

PERFORMANCE ANALYSIS OF TEACHER DEVELOPMENT BUDGET EFFICIENCY BASED ON DATA ENVELOPMENT ANALYSIS (DEA): A CASE STUDY AT SDN TELUKJAMBE TIMUR FOR THE 2023-2024 FISCAL YEAR

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Received: 03/03/2026 | Revised: 15/03/2026 | Accepted: 05/04/2026 | Published: 11/04/2026

Abstract

This study aims to analyze the efficiency level of teacher development budget management in six public elementary schools in Telukjambe Timur District for the 2023–2024 fiscal year using the Data Envelopment Analysis (DEA) approach with a CCR model with an input orientation. Input variables consist of the teacher development budget and the number of teachers, while output variables include the number of development activities and the Teacher Performance Assessment (PKG) score. The quantitative approach is supported by qualitative data through interviews to enrich the interpretation of the results. DEA findings indicate that the efficiency level between schools is unstable and tends to decline. In 2023, there were two efficient schools, while in 2024, no schools reached the efficiency frontier. Inefficiency mainly stems from budget overruns and a lack of development activities that are far below the DEA projection, even though the PKG score in 2024 is in optimal condition. Qualitative results show that budget planning is not fully needs-based, activity implementation is hampered by delays in BOS disbursement, and monitoring and evaluation do not utilize data optimally. This study recommends strategic improvements through strengthening data-driven planning, optimizing teacher development activities, improving documentation, and implementing continuous monitoring and evaluation. Overall, the research confirms that budget efficiency is not only determined by the size of input, but also by the quality of governance of teacher development programs.

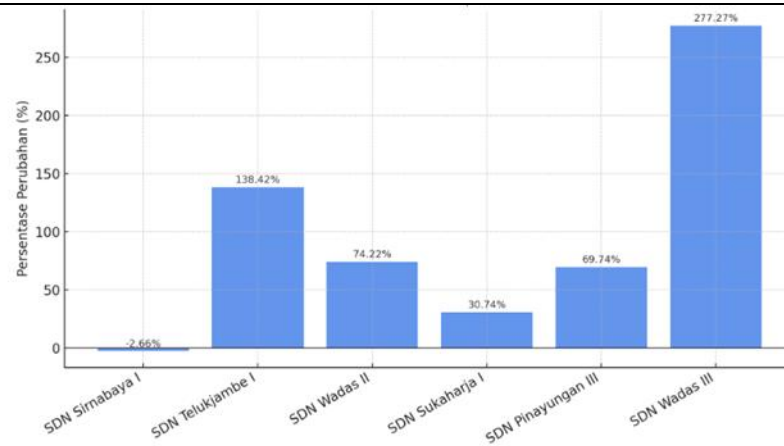
Keywords: *Budget Efficiency, Teacher Development, Data Envelopment Analysis, Teacher Competency, BOS.*

INTRODUCTION

The quality of education is greatly influenced by the quality of teachers, the primary implementers of the learning process. Teachers function not only as instructors but also as facilitators and agents of change, determining the direction and success of the educational process. Therefore, developing teacher competency is a strategic priority in national education policy, and the government has provided funding support through the School Operational Assistance Fund (BOS), which can be used for teacher competency improvement activities. However, each school's capacity to develop teacher competencies varies because the amount of BOS funds depends on the number of students. Initial analysis of six public elementary schools in East Telukjambe District showed variations in BOS funding receipts, with a difference of more than twofold between schools. Schools with large student populations received significantly higher funding than schools with small student populations, thus providing greater fiscal space to conduct teacher competency improvement activities. This disparity is also reflected in the allocation of specific funds for teacher development. This data can be seen in the following diagram:

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In Fiscal Year 2024, several schools increased their teacher development budgets by between 70% and nearly 300% compared to the previous year, demonstrating a stronger commitment to improving educator quality. For example, one school more than doubled its teacher development budget, while another nearly quadrupled its budget allocation from the previous year. Conversely, several schools experienced budget allocation decreases of around 2–3%, indicating shifting priorities or funding constraints. This difference in upward and downward trends indicates that teacher development priorities are uneven across schools. Schools with significant budget increases tend to be able to organize more training activities, while schools with budget decreases are likely to experience stagnation in teacher competency development efforts. This imbalance can ultimately impact the quality of learning and create disparities in educational quality across schools within a region.

