Efficiency of Managing State Madrasah Aliyah through Data Envelopment Analysis Method in Aceh Province

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ABSTRACT

This research aims to analyze the level of efficiency in the administration of Madrasah Aliyah Negeri (MAN) in Aceh Province by comparing input and output aspects and identifying the determinant factors influencing the efficiency of the madrasah. The method used is descriptive quantitative. The population in this study consists of all MAN in Aceh Province, totaling 69. Through purposive sampling technique, a sample of 12 madrasah was obtained. The data analysis technique employed the Data Envelopment Analysis (DEA) method and Tobit regression test. The results indicate that the efficiency level in the administration of MAN in Aceh Province reaches 86.7%, classified as "highly efficient." The MANs categorized under the "perfectly efficient" cluster include MAN 4 Aceh Besar, MAN 1 Banda Aceh, MAN 4 Aceh Timur, MAN 4 Aceh Utara, MAN 3 Aceh Besar, and MAN Aceh Barat Daya. The "highly efficient" cluster consists of MAN 2 Bireuen and MAN 3 Bireuen. The "upper-middle efficiency" cluster includes MAN 1 Langsa, MAN 3 Banda Aceh, and MAN 1 Pidie. Meanwhile, the "middle" cluster is represented by MAN 2 Langsa. The primary source of inefficiency comes from excessive input usage and imbalanced output. Factors contributing to inefficiency include the student-teacher ratio, student-class ratio, number of certified teachers, and the number of graduates accepted into public universities. Although the DEA analysis and Tobit regression provided in-depth understanding, this approach has not been able to consider qualitative factors that may influence the efficiency of the madrasah. Organizational culture and the madrasah environment are expected to be considered for further in-depth study in subsequent research.

Keywords: efficiency; data envelopment analysis; tobit regression; madrasah efficiency

1. INTRODUCTION

The development of madrasahs in Indonesia, quantitatively, shows a significant upward trend. Based on data available from the EMIS (Education Management Information System) of the Ministry of Religious Affairs over the past two years, an increase in the number of madrasahs has occurred at every educational level, from Raudlatul Athfal to Madrasah Aliyah. The average increase is 1.55%, with Madrasah Aliyah experiencing the largest growth of 3.55%, adding 324 madrasahs in 2022 (Kementerian Agama, 2023). However, this increase in the number of madrasahs has not corresponded with improvements in quality (Kurniawan, 2019).

The low quality of madrasahs can be identified from several research reports that measure various quality indicators of madrasahs, such as the management of madrasahs that is still not optimal, the performance of teachers, and the leadership of madrasah principals, as well as the professionalism of teachers (Abubakar, 2016; Iskandar, 2019; Muharyadi, 2019). In fact, the stigma that madrasah are seen as a second choice compared to schools is also an important issue in assessing the quality of madrasah today (Chandra, 2020). Another indicator commonly used to measure the quality of educational institutions, including Madrasahs, is the results of accreditation.

For example, the research by Susetyo & Muksin, (2022) conducted a mapping of the quality of Madrasahs in Indonesia based on accreditation results. The findings indicate that the percentage of Madrasahs with a "B" accreditation is still below 50%. On the other hand, the accreditation results for newly accredited Madrasahs are actually lower compared to those that have undergone reaccreditation. This fact also suggests that the increase in the quantity of Madrasahs, as previously mentioned, is not accompanied by an improvement in quality. Additionally, private Madrasahs contribute to the low quality of Madrasahs nationally based on accreditation results (Kementerian Agama Republik Indonesia, 2009).

The quality of madrasah based on input components can be assessed through teacher performance. Findings from several research reports indicate that certified teachers in Madrasah Tsanawiyah have not yet made a significant impact on improving pedagogical competencies (Raikhan, 2019). Research by Marannu, (2019) also demonstrates that the utilization of teacher certification allowances has not been optimally leveraged for enhancing learning. Furthermore, the competencies of educational staff in madrasah, in several studies, still show weaknesses. This is evident in various aspects such as subject matter expertise, managerial skills, and academic service capabilities (Aristianingsih et al., 2022; Israpil, 2018).

In the process aspect, several weaknesses were identified, such as teachers' ability to prepare lesson plans, their ability to implement and develop innovative learning models, and their performance in the learning process. In fact, the level of performance in implementing this learning is below 60% (Abidin, 2020; Aufa & Oktradiksa, 2019; Hairi, 2019; Ratnasari et al., 2021). From the perspective of output and outcome, the results of the 2022 National Entrance Examination for State Universities through the Computer-Based Written Test (UTBK) were still dominated by schools. According to data from the Higher Education Entrance Test Institute (LTMPT), among 100 secondary education institutions with the highest rankings, 11% were from Islamic Senior High Schools (MA), while 89% predominantly came from regular schools (Lembaga Tes Masuk Perguruan Tinggi, 2023).

