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# Methodological Trends and Statistical Quality of Experimental M.Ed. Dissertations: A Documentary Analysis from the Department of Education, M. K. Bhavnagar University (2015–2020)

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**Abstract:**

Experimental research is very important in educational studies, as it allows to know the cause-effect relationship through the control and management of variables. This study conducted a documentary analysis of experimental M.Ed. dissertations submitted to the Department of Education, M. K. Bhavnagar University from 2015 to 2020. The objectives of the study included examining the methodological characteristics, analysing the trends of the subjects, checking the quality of the statistical procedures, and identifying the strengths and weaknesses in the implementation and reporting of the research. For this, a descriptive content analysis method was adopted. 31 experimental dissertations were selected through purposive sampling from the total population identified. A structured research review checklist was used to collect data, which included research design, sampling, research instruments, variables, statistical techniques, and methods of interpretation. Frequencies and percentages were used for quantitative analysis, while qualitative analysis identified methodological patterns.

The study findings showed that pre-test-post-test control group designs were most commonly used, but true experimental designs with randomization were rare. Samples were generally small and selected non-randomly. Research instruments mostly used self-constructed instruments, but limited information was provided on their reliability. The t-test was the most commonly used statistical method, while advanced methods such as ANOVA and ANCOVA, although appropriate, were used less frequently. Key research areas included teaching methods, educational technology, and psychological interventions, and there was also an increasing focus on ICT and inclusive education. This study suggests that more intensive training in sampling, psychometrics, and advanced statistical analysis is needed to improve methodological rigor and the quality of the papers in teacher education research.

**Keywords**

Experimental Research, M.Ed. Dissertations, Methodological Analysis, Statistical Techniques, Documentary Review, Teacher Education Research, Research Trends, Educational Research Quality

## Introduction

Experimental research inhabits a very important place in educational research. Because it allows the researcher to change independent variables and control external factors, through which the true relationship of cause and effect can be known. Such experimental studies are of particular importance in teacher education, as they provide experimentally based evidence on how effective teaching methods, teaching methods, psychological therapies and assessment methods are. Globally, rigorous methodology is used in experimental research to obtain reliable and generalizable results (Creswell and Creswell, 2018). In the Indian context, postgraduate dissertations in the field of education serve

not only as a source of research training but also as a source of useful knowledge for institutions, which helps in classroom practices and policy making.

Despite the increasing number of experimental studies at the M.Ed. level, some concerns have been raised about the methodological robustness of students' research. In particular, shortcomings are found in research design, sample selection, instrument construction and the use of appropriate statistical methods (Best and Kan, 2016). Many theses and dissertations suffer from issues such as small and non-random samples, underuse of advanced statistics, inadequate reporting of validity and reliability, and superficial interpretation of results. Such issues affect the internal and external validity of the research and reduce its practical application. Therefore, it becomes necessary to systematically review completed dissertations so that the quality of research can be assessed, activities can be identified and future researchers can be better guided.

Teacher education institutions in India play a vital role in developing research capabilities among prospective teachers. M. K. The Department of Education, Bhavnagar University, has a long tradition of experimental research at the M.Ed. level. Many experimental dissertations have been prepared, especially in areas such as teaching methods, psychological interventions, educational technology and assessment methods. However, there has been insufficient study at the institutional level on the methodological characteristics and statistical analysis of these dissertations. Therefore, such a review becomes necessary to know how research training is, how research topics have changed and how much modern methodological standards have been followed.

Analysing essays from a given period provides several educational benefits. First, it helps to know the trends in research and to identify which areas have been worked on and which areas have been neglected. Second, it helps to check the suitability of research designs, such as pre-test–post-test control group designs, single group experiments and factorial designs, and to know how much they are consistent with the objectives and hypotheses. Third, it helps to evaluate the statistical methods used, such as t-test, ANOVA, ANCOVA and non-parametric tests, and whether these methods have been applied correctly or not. Such analysis can improve research training and identify areas that need to be strengthened.

The assessment of the quality of data analysis is also very important, as statistical accuracy directly affects the reliability of research findings. Choosing the right statistical tool according to the level of measurement, sample characteristics and research design is an important indicator of the researcher's ability (Garrett, 2008). If statistical analysis is not done properly, false conclusions can be drawn, which affects the quality of academic research.