However, budget increases do not necessarily indicate efficient use. No empirical studies have yet assessed whether budget increases or decreases result in comparable development outputs, such as the number of training activities or improved Teacher Performance Assessment (PKG) scores. This is where efficiency analysis becomes crucial. The Data Envelopment Analysis (DEA) approach allows for assessment of relative efficiency across schools by comparing inputs (budget size and number of teachers) with the resulting outputs. Given these conditions, this research is important to provide a comprehensive picture of the efficiency of teacher development budget use, understand the management process, and formulate strategic recommendations so that fund allocation can be more optimal to support improvements in the quality of learning.

LITERATURE REVIEW

Performance

Fahmi, quoted (Rusmana, 2020) states that performance is the results achieved by an organization, whether profit-oriented or non-profit-oriented, over a period of time. King, quoted (Maulana, 2025) states that performance is a person's activity in carrying out the main tasks assigned to them. Kotler, quoted (Febrianty, 2020) states that consumer satisfaction is a consumer's feeling, either in the form of pleasure or dissatisfaction, that arises from comparing a product with consumer expectations for that product. From the theories above, we can see that performance is the result of an employee's work in achieving the activities carried out by the employee to realize the goals, vision, and mission of an organization. Therefore, the researcher concludes that the definition of performance is the result of an employee's work in a process or implementation of tasks according to their responsibilities in a certain period which can influence the achievement of a particular organization.

Efficiency

Mardiasmo, quoted by (Marantika, 2020) defines efficiency as the comparison between physical output and physical input. The higher the ratio of output to input, the higher the level of efficiency achieved. Septiana, quoted by (Fardiansyah, 2022) explains that efficiency is a performance parameter that theoretically underlies all company performance. Its ability to produce maximum output with existing input is a measure of expected performance. Novendra, quoted by (Athik Hidayatul Ummah, 2021) explains that efficiency is a term that indicates the success of an individual or organization in their efforts, measured by the amount of resources used to achieve the results of their activities. Efficiency can also be defined as the comparison between input and output. It can be concluded that

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efficiency can also be defined as achieving maximum output from the use of certain resources. If the output produced is greater than the resources used, the higher the efficiency achieved.

Budget

Fuad, as quoted by (Erfiyana, 2025) explains that a budget is a systematically compiled plan in numerical form and expressed in monetary units, encompassing all company activities for a specific period in the future. Warnaningtyas, as quoted by (Arifudin, 2020) explains that a budget is a statement of a management plan and policy used as a guide for activities within a sequence of periods. Hendri et al., as quoted by (Arifudin, 2021) explain that a budget plan is a calculation of the total costs required for materials and wages, as well as other costs related to the implementation of a development project. It can be concluded that budgets are used by large companies for financial management. However, we can also find budgets in everyday life, such as monthly shopping budgets.

Teacher Training

Akmal quoted (Kartika, 2023) explains that the development of a teacher's professionalism basically grows through a sharpening process or through an academic development process, meaning that a teacher who has gone through academic development will certainly grow in professional development according to the field of development of science, education and professionalism that an educator is pursuing, so it is not said to be professional if a teacher experiences obstacles in academic development. Amini quoted (Supriatna, 2026) explains that the development referred to is a condition that makes teachers continuously able to improve their knowledge and skills. The Ministry of National Education quoted (Erfiyana, 2026) explains that development is an action or activity carried out effectively and efficiently to obtain good results. The development activities referred to in this case are teacher competency development carried out in the teacher's life. From the explanation above, coaching is a training process by learning new things that are not yet owned and developing things that already exist, with the aim of improving teacher professionalism in improving the learning process and learning outcomes and teachers also increase insight and knowledge that they have not previously obtained.