The disparity in output achievements between madrasah aliyah and secondary schools occurs not only at the national level but also at the regional level, as seen in

Aceh Province. In terms of optimizing output, the disparity between madrasah and schools can be examined through the achievements of madrasah in national competitions such as the Madrasah Science Competition and the Student Science Olympiad. The performance of MAN in Aceh Province participating in Madrasah Science Competition 2022 showed that only one MAN achieved national recognition from the 69 MAN present in Aceh (Kanwil Kemenag Aceh, 2022). This competition is quite significant for mapping the quality of educational institutions, including madrasah. Madrasah Science Competition is organized by the Ministry of Religious Affairs but is open to schools from the Ministry of Education, Culture, Research, and Technology, making it highly competitive.

From the aspect of outcome quality, the weak quality of MAN implementation in Aceh Province can be observed from the achievements in the State University Entrance Test. As shown in Table 3, over the past three years, only one MAN in 2022 managed to be listed among the top 1,000 Schools/Madrasah with the highest scores nationwide. Compared to schools, MAN's performance in this regard still requires greater efforts to catch up. Even when compared nationally, the quality position of education in Aceh Province, based on the National Examination scores in 2019, also needs improvement. No schools/madrasah in Aceh Province made it to the category of the top 100 National Examination scores in Indonesia (Neraca Pendidikan Daerah Kemendikbud, 2023). Furthermore, when ranked by province, Aceh Province has not yet secured a place among the top 10 nationally.

Several study results and factual data that have been presented indicate that the quality of madrasahs at the national level is indeed not optimal. Research conducted by Yasin, (2022) using a library research approach shows that there are several factors contributing to the suboptimal quality of madrasahs in Indonesia, including low teacher quality, inadequate madrasah facilities, insufficient numbers of educators, inadequate availability of books, budget constraints, weak performance of madrasah supervisors, and poor management practices.

This lagging quality should serve as a basis for stakeholders to promptly undertake efforts to improve quality through evaluation (Maryadi, 2019). Evaluation is one method that can be used to obtain information regarding the fulfillment of aspects and components that serve as indicators of madrasah quality and to determine whether the outputs and outcomes produced have met educational objectives (Elis Ratna Wulan & Rusdiana, 2015).

One component in evaluation that can be used as a medium to determine the achievement of these goals is efficiency analysis (Putri, 2019). Efficiency analysis is important to determine the comparison between input and output (Johnes et al., 2017). Efficient schools are also seen from optimal resource utilization (Lestari et al., 2015).

Often, schools appear to have high academic achievement but this is not accompanied by optimization of existing resources.

In its application, there are two efficiency analysis methods that can be used, such as Data Envelopment Analysis (DEA) and Free Disposal Hull (FDH) (Daraio & Simar, 2007). Later in its development, DEA analysis tended to be used more widely by researchers and academics in their research (El-Mahgary & Lahdelma, 1995). Although efficiency analysis was born in the field of economic science, its application can be used in various organizational sectors such as non-profit organizations, whether in the form of schools or hospitals (Boussofiane et al., 1991; T. J. Coelli et al., 2005; Rostamzadeh et al., 2021).

DEA is a non-parametric analysis method for measuring the level of efficiency of an organization or company (Charnes et al., 2013). The concept of measuring efficiency was actually introduced in general by Farrell, (1957). This concept was then developed by Charnes et al., (1996) who placed greater emphasis on measuring company data or generally referred to as the Decision Making Unit (DMU). Charnes in his research developed the method. Efficiency measurements originating from each DMU with the aim of improving a company's performance.

Further developments Banker, Charnes, and Cooper, (1984) as quoted by Tuffahati et al., (2016) then developed an efficiency analysis method using DEA. The DEA approach technically measures the level of efficiency of the DMU based on the production frontier concept. In terms of production efficiency, the term production frontier is known. In general, the frontier line can be seen from the image below.
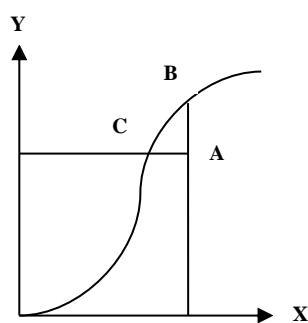
Figure 1. Technical Efficiency

In Figure 1 above, there are two X-axis poles and a Y-axis pole. The X-axis pole means the input variable while the Y-axis pole means the output variable. An organization or company can be said to be efficient if it is above the frontier line. In Figure 1 above, there is a point that shows an efficient company, namely at points B and C. Meanwhile, point A represents an inefficient level, because the company can actually increase output to reach a point that is tangent to point B without having to require much more input. Lots.

