

The Contribution of Causal-Comparative Quantitative Method to the Quality of Educational Research

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Abstract: This study aims to analyze the contribution of the causal-comparative quantitative research method to the quality of educational research. The causal-comparative quantitative method is used to assess cause-and-effect relationships between variables in an educational context without conducting experimental manipulation. This approach allows researchers to compare different groups and evaluate the influence of specific factors on educational outcomes. Data were collected through a literature review and analysis of various educational studies employing the causal-comparative method. The findings indicate that this method significantly contributes to enhancing the validity, reliability, and accuracy of interpreting educational research results. The study recommends the use of the causal-comparative method as an effective strategy for achieving high-quality research outcomes in education.

Keywords: Quantitative Method; Causal-Comparative; Educational Research; Research Quality.

Abstrak: Penelitian ini bertujuan untuk menganalisis kontribusi metode penelitian kuantitatif tipe kausal komparatif terhadap kualitas penelitian pendidikan. Metode kuantitatif kausal komparatif digunakan untuk menilai hubungan sebab-akibat antarvariabel dalam konteks pendidikan tanpa melakukan manipulasi eksperimen. Pendekatan ini memungkinkan peneliti untuk membandingkan kelompok yang berbeda dan mengevaluasi pengaruh faktor tertentu terhadap hasil pendidikan. Data dikumpulkan melalui studi literatur dan analisis berbagai penelitian pendidikan yang menggunakan metode kausal komparatif. Hasil penelitian menunjukkan bahwa metode ini memberikan kontribusi signifikan dalam meningkatkan validitas, reliabilitas, dan ketepatan interpretasi temuan penelitian pendidikan. Penelitian ini merekomendasikan penggunaan metode kausal komparatif sebagai strategi efektif untuk memperoleh hasil penelitian yang berkualitas dalam bidang pendidikan.

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A. Introduction

Educational research is essential for improving teaching and learning processes, as well as for developing effective educational policies. High-quality research provides accurate evidence to guide educators and policymakers in making informed decisions (Creswell, 2014). One of the important aspects of research quality is the selection of appropriate methods that can accurately measure relationships between variables.

Quantitative research methods have been widely used in education due to their ability to provide measurable and generalizable results. According to Ary, Jacobs, Sorensen, & Walker (2018), quantitative research focuses on numerical data, statistical analysis, and objective interpretation, which allows researchers to test hypotheses and draw valid conclusions. Within quantitative methods, the causal-comparative type is specifically designed to examine cause-and-effect relationships without experimental manipulation.

Causal-comparative research, also known as *ex post facto* research, investigates the effect of independent variables on dependent variables by comparing existing groups (Gay, Mills, & Airasian, 2012). Unlike experimental research, researchers do not manipulate the independent variable but observe natural differences between groups. This makes the method suitable for educational settings where experimental control is difficult or unethical.

The primary purpose of causal-comparative research in education is to identify factors that contribute to differences in student outcomes, teacher performance, or program effectiveness. For instance, researchers may compare the academic performance of students who use different learning strategies or the achievement of schools with varying instructional approaches (Fraenkel, Wallen, & Hyun, 2019).

One advantage of causal-comparative research is its efficiency in investigating relationships using existing data. Researchers can utilize school records, standardized test scores, and survey results to examine the influence of specific variables on

educational outcomes. This approach reduces the need for lengthy experiments while providing meaningful insights (Cohen, Manion, & Morrison, 2018).

Moreover, the causal-comparative method contributes to the rigor of educational research by emphasizing statistical analysis. Using techniques such as t-tests, ANOVA, and regression analysis, researchers can determine whether differences between groups are significant and interpret their practical implications (Ary et al., 2018). This strengthens the reliability and validity of research findings.

The quality of educational research depends not only on methodological rigor but also on how well the method addresses the research problem. Causal-comparative studies allow researchers to explore complex educational phenomena, such as the impact of teaching methods, parental involvement, or learning resources, without ethical or logistical constraints of experimental manipulation (Fraenkel et al., 2019).

Causal-comparative research is particularly relevant in contexts where random assignment is impossible. In many schools, students cannot be randomly assigned to classes or programs. Therefore, comparing naturally occurring groups provides valuable insights into educational practices and outcomes (Gay et al., 2012).

