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Think out of the Box for Quality in Educational Research

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A B S T R A C T

If we are thinking about the use of statistics in the different field, we might be wondering just when and how exactly we are going to use it in our life. Statistics plays an important role in a great number of different fields, some of which we might not have expected. This paper is focused on statistical inference in educational research. The researcher has discussed here the role of statistical significance testing in educational research. Statistical inference is the process of generating conclusions about certain characteristics of the population on the basis of information obtained from a sample. We can conductit in two ways: (1) by interval estimation of parameters and (2) by testing the statistical hypothesis on parameters. Here the discussion is limited to the hypothesis-testing procedures applied to a selected batch of parameters. Statistical significance merely provides evidence that an event did not happen by chance. But it provides no information about the practical significance of an event or if the result is replicable. The possible errors include omitting key references, misrepresenting the null hypothesis, omitting the weaknesses of confidence intervals, ignoring the difference between a hypothesized effect size and an obtained effect size, erroneously assuming a linear relationship between p and F. Thus, we should do other researches which recommend that statistical significance testing must be accompanied by judgments of the event's practical significance and replicability.

Introduction

If we think about the use of statistics, we might be wondering about when exactly we use this in our life. A person who isn't math majors often wonders what and why he needs statistics? However, statistics plays an important role in different fields, some of which we might not be aware of it. Statistics has major role in Educational research. Especially Statistical inference is much important in education. What is Statistical inference? It is the process of generating conclusions about certain characteristics of the population on the basis of information obtained from a sample. Statistical inference can be conducted in two ways: (1) by interval estimation of parameters and (2) by testing the statistical hypothesis on parameters.

Statistical inference in education

The main objective of statistical inference in education is to make generalizations about the mean, median, standard deviation of the population on the basis of the sample mean, sample median and sample standard deviation computed from carried out research on the units of sample drawn from population by different sampling methods. Here discussion is limited to the hypothesis-testing procedures applied to a selected batch of parameters such as (1) the population mean, μ, and (2) the sample mean, π , for one-sample tests of significance; (3) the difference between two population means, $\mu_1 - \mu_2$, for independent samples and (4) the difference between two samples mean, $\pi_1 - \pi_2$, for two-sample tests.

What is statistical hypothesis?

It is a statement about the numerical value of a population parameter. It is assertion about explaining the established fact. There are many types of hypothesis but mainly two types of hypothesis are used in education (1) Null hypothesis and (2) alternative hypothesis. A null hypothesis (Ho) and an alternative hypothesis (Ha) are stated, and if the value of the test statistic falls in the rejection region the null hypothesis is rejected in favor of the alternate hypothesis. Otherwise the null hypothesis is retained on the basis that there is insufficient evidence to reject it. The main task of researcher is to verify a given hypothesis. If μ_1 and μ_2 are the means of two populations, null hypothesis Ho states that the difference between these two means is zero. **Ho: $\mu_1 - \mu_2 = 0$**

Rational of the study

Loftus & Masson, (1994) said that null hypothesis testing still dominates the social sciences. Falk and Greenbaum (1995) and Weitzman (1984) noted that the researchers' use of the null may be attributed to the experimenters' ignorance, misunderstanding, laziness, or adherence to tradition. Carver (1993) concluded that the best research articlesare those that include *no* tests of statistical significance.

Statistical inference past and present

Huberty (1993) noted that scholars have used statistical testing for research purposes since early 1700s. With advanced technology applications of statistical testing become advanced. However, much of today's statistical testing is based on the same logic used in the first statistical tests and advanced in the early twentieth century through the work of Fisher and the Pearson family. Specifically, significance testing and hypothesis testing have remained at the cornerstone of research papers. The research methodology literature in recent years has included a full frontal assault on statistical significance testing.

Example

The researcher is provided with two samples who together are the population under study. The researcher wants to know whether a particular method of learning to read is better than another method. Statistical testing is needed, despite complete knowledge of the population. The experimenter wants to know if Method A is better than Method B, not whether the population of people learning with Method A is better than the population of people learning with Method B. The first issue is whether this difference could have been caused by chance, which is addressed with statistical testing.