Based on the results of the analysis of 24 previous studies, it is known that research using the DEA method in the last 9 years (2015-2023) is still a quite important issue. Thus, the theme of educational efficiency using the DEA method is still a very relevant issue for research. In fact, this research theme was not only carried out in Indonesia but outside the Indonesian context and has been applied to all levels of education. In this section, several important things will be explained regarding the positioning of this research with several previous studies.

Judging from the analytical methods applied, several previous studies provide information that the research theme of efficiency in the field of education does not only analyze and measure the efficiency of an entity. However, it is also important to analyze the determinant factors that influence the efficiency of an entity. Thus, other analysis units are needed such as correlation and regression. This efficiency analysis method is better known as two stage DEA.

For example, research conducted outside the Indonesian context, the majority of previous research used two stage DEA analysis. Of the 12 studies, 6 of them used two stage analysis. Meanwhile in Indonesia, the number of studies using two stage analysis is still very limited. Of the 13 study results, only 2 studies used two stage DEA analysis (Prasetyowati & Haryanto, 2018). In fact, two stage analysis is very important as a further analysis to understand and analyze what factors influence efficiency (Sari & Saraswati, 2017).

More specifically, previous research with the object of study in Madrasas, especially in Indonesia, is still very limited. In Indonesia, research on the theme of efficiency, especially at Madrasah Aliyah, has been carried out by Pratama, (2022). However, this research still has limitations, one of which is that it does not use a two-stage analysis. Thus, to obtain solid analysis results, this research continues to use two stage DEA analysis.

Based on the results of the review of previous studies, it can be seen that, in general, this research has similarities in the focus of the problem, namely measuring efficiency and advanced analysis methods (two stage). As for previous research conducted by Pratama, (2022), although it used the same study object as State Madrasah Aliyah, it did not use a two-stage analysis and only analyzed state Madrasah Aliyah, which only numbered 4 Madrasas. Because the number of madrasas is less than 30, further analysis using Tobit regression is not possible. Thus, in general the significance of this research is based on the discovery of gaps in previous research, especially in aspects of research methodology.

2. METHODS

This research uses a quantitative approach, descriptive method. The descriptive method is used because the efficiency data analysis technique uses non-

parametric analysis. This design was carried out in two stages, first, primary and secondary data were collected. Data is processed and analyzed using the DEA method to calculate the efficiency level of each madrasah. Second, a non-parametric analysis was carried out using the Tobit regression method to determine the determining factors for madrasah efficiency. Then the analysis results at stages 1 and 2 are interpreted.
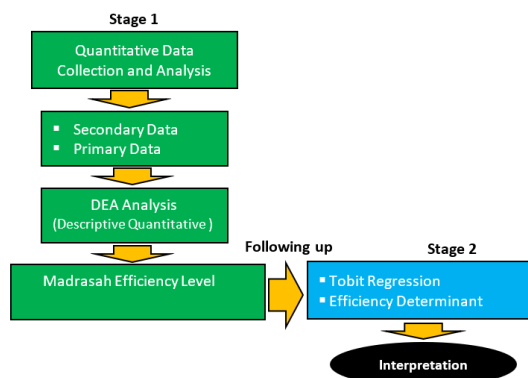

Figure 2. **Research Design**

The population in this study is all MAN in Aceh Province, totaling 69 MAN or can be called DMU (Decision Making Units). The sampling technique was carried out purposively, namely sampling based on the needs and context of the research problem (Biber, 2010). The choice of purposive sampling technique was based on the characteristics and input and output resources that varied between DMU. Based on consideration of these characteristics, a sample of 12 MAN was obtained.

The data collection techniques use documentation techniques and questionnaire techniques. Input variables consist of student-teacher ratio, student-class ratio, number of certified teachers, managerial competence of madrasah heads, and professional competence of teachers. Meanwhile, the output variables consist of education report cards and the number of graduates entering public universities. This research data analysis was carried out in two stages, namely, analysis using the DEA method and Tobit regression analysis (Susanto, 2019). The mathematical model equation for DEA calculations (T. Coelli, 1996) is presented as follows:

$$maxE_m = \frac{\sum_{J=0}^{j} v_{jm} y_{jm}}{\sum_{i=0}^{i} u_{im} x_{im}}$$

$$0 \leq \frac{\sum_{J=0}^{j} v_{jm} y_{jm}}{\sum_{i=0}^{i} u_{im} x_{im}} \leq 1; n = 1,2,K,N$$

$$v_{jm} u_{jm} \geq 0; 1 = 1; 2; K; I; J = 1,2,K,J$$

The DEA method analysis aims to determine the level of efficiency of each madrasah. Meanwhile, Tobit regression analysis is a further analysis to estimate the

determinant factors that influence madrasah efficiency. Tobit regression analysis is an analysis used to determine and describe the relationship between independent and dependent variables (McDonald & Moffitt, 1980). In this research, tobit regression will estimate the influence of the input variables teacher-student ratio, student-class ratio, condition of learning support suggestions, managerial competence of the madrasa head and professional competence of teachers on madrasa efficiency. The equation model for tobit regression is presented as follows:

$$Y_t = \alpha + \beta_1 RSG + \beta_2 RSK + \beta_3 KSP + \beta_4 KMK + \beta_5 KPG + \beta_6 RPD + \beta_7 PTN + \varepsilon,$$

