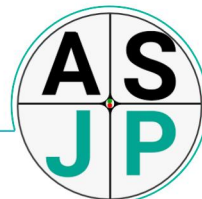




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Abstract

One common perception of research is that it primarily involves formal experiments conducted to examine the strength of relationships between variables. This paper focuses on the significance of the experimental method as an essential research approach in applied linguistics. The study aims to offer a comprehensive understanding of the proper use of the experimental method, including its components, goals, and procedural steps. Additionally, the paper provides a clear example of how the experimental method is applied, along with the key statistical procedures used to analyze and compare the data collected. The study concludes with some of the advantages attributed to the experimental research method.

Keywords: research, experimental method, variables, control group, experimental group.

Résumé

La recherche est souvent associée à la réalisation d'expériences formelles destinées à examiner les relations entre différentes variables. La méthode expérimentale constitue toutefois une approche essentielle pour établir des liens de causalité en linguistique appliquée. Cet article met en évidence l'importance de cette méthode en présentant ses objectifs, ses éléments essentiels et ses principales étapes. Il illustre l'application par un exemple et décrit les procédures statistiques utilisées pour analyser les données. L'étude se termine par une synthèse des principaux avantages que présente cette méthode.

Mots Clé : recherche, méthode expérimentale, variables, groupe témoin, groupe expérimental.

Introduction

Research is a powerful tool for generating knowledge and deepening our understanding of various phenomena in different fields. In applied linguistics, research contributes to effective teaching by providing new insights into the teaching and learning process (Dornyei, 2007, p. 17). By selecting this research orientation, educators can take charge of their professional development and influence their teaching practices with confidence. Teachers can actively benefit from the research conducted by others through informed and critical analysis of their findings. But, they can also conduct research themselves, as

David Nunan asserts (1992), “If knowledge is tentative and contingent upon context, rather than absolute, then I believe that practitioners, rather than being consumers of other people’s research, should adopt a research orientation to their own classroom” (Preface).

Researchers in general and novice ones in particular need to be familiar with the different research methods in language studies for the reliability and validity of their research. As novice, Master’s students find themselves in a dilemma while preparing their final research; they need to know the type of study they will undertake, whether qualitative or quantitative, experiment, case study, corpus study, classroom observation, and so on. This clarity will significantly enhance the quality and impact of their research.

Experiments are effective methods for gathering and analyzing data. Typically, they are designed to investigate the strength of relationships between different variables (Nunan, 1992, p. 25). Researchers intentionally control and manipulate the various conditions relevant to their field of interest, implement interventions, and assess the results, usually through quantitative analysis.

This paper focuses on the experimental method as a crucial research approach in applied linguistics. While it is important to acknowledge that this is not the sole method for conducting research (Nunan, 1992, p. 24), it holds significance in establishing causal relationships between variables. This paper aims to clarify the appropriate use of this method, its essential elements, and to outline its procedural steps and objectives.

1. Experimental research method

The experimental method comes out from the framework of scientific realism and is regarded as the most robust form of research, leading to findings that indicate causal relationships. It represents a specific design for quantitative data collection (Dornyei, 2007, p. 115). In technical terms, researchers manipulate one or more independent variables and examines the effect of the experimental manipulation on the dependent variable or the outcome of the study (Lodico et al, 2007, P. 229). The experimental research method is widely used in applied linguistics, it allows the establishment of cause-and-effect relationships between variables, and it offers a high degree of control over external factors that could affect the results. A true experiment typically incorporates at least three features that verify the effectiveness of the treatment: two comparison groups—namely, an experimental group and a control group. ; the random assignment of participants to each group to maintain internal validity; assignment and the use of pre-tests and post-tests to confirm that any

differences observed in the final assessments are attributable to the innovative material (treatment) (Nunan, 1992, pp. 26-27)

2. Elements of experimental research design

The experimental research design encompasses several key components that collectively define its core elements. In this section, we explore these parts, including variables, sample selection, randomization, population considerations, and the use of pre-test and post-test measurements.

2.1. Variables

A variable as the term itself suggests, is anything, which does not remain constant (Nunan, 1992, p. 26). In applied linguistics, variables include topics such as, language proficiency, skills, aptitude, interest, motivation, engagement, attention and so on. Variables can be classified into two categories: Independent and dependent variables. An independent variable is the input variable, whereas the dependent variable is the outcome variable (Cohen et al, 2007, P. 291). In other words, the independent variable is the manipulated variable and thus is the 'cause' of behavior, while the dependent variable is the observed one that measures the participants' response and therefore, is the 'effect' (Brown et al, 1999, P. 48). Researchers commonly seek to determine the relationship between the dependent and independent variables. For instance, they may investigate the impact of an independent variable, such as the implementation of a teaching method like the flipped classroom, on the dependent variable, which entails evaluating test scores related to reading proficiency.