Case study: "Teach science with comics "

Objective: To study the effectiveness of teaching science with comics.

Hypothesis

1. There will be no significant difference between the mean score of pre-test of Control group and Experimental group.

2. There will be no significant difference between the mean score of post-test of Control group and Experimental group.

3. There will be no significant difference between the mean gain score of Control group and Experimental group.

Variables

Dependent – score in criterion test,

Independent – teaching method, control – standard, topic,

Population

The researcher had included all the students studying in Std. 5th of English medium primary schools of the Gujarat State Board School as the population for the study.

Area

Gujarat State

Medium

English Medium

Educational level

Students of Std. 5th

Sample

The sampling technique used for the selection of the school was convenient sampling technique by which joyous English Medium School was selected from Surat city. The selection of the students as sample from Std.5th is done by equivalent group method. The researcher has formed two groups. 1. Control Group & 2.Experimental Group. The two groups were made equivalent based on their scores they had obtained in First Internal Exam in science subject. In each group, 36 students were included.

Research Tools

1. Tool for conduction of the experiment was Comic, which was developed by the researcher herself.

2. Tool for measuring the effectiveness of the experiment was Criterion Test.

Analysis and Interpretation of the mean scores of pre-test of the Control group and the Experimental group

Group	No.	Mean Score	S.D.	σ M	T- Value
Experimental	36	4.78	1.99	1.69	0.070
Control	36	4.75	0.33	0.28	

From the above table we can say that t-value is 0.70, which is less than table value at 0.05 level (1.96). Thus, hypothesis 1 is accepted. Hence, we can say that both groups might have similar previous knowledge relating to science subject.

Analysis and Interpretation of the mean scores of post-test of the Control group and the Experimental group

Group	No.	Mean Score	S.D.	σ M	T- Value
Experimental	36	21.38	3.10	0.52	3.13
Control	36	18.91	3.59	0.60	

The t-value in the above table is 3.13. Which is greater than table value at 0.01 level (2.58). Thus, the hypothesis 2 is rejected. Hence, we can say that there was a significant difference between the mean score of the post-test of both the groups. It is concluded that, teaching through comic is highly effective as compared to traditional method.

Analysis and Interpretation of the mean of gain scores of Control group and the Experimental group

Group	No.	Mean Score	S.D.	σ M	T- Value
Experimental	36	16.61	2.23	0.37	4.28
Control	36	14.17	2.57	0.43	

The t-value in the above table is 4.28. Which is greater than table value at 0.01 level (2.58). Thus, the hypothesis 3 is rejected. Hence, we can say that there was a significant difference between the gain scores of both the groups.

Findings

1. Both the groups were equivalent because there was no significant difference seen between the mean scores of the pre-test of control group and experimental group.

2. There was significant difference seen between the mean scores of the post -test of control group and experimental group, hence we can say that teaching science with comics is more effective than the Traditional method of teaching.

Recommendations

Significance tests have their place, its important but Thereare possible errors include misrepresenting the null hypothesis, omitting the weaknesses of confidence intervals, ignoring the difference between a hypothesized effect size and an obtained effect size, erroneously assuming a linear relationship between p and F, claiming Cohen chose power level arbitrarily, referring to the "reliability of study," inferring that inferential statistics are primarily for experiments, and recommending "what if' analyses.

Researcher must evaluate the practical importance of results, and not only statistical significance. It is a necessary part of a statistical analysis but insufficient for interpreting research. So researcher should include practical significance in the results. Significance testing as the sole basis for result interpretation is a fundamentally flawed practice; significance tests can be useful as one of the several elements in a comprehensive interpretation of data. Statistical significance merely provides evidence that an event did not happen by chance. However, it provides no information about the meaningfulness (practical significance) of an event or if the result is replicable. Thus, we support other researchers who recommend that statistical significance testing must be accompanied by judgments of the event's practical significance and replicability.

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