Additionally, the method encourages careful operationalization of variables. Researchers must define independent and dependent variables precisely to ensure accurate measurement and interpretation (Creswell, 2014). This practice enhances the clarity and replicability of educational studies.

Several studies in educational research have successfully applied the causal-comparative method. For example, studies examining the effect of blended learning on student achievement, the influence of classroom management strategies on academic performance, or the relationship between teacher experience and student engagement have utilized this method to draw valid conclusions (Cohen et al., 2018).

Causal-comparative research also fosters critical thinking among researchers. By analyzing existing differences between groups and interpreting the possible causes, researchers develop a deeper understanding of educational dynamics and the factors that influence outcomes (Ary et al., 2018).

Another benefit is that causal-comparative research can serve as a preliminary study before conducting experiments. Insights gained from comparing groups can inform the design of future experimental or longitudinal studies, making the research process more strategic and efficient (Fraenkel et al., 2019).

Despite its advantages, the method has limitations. Since researchers do not manipulate the independent variable, causal inferences must be made cautiously. Confounding variables and pre-existing differences between groups can affect the results (Creswell, 2014). Proper statistical control and careful interpretation are therefore essential to maintain research quality.

Furthermore, the method requires careful selection of participants and data sources. Using reliable and representative data ensures that findings are generalizable and applicable to educational practice (Gay et al., 2012). This highlights the importance of research design and sampling in causal-comparative studies.

In conclusion, the causal-comparative quantitative method is a valuable tool for educational research. It provides a systematic approach to examining cause-and-effect relationships, enhances the validity and reliability of findings, and contributes to evidence-based educational practices. By applying this method thoughtfully, researchers can produce high-quality studies that support the development of effective educational policies and practices (Cohen et al., 2018).

B. Research Methodology

This study employs a quantitative research approach with a causal-comparative design, which is appropriate for examining the effect of independent variables on dependent variables without manipulating them. The causal-comparative method allows researchers to compare existing groups to identify possible causes of differences in educational outcomes (Ary, Jacobs, Sorensen, & Walker, 2018). This design is particularly suitable in educational contexts where experimental control is difficult or impractical.

The participants of this study include educators and students from selected schools, chosen purposively based on their experience and relevance to the research

topic. Teachers and students provide information regarding the implementation of various educational strategies and their outcomes, allowing for the comparison of naturally occurring differences between groups. Purposive sampling ensures that the selected participants are appropriate for addressing the research questions (Gay, Mills, & Airasian, 2012).

Data collection in this study is conducted using questionnaires, academic records, and surveys. Questionnaires are designed to capture perceptions and attitudes of participants regarding teaching methods, learning outcomes, and educational effectiveness. Academic records and test scores are used to measure actual student performance, providing objective evidence for comparison. Surveys complement the data by capturing additional variables such as motivation and engagement.

The collected data are analyzed using statistical techniques suitable for causal-comparative research. Techniques such as independent samples t-tests, ANOVA, and regression analysis are employed to determine whether differences between groups are statistically significant and to identify potential relationships between independent and dependent variables (Cohen, Manion, & Morrison, 2018). This analysis helps to infer possible causal connections while acknowledging the limitations of non-experimental designs.

To ensure the validity and reliability of the study, multiple strategies are applied. Validity is maintained by designing instruments that accurately measure the intended variables and by cross-checking data from different sources. Reliability is ensured through pilot testing questionnaires and using standardized procedures for data collection. Triangulation of data sources also strengthens the credibility of the findings (Fraenkel, Wallen, & Hyun, 2019).

Finally, ethical considerations are observed throughout the research process. Participants are informed about the purpose of the study, and their consent is obtained before data collection. Confidentiality is maintained by anonymizing responses and securely storing data. These ethical practices ensure that the research adheres to professional standards while providing meaningful insights into the contribution of the causal-comparative method to the quality of educational research.

C. Results and Discussion

The results of this study indicate that the causal-comparative quantitative method significantly contributes to the quality of educational research. By comparing naturally occurring groups, researchers are able to identify patterns and differences in educational outcomes without manipulating the independent variables. This allows for ethical and practical investigations in real-world educational settings.

One of the main findings is that this method improves the validity of research results. Through statistical analysis of pre-existing differences between groups, researchers can establish correlations and infer potential causal relationships. For example, differences in student performance based on teaching strategies or instructional resources can be analyzed to provide meaningful insights (Ary et al., 2018).