Y_t	:	Madrasah efficiency
$\beta_1 RSG$	:	Student-Teacher Ratio Variable
$\beta_2 RSK$	:	Student-Class Ratio Variable
$\beta_3 KSP$	:	Number of certified teachers
$\beta_4 KMK$	:	Madrasah Head Managerial Competency Variables
$\beta_5 KPG$	:	Teacher Professional Competency Variables
$\beta_6 RPD$	:	Educational report
$\beta_7 PTN$	:	Variable Number of Graduates Entering State Universities
ε	:	*The error term is assumed to be normally distributed*

3. FINDINGS AND DISCUSSION

In analysis using the DEA method, there are two assumptions, namely variable return to scale (VRS) and constant return to scale (CRS). For analysis, this research uses the CRS model. Then, this CRS analysis will also be output-oriented because saving or minimizing input is very difficult to do in the context of the education sector. Because if input variables are minimized it will certainly contradict the national education standards that have been set. Thus, output orientation is very appropriate to use by maximizing output variables (education report card scores and number of public university graduates) through available input resources (student-teacher ratio, student-class ratio, number of certified teachers, managerial competence of madrasah heads, and teacher professional competence). Madrasah can be said to be efficient if they achieve a score of 100%. The further away from a score of 100% or close to 0%, the further away the madrasah is from achieving optimal efficiency.

Table 1. Efficiency Level Scores Assuming CRS is Output Oriented

No	Madrasah	Var. Input					Var. Output		Score (%)	Category
		RSG	RSK	JGS	KMK	KPG	RPD	PTN		
1	MAN 4 Aceh Besar	9.17	23.94	31	3.32	81.275	3.0	49	100	Efisien
2	MAN 1 Banda Aceh	11.30	21.98	42	3.23	89.6	2.5	214	100	Efisien
3	MAN 4 Aceh Timur	6.90	23.47	30	3.65	82.65	3.0	49	100	Efisien
4	MAN 4 Aceh Utara	8.47	9.84	16	3.47	82.05	2.2	32	100	Efisien
5	MAN 3 Aceh Besar	7.60	24.33	22	3.06	83.375	2.8	20	100	Efisien
6	MAN Aceh Barat Daya	11.79	39.57	22	3.55	83.575	2.2	80	100	Efisien
7	MAN 2 Bireuen	8.56	20.23	42	3.16	76.02	2.4	54	91.3	Inefisien

8	MAN 3 Bireuen	11.42	27.40	32	3.49	84.3	2.5	30	80.6	Inefisien
9	MAN 1 Langsa	6.60	18.15	39	3.41	80.25	2.0	27	78.9	Inefisien
10	MAN 3 Banda Aceh	11.71	33.17	41	3.59	84.825	2.0	64	68.5	Inefisien
11	MAN 1 Pidie	14.63	30.82	44	3.43	81.45	1.9	35	63.8	Inefisien
12	MAN 2 Langsa	11.42	23.36	36	3.43	80.475	1.6	50	57.6	Inefisien
Average									**86.7**	

RSG : Student-Teacher Ratio
RSK : Student-Class Ratio
JGS : Number of certified teachers
KMK : Madrasah Head Managerial Competency
KPG : Teacher Professional Competency
RPD : Educational report
PTN : Number of Graduates Entering State Universities