METHOD

According to Rahardjo, as quoted by (Arifudin, 2025) a research method is a way to obtain and seek tentative truth, not absolute truth. The result is scientific truth. Scientific truth is open to continuous testing, criticism, and even revision. Therefore, there is no best method for seeking truth, but rather the appropriate method for a specific purpose based on the existing phenomenon. Budiharto, as quoted by (Kartika, 2024) states that the choice of research method must be tailored to the research being conducted to achieve optimal results. This research uses mixed methods with a design. Concurrent Embedded, where the quantitative approach is the primary method and the qualitative approach plays a supporting role. John W. Creswell quoted (Kartika, 2025), explains that this (mixed) approach is more complex than simply collecting and analyzing two types of data, but involves the functions of both research approaches collectively so that the overall strength of this research is greater than quantitative and qualitative research.

A quantitative approach is used to measure the efficiency of teacher development budget management through techniques. Data Envelopment Analysis (DEA) CCR model, with inputs in the form of the teacher development budget and the number of teachers, and outputs in the form of the number of development activities and the average PKG score. A qualitative approach was used to enrich the quantitative findings through in-depth interviews with the principal, treasurer, and teachers at each school. The research was conducted in six elementary schools in Telukjambe Timur District-SDN Sirnabaya I, SDN Telukjambe I, SDN Sukaharja I, SDN Pinayungan III, SDN Wadas II, and SDN Wadas III-in the 2023–2024 fiscal year. The six schools produced 12 Decision Making Units (DMU) that meets the requirements of at least three times the number of inputs–output variables for DEA analysis. Data collection was conducted in September–December 2025 through documentation, interviews, and observations.

Technique can be seen as a means of carrying out technical work carefully using the mind to achieve goals. Although the study is an effort within the scope of science, it is carried out to collect data realistically and systematically to realize the truth. Research methodology is a means to find a cure for any problem. In this case, the author collected information about the Performance Analysis of Teacher Development Budget Efficiency Based on Data Envelopment Analysis (DEA): Case Study at SDN Telukjambe Timur Fiscal Year 2023-20224, articles, journals, theses, ebooks, and others (Arifudin, 2026). Because it requires library materials for its data sources, this research utilizes library research. Researchers require books, scientific articles, and other literature related to the topics and issues they are exploring, both printed and online (Supriatna, 2025). Finding information from data sources requires the use of data collection techniques. Amir Hamzah in (Karwati, 2026) claims that data collection

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is an effort to gather information related to the subject matter being studied. The author uses a library research method to collect data. Specifically, the author starts with the library to collect information from books, dictionaries, journals, encyclopedias, papers, periodicals, and other sources that share the views of Data Envelopment Analysis (DEA) Data-Based Budget Efficiency Performance Analysis for Teacher Development: A Case Study at SDN Telukjambe Timur in the 2023-2024 Fiscal Year. Furthermore, Amir Hamzah in (Ratnaningsih, 2026) states that data collection is defined as various efforts to gather facts related to a topic of discussion being or will be explored. These details can be found in scientific literature, research, scientific writings, dissertations, theses, and other written sources. According to (Andrivat, 2024), data collection can be conducted in various situations, using different sources, and employing different techniques.

Data were collected using quantitative and qualitative data collection techniques. Quantitative data were gathered from the RKAS (Work Plan and Budget Implementation Plan), budget realization reports, teacher training implementation documents, and PKG documents, while qualitative data were obtained through semi-structured interviews. Moleong, quoted (Kartika, 2022), explains that the collected data was analyzed using an interactive analysis model consisting of data reduction, data presentation, and conclusion drawing. Meanwhile, Syarifah et al. in (Andrivat, 2025) explain that data reduction is carried out by filtering relevant information, presenting data in a systematic narrative form, and drawing conclusions based on research findings. To ensure data validity, this study used source triangulation, namely comparing information from sources. According to Moleong in (Kartika, 2026), source triangulation helps increase the validity of research results by comparing various perspectives on the phenomenon being studied.

