

Comparative Analysis of the Simple Multi Attribute Rating Technique (SMART) Method and the Preference Selection Index (PSI) Method in Determining Best Teacher of Seluma 14 Elementary School

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(Received: Nopember 2025, Revised: Februari 2026, Accepted: April 2026)

Abstract-Objective teacher performance assessment is an important step in improving the quality of education in schools. This study aims to analyze the comparison between the SMART (Simple Multi Attribute Rating Technique) method and the PSI (Preference Selection Index) method in determining the best teachers at Public Elementary School 14 Seluma based on teacher performance assessment data for the 2023/2024 academic year. The comparison was conducted through three main aspects, namely processing time, final assessment results, and accuracy levels measured using a confusion matrix. The results showed that the SMART method had a faster processing time than the PSI method. However, both methods produced the same final results in determining the best teachers, with identical rankings. In terms of accuracy, both the SMART and PSI methods showed the same accuracy level of 80%. System testing using the black box method also showed that the developed application functions well and is capable of providing accurate recommendations for the best teachers each year.

Keywords: SMART Method, PSI Method, Best Teachers, Public Elementary School 14 Seluma

I. INTRODUCTION

In education, teachers play a crucial role as primary facilitators in the learning process. The quality of a teacher significantly impacts the achievement of educational goals, both academically and in shaping student character. Therefore, it is crucial for every educational unit, including elementary schools, to conduct objective and systematic teacher performance evaluations. One such evaluation is identifying the best teacher based on their performance over a specific period. Seluma 14 Elementary School, a public elementary school in Seluma Regency, employs 15 teachers. Each academic year, the school conducts performance

evaluations of all teachers based on assessment criteria such as attendance, teaching ability, achievement, curriculum development, and accountability. These assessments are conducted by the principal with the aim of improving teacher motivation and the quality of teaching. However, in practice, determining the best teacher often faces challenges of subjectivity and a lack of clear decision-making structure. A Decision Support System (DSS) can be a solution to these problems by providing an objective, systematic, structured, and data-driven approach. However, the multitude of methods available in DSS can sometimes make it difficult to select the right method to address specific problems. In this study, teacher assessment data at Seluma 14 Public Elementary School were reviewed using two methods in the SPK, namely the SMART (Simple Multi-Attribute Rating Technique) method and the PSI (Preference Selection Index) method. The SMART method simplifies the evaluation process based on a number of criteria with specific weightings. Meanwhile, the PSI method uses a preference selection approach without requiring explicit weighting. Both methods have their own characteristics that can be applied in the process of assessing the best teachers. Therefore, a comparative analysis of the two methods was conducted to

determine which method produces the most optimal decision in assessing the best teachers at Seluma 14 Public Elementary School.

II. LITERATURE REVIEW

Understanding Analysis

Analysis is an activity that includes a number of activities such as breaking down, differentiating, sorting something to be classified and regrouped according to certain criteria, then looking for connections and interpreting its meaning.(Darmawati, 2023).

Understanding Comparison

Comparison is comparing two things/objects to find out the similarities and differences between the two things/objects through certain stages with a measuring tool in comparing them, so as to gain mutual benefits from the two/more objects being compared. Comparison is a method of study or investigation by making a comparison between two or more objects of study to increase and deepen knowledge about the objects being studied. So in this comparison there are objects to be compared that are already known beforehand, but this knowledge is not yet firm and clear.(Pratiwi, et al., 2020).

III. RESEARCH METHODOLOGY

Research methods

The research method used in this research is the Waterfall Method

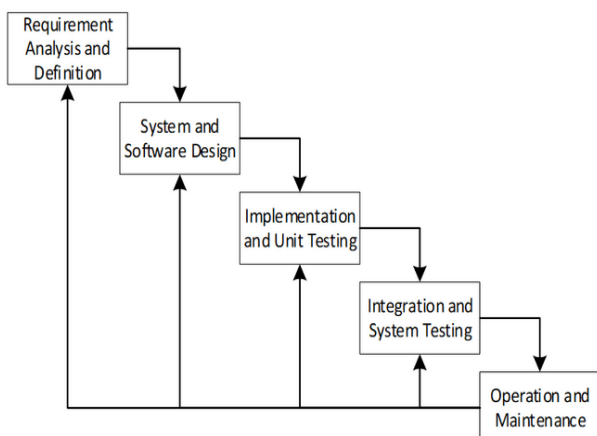


Figure 1. Stages of the Waterfall Method

Information :

1) *Requirements analysis and definition*

This stage involves collecting and analyzing the needs of the system being developed, including identifying problems at Seluma 14 Public Elementary School related to subjective assessments of the best teachers, and collecting data on assessments of the best teachers based on criteria.