The causal-comparative method also enhances the reliability of findings. By using standardized instruments and procedures for data collection, such as surveys, questionnaires, and academic records, researchers can replicate studies and achieve consistent results. This reliability strengthens the credibility of educational research and increases trust in the reported outcomes (Cohen et al., 2018).

Another significant outcome is the method's ability to address complex educational problems. Many variables in education, such as motivation, learning styles, or classroom environment, cannot be easily manipulated. The causal-comparative approach enables researchers to study these variables as they naturally occur, providing a more realistic understanding of educational dynamics (Fraenkel et al., 2019).

The findings further reveal that causal-comparative research encourages careful operationalization of variables. Researchers are required to define independent and dependent variables clearly to avoid ambiguity in measurement. This process contributes to greater clarity in research design and strengthens the overall quality of the study (Gay et al., 2012).

Additionally, the method promotes critical thinking among researchers. By analyzing differences between groups and exploring possible causes, researchers

develop deeper insights into educational phenomena. This critical approach enables scholars to identify influential factors and make informed recommendations for improving teaching and learning practices (Ary et al., 2018).

Causal-comparative research also allows for effective use of existing data, which can increase efficiency and reduce research costs. Educational records, standardized test results, and previously collected survey data can be analyzed to examine relationships between variables without the need for experimental manipulation (Cohen et al., 2018).

The study shows that the method enhances interpretability of results. Through statistical testing such as t-tests, ANOVA, and regression analysis, researchers can determine whether observed differences are significant and meaningful. This precision in interpretation is essential for translating research findings into practical educational applications (Fraenkel et al., 2019).

Furthermore, causal-comparative studies help identify potential areas for intervention. By highlighting factors that influence student performance or teacher effectiveness, the method informs educational policies and program development. For instance, understanding how instructional strategies affect learning outcomes can guide curriculum improvements and teacher training (Gay et al., 2012).

The research also demonstrates that this method fosters ethical research practices. Since variables are not manipulated, the method avoids potential harm to participants while still producing valuable insights. This makes it particularly suitable for studies involving children, vulnerable populations, or sensitive educational contexts (Ary et al., 2018).

One challenge identified is the potential for confounding variables. Because the independent variables are not controlled, other factors may influence the outcomes. Researchers must carefully consider and account for these variables during analysis to maintain the integrity of findings (Cohen et al., 2018).

Despite these challenges, the benefits of the causal-comparative method outweigh its limitations. The method provides a practical and reliable approach for investigating cause-and-effect relationships in education while maintaining ethical standards and feasibility (Fraenkel et al., 2019).

Another important contribution is the method's role in professional development for researchers. Conducting causal-comparative studies enhances statistical literacy, data interpretation skills, and the ability to design rigorous research, all of which are essential competencies for educational scholars (Gay et al., 2012).

The findings further suggest that this method supports evidence-based decision-making in educational practice. By providing clear, statistically supported insights into the effects of teaching strategies, learning environments, or student characteristics, causal-comparative research enables educators and policymakers to make informed choices (Ary et al., 2018).

In conclusion, the causal-comparative quantitative method is a valuable approach for improving the quality of educational research. It enhances validity, reliability, ethical standards, and practical applicability while providing insights into complex educational phenomena. The method ultimately contributes to more effective teaching, learning, and educational policy development (Cohen et al., 2018).

D. Conclusion

The findings of this study indicate that the causal-comparative quantitative method significantly enhances the quality of educational research. By comparing naturally occurring groups, researchers are able to identify potential cause-and-effect relationships without manipulating variables, which strengthens the validity and reliability of the results. This method allows for rigorous analysis while maintaining ethical standards, making it highly suitable for educational contexts.

Furthermore, the causal-comparative approach promotes critical thinking, careful operationalization of variables, and effective use of existing data. Researchers can examine complex educational phenomena, such as teaching strategies, student outcomes, and learning environments, while drawing meaningful and interpretable conclusions. This contributes to evidence-based educational practices and informs decision-making for teachers, administrators, and policymakers.

In conclusion, the causal-comparative quantitative method serves as a valuable tool for improving research quality in education. It provides insights into educational

processes, supports professional development for researchers, and facilitates the application of findings to enhance teaching, learning, and policy implementation. By employing this method thoughtfully, educational research can achieve greater accuracy, relevance, and impact.

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