Muhadjir in (Mayasari, 2025) stated that data analysis is an activity of conducting, searching and compiling records of findings systematically through observations and interviews so that the researcher focuses on the research being studied. After that, making a finding material for others, editing, classifying, and presenting it. Data validity techniques using triangulation techniques include techniques and sources. Data analysis using the Miles and Huberman model in (Nurazizah, 2026) consists of data collection, data reduction, data presentation, and drawing conclusions. Quantitative data analysis was performed using MaxDEA Lite software version 12.2 with input orientation. The results of the analysis produced efficiency scores, benchmark, proportionate movement, slack movement, projection, and dual price, which was used to assess each school's efficiency and determine recommendations for improvement. Meanwhile, qualitative data analysis was conducted using the Miles & Huberman interactive model, which includes data reduction, data presentation, and conclusion drawing. The integration of both types of data was carried out during the interpretation stage, so that the quantitative analysis results were strengthened by qualitative findings regarding strategies, constraints, and the process of managing teacher development budgets.

RESULTS AND DISCUSSION

Research Result

The results of quantitative research through Data Envelopment Analysis (DEA) analysis show that the level of efficiency of teacher development budget management in six elementary schools in Telukjambe Timur District still varies and is not consistent between years.

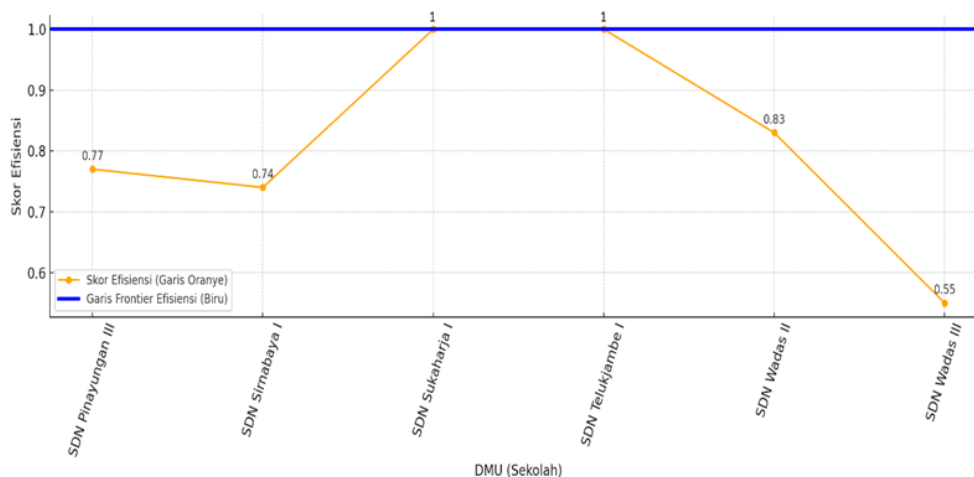


Figure 4.1 Graph of Teacher Development Budget Efficiency Score for 2023

The graph above shows that in 2023, only two schools achieved maximum efficiency with a score of 1.00, namely SDN Sukaharja I and SDN Telukjambe I, while the other four schools were in the score range of 0.55 to 0.83.