2) *System and software design*

This stage involves designing the system based on the results of the needs analysis through Data Flow Diagrams, Entity Relationship Diagrams, File Designs, Menu Structure Designs, and Application Designs.

3) *Implementation and unit testing*

This stage is the implementation of the system design created into an application using the PHP programming language and MySQL database.

4) *Integration and system testing*

This stage involves testing the developed application to determine whether its functionality meets expectations. The final results of the method comparison are tested to determine whether the system produces output that meets its objectives.

5) *Operation and maintenance*

This stage involves operating the application and making periodic improvements to improve the performance of the application.

IV. RESULTS AND DISCUSSION

A. Results

Comparative Analysis of the SMART Method and the PSI Method in Determining the Best Teacher Based on Performance at Public Elementary School 14 Seluma This analysis was conducted using a time-based approach, identifying the best teacher's final results, and measuring accuracy using a confusion matrix. Furthermore, the information from the data processing can help Seluma 14 Public Elementary

School simplify the teacher assessment process and provide information on the best teacher's results each school year, which can be used as teacher evaluation material to improve motivation and teaching quality at the school.

1. In terms of processing time

In terms of processing time, the process was performed three times with the same data to obtain the processing times for both methods. The average processing time for each method was then calculated to determine which method performed the process faster according to its respective stages. The results of the processing time recording are as follows:

Table 1. Processing Time

SMART method		PSI Method	
Waktu Eksekusi: 0.0422 detik	0.0422	Waktu Proses: 0.0448 detik	0.0448
Waktu Eksekusi: 0.0355 detik	0.0355	Waktu Proses: 0.0458 detik	0.0458
Waktu Eksekusi: 0.0359 detik	0.0359	Waktu Proses: 0.0377 detik	0.0377
Average	0.03786	Average	0.0428

Based onComparative analysis in terms of processing time, it was found that the SMART method has a faster processing time compared to the PSI method.

2. From the Final Results of the Best Teacher

In the final results for the best teacher, the best teacher with the highest score was selected from the process that had been carried out using the same data, where the SMART method took a score above 80, while the PSI method took a score above 0.8. The final results for the best teacher were then compared to see whether there was a difference or not between the two methods. The final results for the best teacher were recorded.

Table 2. Final Results of the Best Teachers

SMART method			PSI Method		
Nama Guru	Nilai SMART	1	Nama	Nilai PSI	1
Zeswadi, S.Pd	100	2	Zeswadi, S.Pd	1	Zeswadi, S.Pd
Iin Driyanti, S.Pd	80		Iin Driyanti, S.Pd	0.9804	Iin Driyanti, S.Pd

Based on a comparative analysis in terms of the final results of the best teachers, it was found that the SMART method and the PSI method provided...the same best teacher recommendations that have been sorted from highest to lowest score.

3. Measuring Accuracy Through the Confusion Matrix Approach

To measure accuracy using the confusion matrix approach, actual data (ground truth) from teacher assessment results at Seluma 14 Public Elementary School is first required. The actual data is then compared with the final results from the SMART and PSI methods. The confusion matrix uses four components.

Table 3. Confusion Matrix Components

	Current: Best	Actual: No
Pred: Best	TP (True Positive)	FP (False Positive)
Pred: No	FN (False Negative)	TN (True Negative)

The equations used to calculate accuracy, precision and recall are as follows:(Tinambunan & Wahyuni, 2023):

$$Accuracy = \frac{TP + TN}{Total}$$

$$Precision = \frac{TP}{TP + FP}$$

$$Recall = \frac{TP}{TP + FN}$$

a. SMART method

Table 4. SMART Method

Teacher's Name	Actual Results	SMART Results
Zeswadi, S. Pd	Best	Best
Eti Hartati, S. Pd	No	No
Yeni Dwi Putri, S. Pd	Best	No
Menti Felia Sari, S.Pd	No	No
Nuryanto, S.Pd. I	No	No
Iin Driyanti, S.Pd	Best	Best
Nina Seva Rosdarini, S.Pd	No	No
Yesi Apriani, S. Pd	Best	No
Septen Heri, S. Pd	No	No
Perannada Aprizal, S. Pd	No	No