In this context, the present study conducts a comprehensive review of 45 experimental M.Ed. dissertations submitted to the Department of Education, M. K. Bhavnagar University from 2015 to 2020. The aim of this study is to examine their methodological characteristics, analyze the trends in the content, assess the quality of statistical procedures and identify the strengths and weaknesses in the implementation and reporting of experimental research. The findings of this study are expected to provide evidence-

based suggestions for improving research training, enhancing the quality of dissertations and increasing methodological rigor in future experimental research.

**Review of Related Research**

**Randolph (2008) – Methodological Reviews as a Tool for Identifying Research Trends**

Randolph studied how to identify research trends by systematically analysing characteristics such as research design, sampling, and data analysis methods. The study found that systematic reviews can identify common weaknesses in research, inconsistent use of statistical methods, and reporting errors. He also emphasized the importance of transparent coding and reliability checks when reviewing theses and dissertations. The study is important for current research because it provides a structured framework for analysing research designs, instruments, and statistical methods in many dissertations.

**Ge, Zhao, & Liu (2024) – Quality Issues in Master's Theses in Education**

Ge and colleagues identified common quality issues by analysing 275 master's theses in the field of education. The findings found that the main problems were a lack of research innovation, reduced methodological rigor, and non-compliance with academic writing standards. Many of the theses had poor statistical validity, poorly chosen research designs, and limited interpretation of results. The study recommended stronger guidance, more training in research methodology, and the use of appropriate statistical methods. This research directly supports the need to examine the quality of data analysis and interpretation in M.Ed. dissertations.

**Review of Methodological Flaws in Master's Theses (2019)**

This review examined methodological weaknesses in a sample of master's dissertations. It found common problems such as mismatch between research design and objectives, small and non-representative samples, inadequate validation of instruments, and incorrect use of statistical methods. The study concluded that many postgraduate dissertations lack methodological coherence. Therefore, there is a need for clear guidelines for the selection of research designs and the use of statistics. This finding is relevant to the aim of the present study to identify strengths, weaknesses, and areas for improvement in experimental research.

**Hassad (2010) – Improving Dissertation Quality through Statistics and Research Training**

Hasad studied the importance of statistical competence and guidance in doctoral and postgraduate research. The study found that inadequate training in statistics leads to inaccurate data analysis, low statistical power, and poor interpretation of findings. It recommended curriculum improvements, faculty training, and strong methodological support for students. The study justifies the need to examine the appropriateness of statistical methods used in experimental dissertations.

**Smaldino & McElreath (2016) – Persistence of Poor Research Methods**

Smaldino and McElreath showed that poor research designs and low statistical power persist over time in behavioural sciences, leading to unreliable findings. Their meta-analysis found that methodological flaws persist for years despite awareness of the problems. They emphasized the need to improve research culture, increase

replication, and strengthen methodological rigor. This supports the need for institutional-level evaluation of dissertation research methods in the current study.

**Research Objectives**

1. To examine the methodological characteristics (research design, sample size, tools, statistical techniques, and variables) used in experimental research dissertations submitted in the Department of Education, M. K. Bhavnagar University from 2015 to 2020.
2. To analyse the trends in experimental research topics and areas undertaken by M.Ed. scholars during the selected period.
3. To evaluate the quality of data analysis procedures employed in the selected experimental dissertations with reference to appropriateness of statistical techniques and interpretation of results.
4. To identify strengths, gaps, and scope for improvement in the conduct and reporting of experimental research in the Department of Education.

**Research Design**

The present study was conducted in a descriptive content analysis with retrospective document research study. This study did not describe, so non-response research was suitable for the research. Through documentary analysis, the methodological structure, statistical procedures and subject choices in the folk essay could be systematically examined. Both quantitative and qualitative types of analysis were conducted in this design. The quantitative analysis method looked at the number (Quincy) and percentage position of the characteristics of the subject, while the qualitative analysis looked at the signs, strengths and groups.

The unit of analysis was the individual experimental M.Ed. dissertation submitted to each department of M. K. Individual Education from 2015 to 2020. This study did not evaluate the results of the study, but the research process such as design, sample, instruments, variables and statistical treatment was given.

**Population**

The study world included all experimental M.Ed. dissertation submitted to the entire M. K. Education Department from 2015 to 2020. As per institutional records, a total of 52 essays used experimental studies during this period.