The results of the DEA analysis shown in table 2 above generally show that the efficiency level of 12 MAN in Aceh Province is 86.7% with details of 6 MAN being efficient and 6 MANs being inefficient. Based on the efficiency score, the 6 MANs consist of MAN 1 Banda Aceh, MAN 3 Aceh Besar, MAN 4 Aceh Besar, MAN 4 East Aceh, MAN 4 North Aceh, and MAN Aceh Barat Daya. Meanwhile, MANs that are not yet efficient consist of MAN 1 Langsa, MAN 1 Pidie, MAN 2 Bireuen, MAN 2 Langsa, MAN 3 Banda Aceh, and MAN 3 Bireuen. An inefficient MAN also shows that madrasah management is not yet optimal in managing inputs to produce maximum output. There are even 5 MAN that achieved efficiency scores below the average score, namely, MAN 1 Langsa (78.9), MAN 2 Langsa (57.6), MAN 3 Banda Aceh (68.5), MAN 3 Bireuen (80.6), MAN 1 Pidie (63.8).
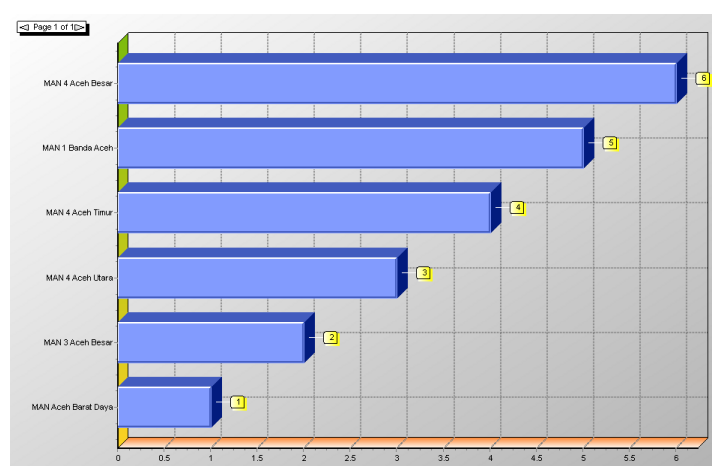
Figure 3. Inefficient DMU Referral Madrasah

In DEA analysis, DMU that are classified as inefficient can refer (benchmark) to DMU or MANs that are already efficient. Figure 2 above presents a MAN graph that can be referred to by MANs that are not yet efficient. In this case, there are 2 MAN that can be referred to in terms of input management in sequence, namely, MAN 4

Aceh Besar which is referred to 7 times, MAN 1 Banda Aceh 5 times, MAN 4 East Aceh 4 times, MAN 4 North Aceh 3 times , MAN 3 Aceh Besar twice, and MAN Aceh Barat Daya once.

Table 2. Recapitulation of Sources of Inefficiency and Potential Improvements to Input and Output Variables

No	Madrasah	*Input Orientation*		*Output Orientation*	
		Source	Potential	Source	Potential
1	MAN 2 Bireuen	Number of certified teachers	-39%	Number of certified teachers	-34%
2	MAN 3 Bireuen	Number of Graduates Entering State Universities	35%	Number of Graduates Entering State Universities	67%
3	MAN 1 Langsa	Number of certified teachers	-51%	Number of certified teachers	-38%
4	MAN 3 Banda Aceh	Student-Class Ratio	-50%	Student-Class Ratio	-28%
5	MAN 1 Pidie	Student-Teacher Ratio	-59%	Student-Teacher Ratio	-36%
6	MAN 2 Langsa	Student-Teacher Ratio	-52%	Student-Teacher Ratio	-17%

Based on table 2 above, the majority of sources of inefficiency come from the number of certified teachers and the student-teacher ratio using either input or output approaches. Based on input and output orientation, there is only 1 MAN that is recommended to increase the number of graduates entering state university, namely MAN 3 Bireun. Meanwhile, the other 5 MANs based on input orientation need to improve the quality of the certified teacher variable and rationalize the student-teacher ratio variable. Thus, it can be concluded that MAN 3 Bireuen can focus on efforts to increase the output variable in the number of graduates entering PTN. Meanwhile, MAN 2 Bireuen, MAN 1 Langsa, MAN 3 Banda Aceh, MAN 1 Pidie, and MAN 1 Langsa can focus on making efforts to improve the quality of certified teachers, rationalizing student-teacher ratios and student-class ratios.

The results of the analysis using DEA basically do not consider any factors that can influence DMU efficiency. Thus, in this second stage further analysis is needed through Tobit regression analysis. Consideration of the Tobit regression analysis model is used because the data level on the dependent variable (Y) in this study is dichotomous data 0 – 1. In this case, the dependent variable is the level of efficiency. If the DMU is efficient then the score is 1 and inefficient the score is 0.

The data processing process for Tobit regression analysis uses EVIEWS.12 software. The dependent variable in this research is the categorization of efficiency levels resulting from the first stage of DEA analysis. Meanwhile, the output variables are all input and output variables in the DEA analysis.

