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## Data Analysis Technique: Hypothesis Testing in the Field of Education

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### Abstrak

Dalam konteks penelitian pendidikan, pengujian hipotesis merupakan teknik analisis data yang penting. Dalam konteks ini, pengujian hipotesis digunakan untuk mengevaluasi berbagai klaim tentang bagaimana meningkatkan sistem pendidikan Islam. Penelitian ini merupakan penelitian kualitatif dengan menggunakan metode penelitian kepustakaan. Dengan merumuskan hipotesis nol dan alternatif yang jelas, melakukan pengumpulan data yang cermat, dan menggunakan analisis statistik yang tepat, manajemen pendidikan Islam dapat mengukur efektivitas program, mengidentifikasi dampak kebijakan, dan mengoptimalkan sumber daya dengan lebih efektif. Selain itu, pengujian hipotesis mendorong transparansi dan akuntabilitas dalam pengambilan keputusan, membantu terciptanya lingkungan pendidikan yang lebih baik dan berkualitas bagi siswa dan pemangku kepentingan. Itu sebabnya pengujian hipotesis sangat penting untuk meningkatkan kualitas pendidikan Islam dan membuat keputusan berdasarkan bukti.

Kata Kunci: *Teknik Analisis Data, Uji Hipotesis, Edukasi*

### Abstract

In the context of educational research, hypothesis testing is an important data analysis technique. In this context, hypothesis testing is used to raise various claims about how to improve the Islamic education system. This research is qualitative research using library research methods. By proposing clear null and alternative hypotheses, conducting careful data collection, and using appropriate statistical analysis, Islamic education management can measure program effectiveness, identify policy impacts, and optimize resources more effectively. Additionally, hypothesis testing promotes transparency and accountability in decision making, helping to create a better, quality educational environment for students and stakeholders. That's why hypothesis testing is very important for improving the quality of Islamic education and making decisions based on evidence.

Keywords: *Data Analysis Technique, Hypothesis Testing, Education*

## INTRODUCTION

Data analysis is one of the critical stages in the research and decision-making process. Within it, various methods and techniques are used to extract valuable information from the collected data. One of the most essential techniques in data analysis is hypothesis testing. Hypothesis testing is a statistical tool used to test claims or assumptions about a population or sample of data.

The phenomenon in the research world is constantly growing, especially in understanding the substance of the role of research support tools and the significance of research results. The development of understanding increasingly reveals that there is contemporary and phenomenal analysis to enrich conventional knowledge of research methods and tools that tend to be orthodox and rigid, adhering to fundamental theories.

The development of understanding leads to critical corrections of some rigid views based on standard theories and neglects the latest actual phenomena related to the research object. Learning is supported by global conditions, phenomena arising from the transdisciplinary nature of science, or the mixture of elements (variables) from different scientific bases. This developmental phenomenon is a positive and productive motivation to explore the substance of research using qualitative and quantitative methods and their supporting tools.

One of the supporting tools for quantitative research that will be discussed in this article is hypothesis. Hypotheses are standard and straightforward in quantitative analysis but crucial in guiding the research journey. Assumptions are needed to respond to research questions, thus serving as a reference for data collection. Referring to the role of ideas in research, understanding the substance, meaning, and formulation of hypotheses becomes important (Yam and Taufik, 2021).

If we assume that our assumptions about a population are correct, then we can use statistical hypothesis testing to determine whether or not our data sample is representative of the population as a whole. A data sample is a selection of items from a larger population for the purposes of analysis; the larger population includes all available items.

It is important to distinguish between hypothesis testing and estimate with quantifiable uncertainty when working with data. Frequentists in psychology have coined the term "New Statistics" to describe the movement away from hypothesis testing toward evaluation (Kruschke and Liddell, 2018).

## METHOD

This qualitative study uses the library research method, which leverages previous writings such as books, journals, and articles. These sources are then carefully processed to discover new knowledge that can benefit the academic and the general public (Kaharuddin, 2021). Literature studies consist of four steps: gathering the required materials, creating a working bibliography, scheduling time for reading and taking notes, and finally, collecting data through searching and reconstructing information from various sources like books, journals, and previous research. Content analysis and descriptive analysis form the basis of this study. Propositions and concepts are supported by a comprehensive and critical analysis of literature from a variety of sources (Kaharuddin, 2021).