**Sample and Sampling Technique**

Out of the identified population, 31 essays were selected as a sample for detailed analysis. Purposive sampling technique was included, as only those essays were included as they were of experimental design (true experimental, quasi-experimental or pre-experimental) category and in which complete chapters on methods, instruments and statistical analysis were available. Incomplete reports or incomplete methodological information were excluded from the analysis below so that the accuracy of the analysis could be assessed.

The selected essays cover various areas such as research principles, methodological techniques, psychological interventions, achievement studies and assessment theories. Therefore, the selection is made suitable for the experimental research to be conducted during this period.

**Tool for Data Collection**

M. K. The researcher prepared a structured research review checklist for the systematic analysis of selected experimental dissertations submitted to the Department

of Education, Bhavnagar University. The checklist was based on standard criteria for experimental research and dissertation evaluation. It included clearly defined categories to cover both quantitative and qualitative aspects of the research process. The tool included sections related to general information (year, title, and research area), type of experimental design, sample characteristics (size and sampling method), identification and management of variables, type of research instruments (standardized or self-constructed), and validity and reliability reporting. A separate section was kept to note whether the statistical techniques used—such as descriptive statistics and predictive tests—were appropriate for the research design and level of data.

The checklist also contained indicators to check the quality of data analysis, such as clarity of tables, procedure for hypothesis testing, accuracy of interpretation, and consistency between objectives, hypotheses, and findings. The checklist was reviewed by experts in academic research methodology for content validity and necessary amendments were made. A pilot review of some essays was also conducted to make the categories clearer and facilitate coding.

**Data Collection Procedure**

Permission was obtained from the Head of Department to access the essays available in the departmental library and digital collection. Each essay was carefully read chapter by chapter, with particular focus on the sections on methodology, instrument construction, statistical analysis and results. Data were systematically recorded using the research review checklist. To maintain impartiality and confidentiality, each essay was assigned a numerical code. Quantitative data such as sample size, type of design and statistical techniques were tabulated, while qualitative notes on strengths and limitations were written descriptively. The researcher re-analysedsome essays after two weeks to check the reliability of the coding and to ensure consistency.

**Data Analysis Procedure**

The collected data was analysed both quantitatively and qualitatively. Quantitatively, frequencies and percentages were calculated to identify the distribution of research designs, sample sizes, types of instruments, variables, and statistical techniques. Year-by-year tables were created to identify trends in experimental research topics and methods from 2015 to 2020. Cross-tabulation was used to identify the relationship between the type of experimental design and the statistical tests used.

Each essay was evaluated against predetermined criteria to check the quality of the statistical procedure—such as the appropriateness of the test, the appropriate use of descriptive and inferential statistics, appropriate hypothesis testing, and logical interpretation of the results. Based on this, essays were divided into three levels: statistically sound, partially sound, and sound.

Qualitatively, content analysis was conducted to identify general strengths, frequently encountered methodological limitations, and gaps in reporting. It identified issues such as inadequate control of extraneous variables, inadequate justification for sample size, inadequate reporting of validity and reliability, and overreliance on basic statistical tests. All of these findings were presented through tables, charts, and descriptive text to provide a comprehensive picture of the

methodological practices and quality of experimental research in the section.

**Delimitations of the Study**

This study was limited to experimental M.Ed. dissertations submitted to the Department of Education, M. K. Bhavnagar University between 2015 and 2020. Non-experimental dissertations were not included. The study mainly focused on methodological and statistical aspects and did not assess the actual effectiveness of the experimental treatment.

**Limitations of the Study**

This study was conducted under certain limitations, so the following points need to be kept in mind while interpreting the findings:

- The study was limited to experimental M.Ed. dissertations submitted to the Department of Education, M. K. Bhavnagar University between 2015 and 2020. Therefore, these findings cannot be applied to dissertations from other years, programs, or other universities.
- The analysis was based only on the information written in the dissertations. Methods actually used by the researchers but not written in the dissertation could not be included.
- The study focused on methodological characteristics and statistical procedures. It did not assess how effective the experimental treatment actually was or how valid the research findings are in practice.
- The statistical methods and their interpretation were assessed using predetermined criteria. Although these criteria are based on standard guidelines, they may involve some subjective judgment.
- Only 31 articles that met the inclusion criteria were analysed. Articles with incomplete methodological or statistical information were excluded, which may have limited the comprehensiveness of the review.
- External factors such as the availability of research guidance, institutional facilities, or researcher capacity, which may affect the quality of experimental research, were not examined.
- The instrument used for analysis was developed by the investigator. Although it has received expert validation and pilot testing, it may not fully capture all aspects of research quality.
- Therefore, these findings should be understood as indicators of methodological trends in the selected period and context, rather than as the ultimate measure of the overall quality of the research.