Table 3. Tobit Regression Model Test Results

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.1701	2.7506	-1.5590	0.0184
Student-Teacher Ratio (X1)	0.1355	0.1639	0.8266	0.4085

Student-Class Ratio (X2)	-0.0722	0.0406	-1.7787	0.0550
Number of certified teachers (X3)	0.1063	0.0700	1.5192	0.1287
Madrasah Head Managerial Competency (X4)	0.0935	1.9667	1.8107	0.0300
Teacher Professional Competency (X5)	0.0239	0.0676	-0.3542	0.7232
Educational report (X6)	1.2895	0.7186	1.7944	0.0321
Number of Graduates Entering State Universities (X7)	0.0128	0.0125	-1.0274	0.0423

Based on table 3 above, a regression model can be created as follows:

$Efficiency\ Level$
$$= 0.1701 + 0.1355_{X1} - 0.0722_{X2} + 0.1063_{X3} + 0.0935_{X4} + 0.0239_{X5} + 1.2895_{X6}$$
$$+ 0.0128_{X7} + \varepsilon$$

From the tobit regression modeling, it can be understood that the level of efficiency in implementing MAN in Aceh Province is influenced by the teacher-student ratio, student-class ratio, number of certified teachers, managerial competence of madrasa heads, professional competence of teachers, education report cards, and the number of graduates entering state universities. Based on the results of the Tobit regression analysis in table 3, it can be seen that there are several variables that have a positive or negative influence on the level of efficiency of MAN implementation in Aceh Province. However, not all of these independent variables have a significant or meaningful influence. The significance of the influence between the independent variable and the dependent variable is expressed by the alpha/Prob value. ≤ 0.05.

If seen from the results of the tobit regression analysis, the student-teacher ratio variable does not have a significant effect on the level of madrasah efficiency with the Prob value. $= 0.4085 > \alpha = 0.05$. The student-class ratio variable has a significant negative effect on madrasah efficiency with a value of Prob. $= 0.0550 < \alpha = 0.05$ and a coefficient of -0.0722. This means, if the student-class ratio is reduced by 1 unit, there is an opportunity to increase madrasah efficiency by 7.2%. The variable number of certified teachers has no significant effect on madrasah efficiency with a value of Prob. $= 0.1287 > \alpha = 0.05$. Meanwhile, the madrasa head's managerial competency variable has a positive and significant effect on madrasa efficiency with a value of Prob $= 0.0300 < \alpha = 0.05$ and a coefficient of 0.0935. This means that every time there is an increase of 1 unit in the managerial competence of the madrasah head, there is an opportunity for an increase in madrasah efficiency of 9.3%.

Table 4. Recapitulation of Variable Significance and Opportunities for Increasing Efficiency

Variable	Significant	Opportunities for Increased Efficiency (%)
Student-Teacher Ratio (X1)	**Not Significant**	-
Student-Class Ratio (X2)	**Significant**	7.2%
Number of certified teachers (X3)	**Not Significant**	-
Madrasah Head Managerial Competency (X4)	**Significant**	9.3%
Teacher Professional Competency (X5)	**Not Significant**	-

Variable	Significant	Opportunities for Increased Efficiency (%)
Educational report (X6)	**Significant**	1.28%
Number of Graduates Entering State Universities (X7)	**Significant**	1.28%

The teacher professional competency variable does not have a significant effect on madrasah efficiency with a value of Prob. $= 0.7232 > \alpha = 0.05$. The educational report card variable has a positive and significant effect on madrasah efficiency with a value of Prob. $= 0.0321 < \alpha = 0.05$ and a coefficient of 1.2895. This means that every time there is an increase of 1 unit in the educational report card score, there is an opportunity for an increase in madrasah efficiency of 1.28%. The variable number of graduates entering PTN has a positive and significant effect on madrasah efficiency with a value of Prob $= 0.0423 < \alpha = 0.05$ and a coefficient of 0.0128. This means that every time there is an increase of 1 unit in the number of graduates entering state university, there is an opportunity for an increase in madrasah efficiency of 1.28%.

The results of data analysis using the DEA approach to determine the level of efficiency of madrasah implementation in Aceh Province theoretically compare input and output variables. The input variables in this research consist of student-teacher ratio, student-class ratio, number of certified teachers, managerial competence of madrasah heads, and professional competence of teachers. Meanwhile, the output variables consist of educational report card scores and the number of graduates entering state university. The efficiency level score is shown through a score range between 0-100%. The closer to 100%, the higher the efficiency of a DMU. Conversely, the closer to 0, the lower the efficiency of a DMU.

In general, the efficiency level of 12 MAN in Aceh Province is in the score range of 57-100%. The average efficiency score is 86.7% in the high efficiency category. However, partially there are still 6 MAN (50%) that have not been able to reach efficiency levels. This also indicates that 50% of the MAN sampled in this research are still unable to optimize and utilize their input. Apart from being able to identify MAN that are efficient or inefficient, DEA analysis can also show sources of inefficiency and suggest improvements to MAN that are not yet efficient.