## RESULTS AND DISCUSSION

Hypothesis testing is a statistical method used to validate or test a statement or assumption about a population based on the collected sample data. Hypothesis testing primarily aims to measure how much the observations or sample data support or refute the proposed hypothesis. In the hypothesis testing process, the primary objective is to determine how much the collected data supports  $H_0$  or  $H_1$ . The results of hypothesis testing provide information on whether we can reject  $H_0$ . As previously explained, a hypothesis stems from a theory about a specific event or phenomenon. Etymologically, the word "hypothesis" comes from two parts: "Hypo," meaning under, and "Thesa," telling the truth.

Sugiyono divides hypotheses into two categories: research hypotheses and statistical hypotheses (Sugiyono, 2014). Statistical inferences occur when research involves working with a sample; if the research does not use a model, then there are no statistical hypotheses in that study (Saat and Mania, 2019). Thus, in the research process, there may be research hypotheses without any statistical hypotheses.

Therefore, a hypothesis, later adapted to Indonesian spelling as "hipotesa" and further evolving into "hypothesis," is a temporary answer to a phenomenon or research question formulated after the researcher examines specific theories (Annur, 2018). In various literature, the definition of a hypothesis is constructed by experts from multiple perspectives. Creswell and Creswell (2018) state, "A hypothesis is a formal statement presenting the expected relationship between independent and dependent variables." Based on the definitions from several experts, it can be concluded that a hypothesis has several essential components, namely temporary assumptions, relationships between variables, and a truth test.

Understanding hypotheses involves three main processes: 1) Searching for a

foundation to formulate hypotheses; 2) Formulating premises or theories related to bridging the gap between dependent and independent variables to build analysis; and 3) Choosing the appropriate statistics as a testing tool. Thus, the substance of a hypothesis is a temporary statement based on norms related to a phenomenon or research case and will be tested with an appropriate method or statistics (Yam and Taufik, 2021).

Theory and hypothesis are essential tools for researchers to prove the truth by explaining social phenomena through controlled testing. Therefore, one crucial step in research is formulating hypotheses with measurable variables, allowing systematic and practical hypothesis testing. In addition to attempting to explain relationships to describe a social phenomenon, a hypothesis is also a prediction that can be empirically tested (Adiyanta, 2019).

Hypothesis testing is a logical process in quantitative scientific research and falls within inferential statistics using statistical testing tools (Emmert-Streib and Dehmer, 2019). The hypothesis testing stage is not a formal ritual in quantitative analysis but a formal obligation to use test results to conclude further investigation.

Etymologically, statistics refer to a collection of information consisting of numbers or numerical values. In the context of activities, statistics involve data collection, organization, announcement, reporting, and data analysis (Supardi, 2017). As a method, statistics serve as an approach to solving problems through data collection, organization, presentation, research, and providing interpretation and conclusions for the issues at hand.

Another reason supporting the obligation of hypothesis testing is that statements in hypotheses are still tentative conclusions with weak levels of truth. Therefore, ideas must be tested with statistics to decide the significance of accepting or rejecting the opinions stated in the research hypotheses (Yam dan Taufik, 2021).

In this context, there are two types of statements involved in hypothesis testing:

1. Null Hypothesis ( $H_0$ ): This initial hypothesis is proposed without previous evidence. Typically,  $H_0$  states that there is no difference, no effect, or no relationship between the tested variables.
2. Alternative Hypothesis ( $H_1$ ): This is the hypothesis that contradicts  $H_0$ . An important distinction, effect, or connection between the two factors being compared is postulated here.

The hypothesis testing process involves several systematic steps:

1. First, depending on the study topic, you should formulate your hypotheses, including a null ( $H_0$ ) and an alternative ( $H_1$ ) hypothesis.  $H_0$  normally comprises a declaration stating there is no impact or difference, whereas  $H_1$  carries a message to the contrary.

2. The data needed for the study must be painstakingly gathered in accordance with the study's planned methodology.
3. The data is analyzed using a suitable statistical approach, and then tested. The data and the research topic determine the statistical analysis that will be performed.
4. The significance level, which quantifies the amount of uncertainty we can tolerate when making judgments, must be established before any statistical tests can be run. In most cases, a significance threshold of 0.05 or 0.01 is used.
5. Statistical Test Calculation: In this step, the test statistic value is calculated based on the collected data. This value will be compared to critical values corresponding to the predetermined significance level.
6. Drawing Conclusions: The statistical test results are used to draw conclusions. If the test statistic value is greater than the critical value at the set significance level, we can reject  $H_0$ . Conversely, if the test statistic value does not reach the critical value, we fail to reject  $H_0$ .
7. Results Interpretation: After concluding, the results of hypothesis testing must be interpreted in the research context. Can  $H_0$  be accepted or rejected? What are the implications for the research question?