2.2. Sample and Population

While designing an experiment, the researcher needs to designate the population and the sample of his study. The sample is "the group of participants whom the researcher actually examines, and the population is the group of people whom the study is about" (Dornyei, 2007, p 96). The population can be "cases, individuals who share one or more similar characteristics. The sample is needed when the population of the research is too big and is not possible to do the experiment overall population; thus the sample is a subset of the population that is representative of the whole population (Dornyei, 2007, p 96). An instance of a population could be a group of first-year English students, while a sample would encompass one or more groups selected among this population.

2.3. Randomization

By Randomization, we mean “the members of the population to be included in the sample is going to be randomly assigned to groups” (Gliner et al, 200, p. 500). The assumption underlying this procedure is that the selection is based entirely on probability and chance (Cohen and all, 2007, P110). This means that a sufficiently large sample should contain subjects with characteristics similar to the population as a whole. An example of random drawing is by numbering each member and using the computer to generate random numbers. Random sampling helps to avoid subjective factors, achieving representativeness, and thus generalizing results overall population.

2.4. Pre-test and Post-test

Tests are a powerful method of a numerical rather than verbal kind of data collection. In order to measure the effect of the treatment on the experimental group, a pre-test is needed before the intervention. The pretest serves as a diagnostic tool to evaluate whether the experimental and control groups share similar characteristics. It aims to identify any existing variations in abilities or other factors between the groups. If there were preexisting differences, then one would not be able to conclude that differences noted at the end of the experiment are due to the innovative material (Lodico et al, 2010, P. 236). After the intervention, a post-test is conducted. A post-test is a measure on some attribute or characteristic that is assessed for participants in an experiment after a treatment (Cresswell, 2008, P.297). The examination of the two groups in such a 'pre-test-post-test control-group design' is carried out by using statistical procedures (Dornyei, 2007, P.116). The data obtained in both tests are to be compared to see the difference between them and the effect of the independent variable on the experimental group.

In experimental research, statistical methods are commonly employed to analyze research data. Several key terms, such as mean, variance, standard deviation, and standard error, are utilized to describe and interpret the data.

3. Types of experiments

When subjects in both control and experimental groups are assigned randomly (Nunan, 1992, p. 40), then we are conducting a true experiment. Although it is not always feasible to conduct a true experiment, many scholars consider the experimental design the optimal model for rigorous research (Dornyei, 2007, p. 117).

In educational settings, it is rarely possible to randomly assign students to both groups; therefore, researchers must navigate a quasi-experimental design. “Quasi-experiments are similar to true experiments in every respect except that they do not use random assignment to create the comparison from

which treatment-caused change is inferred” (Dornyei, 2007, p. 117). By randomly assigning subjects, differences between the control group and the experimental group can be minimized, allowing the researcher to ultimately claim that a causal relationship exists between the independent variable (the innovative treatment) and the dependent variable (students’ test scores).

Another type of experiment in the field of education is called a Pre-experiment. “It is a kind of one-group pretest-post test design” (Nunan, 1992, P. 40). That is, the researcher deals with the experimental group only. Such studies have weak internal validity because it is possible to conclude with confidence that differences in the dependent variable are due to the effect of the independent variable.

David Nunan (1992) summarizes the difference between the three types of experiments in the following table (p 41):

Type	Characteristics
Pre-experiment	May have Pre and post treatment tests, but lacks a control group.
Quasi- experiment	Has pre and posttests and experimental and control groups, but no random assignment of subjects.
True experiment	Has both pre and post-tests, experimental and control groups and random assignment of subjects.

Table no (01): Types of experiments

4. How to experiment in the field of education

Conducting an experiment in applied linguistics requires the application of a prescribed set of procedures. Here are the basic steps involved in the experimental method: (Lodico et al., 2010, pp. 230-241 and Cresswell, 2009, P. 156)

- Select a topic.
- Identify the research question and formulate a hypothesis. The hypothesis should state the expected relationship between the independent variable(s) and the dependent variable.
- Select an appropriate sample and assign participants to experimental and control groups. The experimental group receives the treatment or manipulation of the independent variable(s), while the control group

receives instruction, which is usually the standard. Its role is to provide a baseline for comparison.

- Randomly assign participants to groups to minimize individual differences that could affect the results.
- Select measurement instruments to measure the dependent variable before and after the treatment or manipulation of the independent variable(s) through the pretest-posttest design.
- Select controls for extraneous variables.
- Define and administer the experimental treatments.
- Collect and analyze data using statistical tests to determine whether there is a significant difference between the experimental and control groups.
- Interpret the results and draw conclusions about the hypothesis.

5. Example of the application of the experimental method

In the majority of research studies, it is often impractical to gather data from the entire population of interest. Consequently, researchers opt to select a sample from the specific population under investigation. To initiate the research process, researchers need to accurately identify and define the research problem. In this study, our research topic revolves around examining the reading habits of middle school learners. The experiment is conducted in order to know the impact of extensive reading, which is here the independent variable, on the reading habits of first-year Middle school pupils in Algeria who represent the population of the experiment. The next step involves the selection of a sample from the population under investigation. In this study, the experimental group will consist of ten pupils, chosen through a random selection process, while the control group will comprise eleven pupils. To establish a baseline, both groups will undergo a pre-test assessing their reading attitudes and vocabulary prior to the introduction of the treatment variable in the experimental group. It is also preferable to collect qualitative data on reading habits, classroom-teaching procedures and so on, in both groups, because as Nunan (1992), stated such qualitative information is often crucial for the interpretation of the quantitative data (p41). Before conducting the experiment, the researcher has to define the research questions and the related hypotheses, which can be here: What is the effect of extensive reading on first year middle school pupils' reading attitudes? What is the effect of extensive reading on pupils' vocabulary?