The student-teacher ratio does not affect madrasah efficiency

MAN's main sources of inefficiency, including inefficiencies, come from the number of certified teachers, student-teacher ratio, student-class ratio, and the number of graduates entering state university. In this context, inefficiency occurs due to weak management carried out by madrasah management. Management is a process activity of planning, organizing, leadership, and efforts to control all organizational components in order to achieve organizational goals (Turmudzi, 2021). In more detail, management can be understood as a process of controlling resources to achieve goals effectively and efficiently (Turmudzi, 2021). Based on an understanding of what management is, one keyword that is important for madrasa management to pay

attention to is that madrasa management should focus more on the input and process aspects.

The main source of MAN's inefficiency based on the DEA analysis results also comes from the student-teacher ratio variable. The findings of this research are in line with the results of study that done by Sri, (2018) also proves that the student-teacher ratio variable is the main source of inefficiency in educational institutions. Based on factual data, the 12 MANs sampled in this study have an ideal student-teacher ratio, namely 10 students per teacher and still < 20 students per teacher. However, why is the ideal student-teacher ratio still a major source of inefficiency?

Theoretically, this is in line with the concept of efficiency itself, which is a comparison between output and input values. If related to the context of this research, an educational institution will reach an efficient point if it is able to produce maximum output with the same amount of input. Or vice versa, minimizing, optimizing and rationalizing input to produce the same output (Amelia & Purbaningtyas, 2022). So, in this case, inefficient madrasas need to focus on producing the maximum possible output. The output in this efficiency analysis is the education report card and the number of graduates entering state university.

Student-Class Ratio Affects Madrasah Efficiency

In this context, there are two efforts that can be made to improve inefficiencies, namely through input and output approaches. If using the input approach, MAN which is not yet efficient can rationalize 15 students per class. With the ideal number of students per class, it will make it easier for teachers to manage their classes. If classroom management can be carried out optimally, it will certainly have an impact on the conduciveness of the learning process and will have a direct impact on achieving learning goals. The results of recent research related to classroom management have shown this a lot. Research by Harvina et al., (2022), found that the influence of classroom management on the quality of education was 16%. In the learning process too, the results of the study by Israh et al., (2023) prove that the contribution of good classroom management will increase the quality of learning by 45%.

In the context of the current independent curriculum, classroom management should focus more on efforts to increase student discipline and involvement. (Izzah & Anggoro, 2024). The need to condition students to behave in a disciplined manner is to build collective awareness among students in the class regarding the applicable rules or norms. So, the learning atmosphere becomes more conducive. Meanwhile, students' active involvement aims to build their motivation. Because if all students are actively involved, it indicates that students are enthusiastic about learning, high enthusiasm for learning will also have an impact on class conduciveness.

Improvement efforts to increase efficiency will certainly be more optimal if improvements are made to the output aspect as well. There are 2 output variables in this research, namely, education report cards and the number of graduates passing

state university. Input and output aspects need to be carried out because based on Tobit regression analysis, this student-class ratio variable has a significant positive effect on the level of madrasah efficiency. Thus, if the madrasah management can make concrete efforts as explained at the beginning, the madrasah has the opportunity to increase efficiency by 7.2%.

The number of certified teachers does not affect madrasah efficiency

The findings of this research further strengthen the results of several studies which report that the presence of certified teachers in educational units only has an impact on teacher welfare (Nawawi, 2022), but has no impact on improving performance, learning quality or the quality of the educational unit. The results of the study by Muamar, Puji Dwi Darmoko, Srifariyati, (2017) prove that certified teachers do not contribute to teacher performance. The findings of Pertiwi et al., (2024) also show that teachers who complete the certification program do not have an impact on teacher productivity and performance. In the context of classroom learning, for example, the findings of Siswandari & Susilaningsih, (2013), show that the professional and pedagogical competence of teachers (<50%) who have taken part in the certification program regarding the learning process is still weak. Some of the study results and research findings are basically enough to illustrate that the quantity of certified teachers in each madrasah does not guarantee that they can contribute to improving the quality of learning. On average, MAN who are not yet efficient have a greater number of certified teachers than MAN who are efficient.

Madrasah head managerial competence influences madrasah efficiency

Efficiency in the managerial context of madrasah heads refers to the ability of madrasah heads to optimize all available resources to produce quality educational products. The existence of a positive influence means that if the managerial competence of the madrasa head continues to increase, the efficiency of the madrasa will also increase. The findings of this research are certainly in line with the concept of educational management itself. To achieve educational goals, good management is needed to provide clear direction. According to Uwes & Rusdiana, (2017), management functions in the educational context are oriented towards achieving productivity, effectiveness and efficiency.

In a study, it was found that the competence of school principals contributed 25% to the quality of madrasas (Susanti & Miyono, 2022). Educational institutions such as madrasas are led by a madrasa head. The leadership of the madrasa head is certainly not only understood normatively. However, madrasa heads need to have adequate competence. As stated in the Minister of National Education Regulation Number 13 of 2007, it is explained that madrasa heads have at least five competencies, namely, personality, managerial, supervisory, entrepreneurial and social competencies.

