studies. These are pre-experiment, quasi-experiment, and true experiment. The presence of a control group and the randomization of participants distinguish the three types of experiments.

- 1 Pre-experimental** studies follow the basic feature of an experimental research design, wherein an independent variable is manipulated to see its effect on a dependent variable. However, randomization is not applied in the selection of participants. There is also no control group.
- 2 Quasi-experimental** studies also involve the basic characteristic of experimental research design; an independent variable is manipulated to examine its influence on a dependent variable. Like pre-experimental studies, there is no random selection of participants in quasi-experimental studies. However, there is a designated control group.
- 3 True Experimental** studies introduce an independent variable to assess its impact on a dependent variable. Like quasi-experimental studies, a control group is included in true experimental studies. In contrast though, randomization is utilized in the selection of participants.

To summarize the differences among pre-experiments, quasi-experiments, and true experiments, take note of the following:

- In a pre-experiment, there is manipulation of an independent variable, but there is neither control group nor randomization in sampling.
- In a quasi-experiment, there is manipulation of independent variable and a control group, but no randomization in sampling.
- In a true experiment, there is manipulation of independent variable, a control group, and randomization in sampling.

These differences are presented in the following table.





**TABLE \_\_. COMPARISON OF THREE TYPES OF EXPERIMENTS**

Type of Experiments Design	Independent Variable (Manipulation)	Control Group	Sampling
Pre-experiment	manipulation of independent variable	no control group	nonrandom sampling; a single group is studied
Quasi-experiment	manipulation of independent variable	experimental and control groups, or just experimental group	nonrandom sampling
True Experiment	manipulation of independent variable	experimental group and control group	random sampling

Action Research is conducted in the teacher’s own classroom. For this reason, the Pre-experimental and Quasi-experimental designs are the more commonly used designs for Action Research.

### **SAMPLING METHOD**

It is desirable that sampling method for experiments be random. However, since experimental Action Research are conducted to solve specific classroom problems, the sampling may have to be purposive and accessible.

### **DATA COLLECTION METHODS**

The most common data collection methods in experimental Action Research are paper-and-pencil instruments that yield numerical data. These include tests, rating scales, and checklists. Observation and documentation, such as portfolios, may also be used as long as the data derived from these can be transformed to numerical values.

### **DATA ANALYSIS TECHNIQUES**

The following are the most common statistical techniques in experimental Action Research.

- 1 Descriptive Statistics
  - Measures of central tendency or location, such as mode, median, and mean

- Measures of variability or dispersion, such as range, variance, and standard deviation

## 2 Inferential Statistics

- a Independent t-test—when comparing two means from two groups (e.g., experimental vs. control)
- b Paired t-test—when comparing two means from one group measured twice (e.g., pretest vs. posttest)
- c Analysis of Variance (F test)—when comparing three or more groups or means

Sampling, data collection methods, and data analysis techniques will be discussed in full in later LAC sessions.



## Application (40 minutes)

Lead the participants in applying what they have learned by asking them to design an experimental study for each of the following research topics using the three types of experiments.

Research topics:

- effectiveness of buddy system in improving test scores in Math
- efficacy of self-evaluation in developing self-directed learning
- usefulness of feedback through SMS in increasing the achievement levels of at-risk students

For each topic, have the participants:

- 1 Formulate an Action Research question;
- 2 State the null and research hypotheses (you may use nondirectional or directional);
- 3 Identify the independent variable and the dependent variable;
- 4 Name the groups that will be formed (experimental and/or control); and
- 5 describe the sampling method (random or nonrandom) for the learners.

Make sure that the participants will use each type of experiment only once. Present the following table for the participants' use.

Research Question	Hypotheses: Null and Research	Type of Experiment	Independent Variable and Dependent Variable	Group/s: Experimental or Experimental & Control	Section of Participants: Random or Nonrandom
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You may simply assign one topic per group to save time. When the groups are done, ask them to come up to the board and complete the matrix with their ideas. After 15–20 minutes, you may call for representatives per group to share their ideas with the rest of the participants. Allow time for questions.

**NOTE TO THE FACILITATOR:**

Check the suggested responses at the end of this session guide.

### Closing (5 minutes)

Conclude the learning session by saying: “Having now learned the definition of experimental research design and the differences among the three types of experiments, you are expected to apply them as you design your Action Research.

In the next series of our LAC sessions on research designs, you will be able to see clearly what makes the experimental design different from the others and why it is favored as the design when an intervention is being implemented. You will also know about qualitative design, an alternative to experiments.

For your assignment, write your Action Research in such a way that you can use an experimental design. Select which of the types of experiments will be most suitable for your research question. Use your Action Research journal for this and bring it on our next LAC session.

Thank you for your participation in today’s learning session. Goodbye for now and see you again.”

## SUGGESTED RESPONSES FOR THE ACTIVITY UNDER APPLICATION

Research Question	Hypotheses: Null & Research	Type of Experiment	Independent Variable & Dependent Variable	Group/s: Experimental or Experimental & Control	Section of Participants: Random or Nonrandom
Is the buddy system effective in improving test scores in Math?	<p>Null: The buddy system is not effective in improving test scores in Math.</p> <p>Research: The buddy system is effective in improving test scores in Math.</p>	True Experiment	<p>Independent variable: having or not having a buddy</p> <p>Dependent variable: test scores in Math</p>	<p>Experimental group: students are allowed to choose a “buddy” in the classroom during Math</p> <p>Control group: students work on their own during Math</p>	participants are selected randomly and organized into two groups; the groups are randomly assigned to either experimental or control group
Does self-evaluation help develop self-directed learning?	<p>Null: Self-evaluation does not help develop self-directed learning.</p> <p>Research: Self-evaluation helps develop self-directed learning.</p>	Quasi-experiment	<p>Independent variable: use or nonuse of self-evaluation</p> <p>Dependent variable: questionnaire on being a self-directed learner</p>	<p>Experimental group: Students are given self-evaluation tool for weekly monitoring</p> <p>Control group: Students do not have self-evaluation tool</p>	One class is assigned as experimental group while another class is the control group
Does SMS feedback increase the achievement levels of at-risk students?	<p>Null: SMS feedback does not increase the achievement levels of at-risk students.</p> <p>Research: SMS feedback increases the achievement levels of at-risk students.</p>	Pre-experiment	<p>Independent variable: getting feedback from teacher through SMS</p> <p>Dependent variable: achievement scores; collected before and after the implementation of the intervention</p>	<p>Experimental group: Students receive SMS feedback from teacher at least twice a week</p> <p>Control group: None</p>	Participants are selected purposively; students who are at the bottom 15% of the class



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