#### Example Data Analysis Techniques: Hypothesis Testing in Islamic Education Management

1. Influence of Teacher Leadership and Classroom Management Skills on Fourth-Grade Student Learning Behavior

Research Objective: To determine if teacher leadership and classroom management skills influence the learning behavior of fourth-grade students. This is a quantitative survey using the survey method. The sample size, determined using the Slovin formula, is 30 respondents. Data collection is done through a questionnaire. Hypothesis Testing:

- a. The first hypothesis testing (partial test t) resulted in  $t\text{-value} = 5.108 > t\text{-table} = 2.052$  with significance  $0.000 < 0.05$ , meaning rejecting  $H_0$  and accepting  $H_1$ . This indicates teacher leadership's vivacious and significant influence on student learning behavior.
- b. The second hypothesis testing (partial test t) resulted in  $t\text{-value} = 5.114 > t\text{-table} = 2.052$  with significance  $0.000 < 0.05$ , meaning rejecting  $H_0$  and accepting  $H_1$ . This indicates classroom management's vivacious and significant influence on student learning behavior.
- c. The third hypothesis testing (simultaneous test F) resulted in  $F\text{-value} = 71.873 > F\text{-table} = 3.35$  with significance  $0.000 < 0.05$ , meaning rejecting  $H_0$  and accepting  $H_1$ . This indicates that teacher leadership and classroom management

simultaneously positively and significantly influence learning behavior (Rahayu and Susanto, 2018).

## 2. Influence of School Principal Leadership, Teacher Commitment, Work Discipline, and School Culture on Vocational High School Teacher Performance

Research Objective: To investigate the influence of school principal leadership, teacher commitment, work discipline, and school culture on teacher performance in State Vocational High Schools in Sleman Regency, Yogyakarta. This correlational research uses a quantitative approach.

Population and Sample Size: The population includes all teachers in State Vocational High Schools in Sleman Regency (659 individuals), with the sample size determined using random sampling techniques. Hypothesis Testing:

- a. Leadership hypothesis testing shows a positive and significant influence on teacher performance.
- b. Teacher commitment hypothesis testing shows a positive and significant influence on teacher performance.
- c. Teacher work discipline hypothesis testing positively and significantly influences teacher performance.
- d. School culture hypothesis testing shows a positive and significant influence on teacher performance.
- e. Simultaneous testing shows a positive and significant influence of leadership, teacher commitment, work discipline, and school culture on teacher performance (Binjei, 2021).

## 3. Influence of School Climate and Work Motivation on Teacher Performance

Research Objective: To determine the influence of school climate on teacher performance and the impact of work motivation on teacher performance. The subjects are teachers at MAN 2 Model Kota Medan, with a sample size of 91 respondents. This quantitative correlational research has two independent variables and one dependent variable. Hypothesis Testing:

- a. School climate hypothesis testing positively and significantly influences teacher performance (coefficient = 0.403).
- b. Work motivation hypothesis testing positively and significantly influences teacher performance (coefficient = 0.428).
- c. Overall conclusion: Improvements in teacher performance can be achieved through improvements in school climate and work motivation, accounting for 40.3% of the variance (Dongoran and Batubara, 2021).

Hypothesis statements are formulated to determine the level of significance to be used. This is necessary because researchers will face the possibility of errors in decision-making during testing (Sutopo and Slamet, 2017). There are two types of errors: Type I error, commonly referred to as  $\alpha$ , and Type II error, commonly referred to as  $\beta$  (Walpole, R.E., Myers, R.H., Myers, S.L and Ye, 2015).

After the hypothesis statements and the significance level are determined, the next step is to select the appropriate test statistic (Mufarrikoh, 2020). Using hypothesis testing, administrators in the field of Islamic education may investigate competing claims and hypotheses about how best to advance the field. The aforementioned cases show how hypothesis testing may be used to analyze the impact of various variables on student achievement in an Islamic school.

## CONCLUSION

Hypothesis testing is an important method in educational research because it helps policymakers and educators evaluate the efficacy of different programs and policies and adopt data-informed actions to improve education. Testing hypotheses systematically helps Islamic schools do better at what they do, makes better use of the resources they have, and increases their responsibility to their constituents. This helps to create a classroom that is more open and high-quality for kids.

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