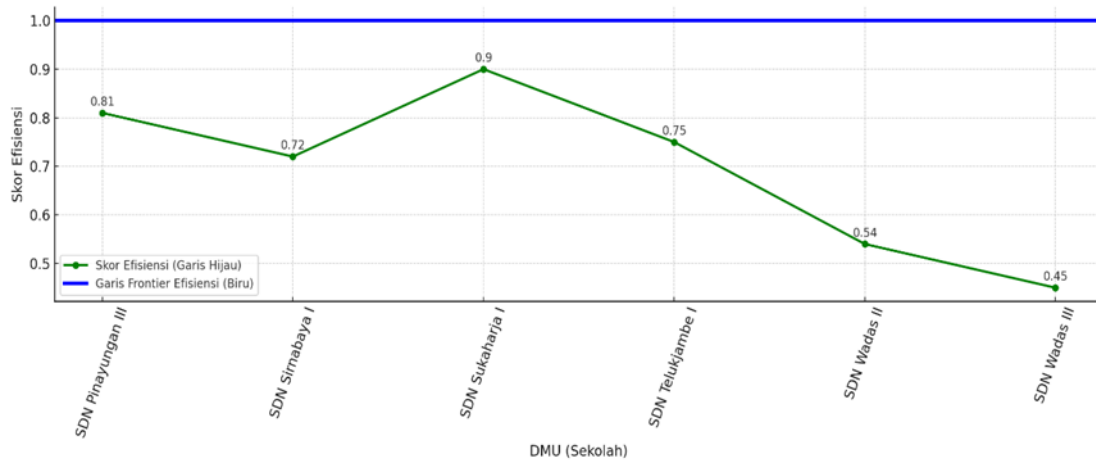


Figure 4.1 Graph of Teacher Development Budget Efficiency Score for 2024

This situation changes in 2024, where not a single school is on the efficiency frontier. The highest score was achieved by SDN Sukaharja I with 0.90, while the lowest score was achieved by SDN Wadas III with 0.45, indicating a general decline in efficiency. This inefficiency is primarily caused by an imbalance between input and output. The input variable, namely the teacher development budget, shows a significant overallocation. For example, SDN Telukjambe I allocated Rp14.46 million in 2024, even though the DEA projection was only Rp5.07 million. The variable number of teachers also shows a surplus in several schools in 2023, which does not have a significant impact on output. On the output side, the variable number of activities is the most dominant factor causing inefficiency because all schools show a significant shortage of activities compared to the optimal needs of the DEA model. However, the Teacher Performance Assessment (PKG) variable shows positive developments in 2024, marked by zero slack in all schools, so that teacher performance achievements have met optimal standards.

Qualitative findings support this situation by showing that teacher development budget planning has been conducted, but not through a dedicated forum and not fully based on an analysis of teacher needs. Implementation has faced numerous obstacles, particularly delays in the disbursement of BOS funds, which impacted the implementation of training activities. Schools have subsequently implemented various adaptation strategies, such as using bridging funds, rotating teacher training, or reducing training activities. Nevertheless, teachers have demonstrated high motivation to continue participating in competency development activities. Administratively, several schools have not yet completed accountability documents optimally. Monitoring and evaluation processes have been implemented internally and externally, but recommendations are not fully data-based, so follow-up improvements have not significantly increased efficiency. Overall, the research results show that increasing inputs in the form of budgets and the number of teachers does not always produce optimal output, primarily because the number of teacher development activities still does not meet the needs targets indicated by the DEA analysis.

Discussion

The results of the discussion indicate that variations in the efficiency of teacher development budget management in six elementary schools in Telukjambe Timur District align with the concept of technical efficiency proposed by (Farrell, 1957), which states that inefficiency occurs when the input used is not directly proportional to the output achieved. DEA findings indicate an excess of input, especially in budget variables, where some schools allocate funds far above the optimal value recommended by the model. This condition confirms the findings of (Bousofiane et al, 1991) that resource waste occurs when budget allocations are not based on actual needs. The variable number of teachers also shows a surplus in several schools, which according to (Johnes, 2006) does not automatically increase productivity if not balanced by increased professional development activities. The most dominant factor in inefficiency is the low number of teacher development activities, far from the ideal number of DEA analysis results. This is in line with (Fitriani, 2021) and (Zahra & Nurhayati, 2023) which emphasize that the frequency of professional development activities has a significant effect on improving the quality of learning and teacher performance. Meanwhile, the increase in PKG scores in 2024, which reached optimal conditions, supports

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the theory (Rahmawati dan Kurniawan, 2023), that improving teacher competency is not only formed through formal training, but also through learning communities, academic supervision, and informal collaboration between teachers.

Qualitatively, the discussion indicates that the budget planning process has not been conducted through a dedicated forum, resulting in program priorities not being fully data driven. This contradicts the educational planning principle proposed (Uno, 2016), which states that effective planning must be based on an analysis of needs and real-world conditions. Variation in funding sources across schools also significantly impacts the ability to set priorities, consistent with findings (Suryana, 2021) that schools with diversified funding tend to be more adaptive in meeting teacher development needs. At the implementation stage, delays in the disbursement of BOS funds are an external factor hindering the smooth running of the program, as also found in a study (Wirawan et al, 2023) that found that timely education funding is crucial for the successful implementation of school programs. Adaptive strategies implemented by schools, such as rotating teacher training and disseminating training results, support the peer learning concept recommended by the OECD (2020), although implementation has not been entirely consistent each year.