Based on these research questions, the corresponding hypotheses could be:

Pupils would develop their reading skill and attitudes.

Pupils would acquire a rich vocabulary.

The experimental design revolves around providing ample books and a daily one-hour reading session for the experimental group, while the control group only receives a weekly one-hour reading session. Following a six-month period, both groups will undergo a post-test, and the obtained test scores will be subjected to statistical procedures for comparison. In the event that the experimental group attains higher scores, this outcome can be attributed exclusively to the treatment variable, serving as the singular distinguishing factor between the two groups.

6. Analysis through statistical inference

To assert that the test scores are attributable to the innovative material, and to extend conclusions about the entire population based on data derived from a subset of that population, the application of statistical inference is necessary. “The aim of the statistical inference is to know the extent to which the data are similar and the degree to which the data differ” (Nunan, 1992, P. 28). The most useful measure of similarity is the mean ($\bar{X}$), which is “the average of a set of scores obtained by adding the individual scores together and dividing by the total number of scores” (Ibid). The mean result gives information about the central tendency of the scores. The standard deviation (SD), on the other hand, is the most important measure of dispersion. It provides insights into the degree of variability exhibited by a set of scores in relation to the mean. It is calculated by deducting the mean from each individual score, squaring the resulting figures to get rid of the minus signs, adding these together and dividing by the number of scores minus one. This gives the variance. The square root of this figure is the Standard deviation. This formula is used to estimate the population variance based on a sample. A high standard deviation indicates that the scores are more spread out, while a low standard deviation indicates that the scores are more clustered around the mean. Standard error is indeed the standard deviation of a sample divided by the square root of the sample size. The standard error represents the standard deviation of the distribution of sample means, which is expected to be smaller than the standard deviation of the population itself (Nunan, 1992). The standard error is closely related with the level of confidence of the research results. The lower the standard error, the higher the level of confidence of the research result will be. The following example illustrates the whole procedure.

Score	Score-mean ²	Square of figures in 2 nd column
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2	-2	4
8	4	16
5	1	1
3	-1	1
4	0	0
1	-3	9
2	-2	4
3	-1	1
5	1	1
7	3	9
40		46

Table no (02): Clculating Mean, Variance and Standard Deviation (Source: Nunan 1992, P29)

The Mean = 4. This is calculated by dividing the sum of the scores (40) by the total number of individual scores (10)

The Sum of the squares/(no. of scores minus 1) = $46/(10-1) = 5.111$

Variance = 5.111

Standard deviation (i.e., square root of variance) = 2.26

The variance for these scores is 5.111, and the square root of the variance, i.e. the standard deviation (SD) is 2.26. Thus, the standardized amount by which these scores deviate from the mean is 2.26 (Nunan, 1992, p. 29).

7. Interpreting results

After obtaining the statistical inferences, it is important to analyze and interpret the findings in relation to the hypotheses or research questions formulated at the beginning of the study. Here, the researcher addresses whether the hypotheses were supported or refuted. He also needs to consider the treatment that was implemented and actually made a difference for the subjects in the experimental group. The researcher then proceeds to explain the significance or lack thereof of the obtained results, providing an explanation rooted in the literature reviewed or employing persuasive logic to elucidate the findings. Besides, the researcher has to address whether the results might have occurred

because of inadequate experimental procedures, such as threats to internal validity, and indicate how the results might be generalized to certain people, settings, and times. Finally, he/ she indicates the implications of the results for the population studied (Cresswell, 2009).

8. Conclusion

In conclusion, the experimental method has a significant value in the field of applied linguistics. It plays a crucial role in uncovering causal links between variables. By manipulating and controlling independent variables, researchers can examine their impact on dependent variables, thereby gaining valuable insights into language learning and teaching methodologies.

The experimental method enables researchers to make claims about cause-and-effect connections, delivering a structure for examining hypotheses and theories. It enables the identification of effective instructional strategies, the evaluation of language interventions, and the investigation of language acquisition processes.

The experimental method in applied linguistics helps to establish causal relationships and control extraneous variables. It allows for the precise measurement of variables and provides a systematic approach to data collection and analysis.

For the interpretation of the quantitative data, researchers often combine experimental methods with other research approaches, such as qualitative studies, observational research, and field experiments. This helps provide a comprehensive understanding of applied linguistic phenomena and allows for the analysis of findings.

Overall, the experimental method serves as an effective tool in applied linguistics research, enabling researchers to generate conclusions based on real experiences, to bring about evidence-based recommendations, and contribute to the development of language teaching and learning practices.

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