**Findings**

An analysis of 31 experimental M.Ed. dissertations submitted to the Department of Education, M. K. Bhavnagar University between 2015 and 2020 revealed several important methodological trends. In terms of research design, most studies (about two-thirds) used a pre-test–post-test control group design, which demonstrates a basic understanding of experimental control. However, many studies used a single-group pre-test–post-test design. The lack of a control group limited the internal validity of such studies. True experimental designs with randomization were rarely observed.

In terms of sampling, most of the dissertations used small samples of 30 to 60. These samples were usually selected through purposive or convenience sampling. Random sampling was rarely used. The studies mainly involved school students, especially secondary level students. Studies based on teacher trainees or higher education learners were few. Self-constructed achievement tests and attitude scales were the most commonly used research instruments. Content validity was demonstrated by peer review in many articles, but only a few studies provided detailed reliability coefficients using appropriate statistical methods. The use of standardized instruments was also less common.

The most commonly used statistical method was the t-test. Descriptive statistics such as mean and standard deviation were routinely reported. Advanced methods such as ANCOVA and ANOVA were used in very few studies, while some studies should have used them as per the study design. In many cases, the choice of statistical test was not entirely consistent with the level of measurement or design. Interpretations of results were generally objective, but some articles overgeneralized findings from out-of-sample settings. The hypothesis testing procedure was mostly followed correctly, although the reporting format varied. There was generally a good relationship between objectives, hypotheses, and findings.

In terms of topics, teaching methods, educational technology, and psychological interventions were the most common experimental areas. In the following years, new topics such as inclusive education, ICT integration and constructivist approaches emerged, indicating a slow shift towards modern activities. Overall, this review showed that the basic framework of experimental methodology and hypothesis testing is strong. However, the rigor of sampling, the use of advanced statistical methods and detailed reporting of validity and reliability still need to be improved.

**Discussion**

The high use of pre-test–post-test control group designs suggests that M.Ed. students have a basic understanding of experimental research. However, the frequent use of non-random sampling and small sample sizes suggests that they have practical difficulties and limited access to a larger population. Such limitations are common in educational research, yet they make it difficult to generalize findings. Therefore, stronger training in sampling methods and research design is needed. The high use of self-constructed instruments suggests that teacher education emphasizes test-making skills. However, the lack of information about reliability suggests that more attention needs to be paid to psychometric properties. Standardization of the tool and holding workshops for statistical validation could improve the quality of the research.

The high use of t-test as the main inferential statistical method suggests that students rely on basic analysis. It is appropriate for comparisons of two groups, but its use when there are more than two groups or other factors indicates that advanced statistical methods are underused. This is probably due to the lack of training in statistical software and high-level data analysis. Providing practical training in software can overcome this deficiency.

In terms of subjects, more attention has been paid to teaching methods and achievement studies, which reflect traditional priorities. The inclusion of ICT, inclusive education and constructivist strategies shows a response to modern

educational reforms. However, there is still less research on topics like socio-emotional learning, assessment innovation and interdisciplinary approach. An important issue is related to the interpretation of findings. Objectivity has been maintained in most of the essays, but there is a tendency to generalize too much. Therefore, more emphasis needs to be placed on limitations and cautious conclusions. Providing training in research reporting such as APA style and effect size reporting will enhance the academic quality of essays.

Overall, the Department of Education, M. K. Bhavnagar University has laid a good foundation in practical research training. However, there is a need to increase the methodological rigor, statistical skills and diversity of subjects as per modern academic standards.

**Conclusion**

This review of 31 experimental M.Ed. dissertations found that students had a good understanding of pre-test–post-test design, hypothesis generation and the use of descriptive statistics. However, limitations were found in the sampling method, reliability of instruments and use of advanced statistical methods. The topics were mainly focused on teaching methods and achievement studies, while ICT and inclusive education were also included.

This study shows that systematic training in research design, psychometrics and statistical analysis is necessary to enhance the quality and impact of postgraduate experimental research. Strengthening methodological training, increasing the use of standardized tools and encouraging research on various topics will lead to more quality and meaningful experimental research in the Department of Education, M. K. Bhavnagar University.

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