During the monitoring and evaluation phase, both internal and external monitoring and evaluation (M&E) implementation failed to produce data-based recommendations, resulting in no significant improvements in follow-up. This situation reinforces the view (Robbins dan Coulter, 2018) that decision-making without empirical data tends to result in ineffective policies. The DEA findings, which showed a decline in efficiency in 2024, also demonstrate that the PDCA cycle has not been running effectively, particularly at the Act phase, which should ensure continuous improvement and closing the loop for each recommendation. This is consistent with Deming's quality management principles, which emphasize that PDCA must be systematic and evidence-based to produce sustainable improvements in organizational performance. Therefore, this research discussion indicates that the inefficiency that occurred was not only caused by large inputs that were not balanced by outputs, but also influenced by weak data-based planning, inconsistent program implementation, and suboptimal evaluation follow-up.

Based on the research and discussion, a series of strategic recommendations are needed to improve the management of teacher development budgets to make them more effective and efficient. These improvements are structured based on the PDCA cycle framework so that each stage is integrated and results in sustainable improvement. At the Plan stage, schools need to form a Special Planning Forum (FPK) involving the principal, treasurer, core teachers, committees, supervisors, and learning community administrators. This forum is tasked with developing teacher development plans based on needs analysis through a Training Needs Assessment (TNA) using indicators from the PKG results, competency gaps, training participation history, and curriculum demands. The preparation of the RKAS must also be based on quantitative data from the DEA results, such as projection and slack values, so that budget allocation is more proportional and does not result in excess input as found in this study. Integration of various funding sources from Regular BOS, Performance BOS, partnerships, and internal school funding is also necessary to ensure the sustainability of competency development activities.

In the Do phase, the implementation of teacher development activities needs to be strengthened through the implementation of a structured training rotation system, so that all teachers have equal opportunities to participate in training and are required to disseminate training results to school learning communities. Risk management resulting from delays in BOS disbursement must be anticipated by providing a buffer fund, simplifying partnership procedures, and developing an annual training calendar established at the beginning of the year. Strengthening accountability for implementation and reporting is carried out through the implementation of standard LPJ templates, digital evidence, and the use of electronic assignment letters to improve administrative order.

In the Check phase, the monitoring and evaluation process needs to be directed towards the use of data-based evaluation instruments, particularly the DEA efficiency indicator, so that evaluations are no longer as assumptions as they were previously. Quarterly evaluations using a mini dashboard are necessary to monitor budget realization, activity implementation, teacher participation, and competency development. Involving the learning community not only as activity implementers but also as evaluators of teacher competency development can increase the validity of monitoring results. The final stage, Act, emphasizes the importance of developing an evidence-based action plan that draws on the results of input-output evaluations and activity gaps. Each evaluation finding must be processed into concrete recommendations that are fed back into the planning stage of the following period through a closed-the-loop mechanism, ensuring mistakes are not repeated and good practices can be standardized. Schools are also advised to prepare quarterly improvement reports to the education office and learning community to strengthen accountability and ensure that improvements are sustainable. By implementing this strategy, teacher development budget

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management is expected to become more efficient, measurable, and aligned with teacher competency needs in facing the dynamics of education policy.

CONCLUSION

The results of the study indicate that the efficiency level of teacher development budget management in six public elementary schools in Telukjambe Timur District remains low and has experienced instability from 2023 to 2024. Quantitative analysis using DEA confirms that inefficiency is primarily caused by an imbalance between input and output, specifically budget overallocation and a minimal number of competency development activities. Although the teacher PKG score in 2024 reached the optimal level according to the DEA model, this increase was more influenced by informal activities such as learning communities, coaching, and academic supervision, rather than structured formal training. Qualitative findings indicate that program planning is not yet needs-based, activity implementation is still hampered by delays in BOS funds, monitoring and evaluation do not use adequate data, and follow-up on recommendations has not had a significant impact on efficiency improvements. Overall, this study confirms that the size of the budget is not always directly proportional to the improvement of teacher competency if it is not accompanied by a systematic planning, implementation, and evaluation system.

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