Managerial competency is closely related to the ability of the madrasa head to manage human resources to be directed towards achieving madrasa goals. The managerial

competence of madrasah heads contributes 86% to improving the quality of academic services in schools/madrasahs (Rozak et al., 2021). In fact, according to Wahab, (2011), strong leadership is a reflection of the quality of an organization. Leadership is essentially related to how much a leader cares about the achievements of the organization they lead. The stronger the leadership of the madrasah head, the more efficient the madrasah will be.

Teachers' professional competence does not affect madrasah efficiency

Teacher professional competence is an ability related to planning and implementing the learning process (Wijaya, 2018). Theoretically, a teacher who has high professional competence will certainly have an impact on the quality of learning. If the quality of learning is achieved, the learning objectives will also be achieved and will directly influence the output achievements in the madrasah. Quality learning is also an indicator of an efficient madrasah. Because teachers are able to manage and build effective learning.

It is quite difficult to find a relationship with several previous studies which stated that teacher professional competence is not always linear with increasing the efficiency of educational institutions. However, the results of this Tobit regression analysis basically have an indirect relationship with the results of the previous DEA efficiency analysis. Where the input variable of teacher professional competence is not a variable that causes madrasah inefficiency. In some previous literature, research on the topic of efficiency in the field of education did not include teacher professional competency variables as input variables for DEA analysis.

Educational Report affect madrasah efficiency

The results of Tobit regression analysis to determine the determinants of madrasah efficiency show that the education report card score variable has a significant positive effect on madrasah efficiency. This means that madrasas that have a high educational report card score tend to be more efficient than madrasas that have a low educational report card score. The tendency for madrasas that have high education report cards to generally have teachers with adequate skills in terms of literacy and numeracy.

Teacher literacy abilities have a significant effect on madrasah efficiency. In this context, literacy does not only include the ability to read and write, but also includes students' critical understanding of various information that is relevant to the learning process. According to (Topping, K. J., & Paul, 2016), teachers who have good literacy skills tend to be able to implement effective teaching strategies, and have an impact on student learning outcomes.

Apart from that, literacy skills are also important for developing teacher professionalism. According to Darling-Hammond et al., (2017), teachers who are more active in reading and exploring various new sources will be able to apply innovative teaching methods. The impact is not only to improve the quality of teaching but also

to create a more dynamic and responsive learning environment. So, the relationship between teacher and madrasah literacy skills is very complex but interrelated. Several research results as described previously show that teachers who have good literacy skills will be able to improve the quality of learning and create collaboration between colleagues more effectively. Thus, investment in developing teacher literacy should be a priority for madrasah management.

The number of graduates entering state university affects the efficiency of madrasas

Management of graduate quality is closely related to quality management. The concept of integrated quality management has been widely practiced by several educational institutions. Muttaqin & Kusaeri, (2017) research proves that the implementation of integrated quality can produce 70% of the quality of graduates accepted at state universities. Integrated quality management is an approach that should be implemented by organizations to improve the quality of their output, reduce production costs and increase productivity.

In this case, the leadership of the madrasa head is the main point in building and encouraging all madrasa components to commit to the quality of graduates. The results of the study by Hidayat & Martina, (2022) found the importance of the role of madrasah heads through planning, implementation and continuous evaluation. As previously discussed, the managerial competence of madrasah heads which is directly related to leadership has a significant contribution to madrasah efficiency.

CONCLUSION

Based on the results of data processing and in-depth analysis using various perspectives previously explained, the efficiency level of MAN implementation in Aceh Province is 86.7% and is included in the "high efficient" cluster. Regarding madrasas that fall into the inefficient category, these madrasas can be benchmarked against 6 MANs that are already efficient. The results of the analysis of sources of inefficiency and potential improvement as explained provide an understanding that MAN has not yet reached the optimal efficiency point due to excessive use of inputs and low input optimization efforts. Apart from that, MAN inefficiency can also be caused by output achievements that are not in accordance with the availability of existing inputs. Inefficient MAN generally have large and sufficient input resources, but are unable to produce balanced or maximum output. The variables that cause inefficiency consist of student-teacher ratio, student-class ratio, number of certified teachers, and number of graduates entering state university.

Analysis of the determinants of factors that influence the level of madrasah efficiency is influenced by the student-class ratio, the managerial competence of the madrasah head, educational report cards, and the number of graduates entering PTN. If madrasas are able to optimize existing input resources in the student-class ratio variable, they have the potential to increase efficiency by 7.2%. The managerial

competency variable of madrasah heads has the potential to increase efficiency by 9.3%. Education report cards have the potential to increase efficiency by 1.28%, and the variable number of graduates entering PTN has the potential to increase efficiency by 1.28%.

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