Table 5. SMART Method Confusion Matrix

	Act: Best	Pred: No
Pred: Best	2	2
Pred: No	0	6

The following is the calculation of accuracy, precision and recall of the SMART method:

$$Accuracy = \frac{2 + 6}{10} = 0,8 * 100 = 80\%$$

$$Precision = \frac{2}{2 + 1} = 0,67 * 100 = 67\%$$

$$Recall = \frac{2}{2 + 0} = 1 * 100 = 100\%$$

b. PSI Method

Table 6. PSI Method

Teacher's Name	Actual Results	PSI Results
Zeswadi, S. Pd	Best	Best
Eti Hartati, S. Pd	No	No
Yeni Dwi Putri, S. Pd	Best	No
Menti Felia Sari, S.Pd	No	No
Nuryanto, S.Pd. I	No	No
Iin Driyanti, S.Pd	Best	Best
Nina Seva Rosdarini, S.Pd	No	No
Yesi Apriani, S. Pd	Best	No
Septen Heri, S. Pd	No	No
Perannada Aprizal, S. Pd	No	No

Table 7. Confusion Matrix of PSI Method

	Act: Best	Pred: No
Pred: Best	2	2
Pred: No	0	6

The following is the calculation of accuracy, precision and recall of the PSI method:

$$Accuracy = \frac{2 + 6}{10} = 0,8 * 100 = 80\%$$

$$Precision = \frac{2}{2 + 1} = 0,67 * 100 = 67\%$$

$$Recall = \frac{2}{2 + 0} = 1 * 100 = 100\%$$

Based on a comparative analysis in terms of accuracy through a confusion matrix, it was found that the SMART method and the PSI method have the same level of accuracy, namely 80%.

B. Discussion

To assist in the comparative analysis of the two methods, a web-based application was developed using the PHP programming language and a MySQL database. This application interface simplifies data processing and provides information on the best teacher recommendations for each year using both methods. The interfaces of the applications that have been built include:

1. Login Page

It is a web page on an application used to limit login access to an application, where users must enter the correct username and password to be able to log in to the application.

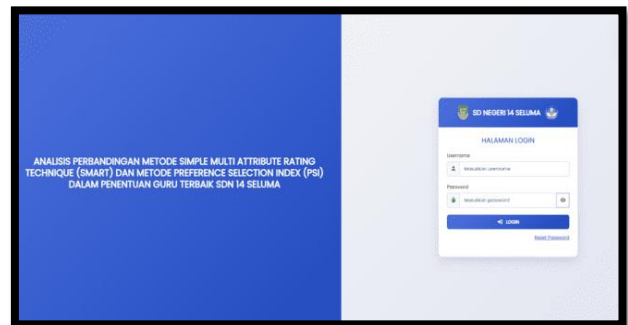


Figure 2. Login Page

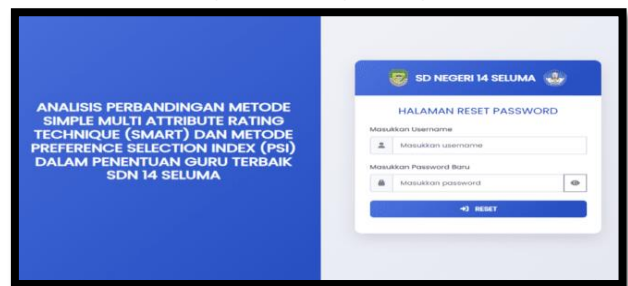


Figure 3. Reset Password Page

- a) If you enter the correct username and password, a success message will appear.



Figure 4. Success Message

- b) If you enter the wrong username or password.

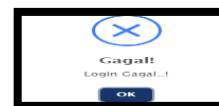


Figure 5. Error Message

2. Main Menu Page



Figure 6. Main Menu

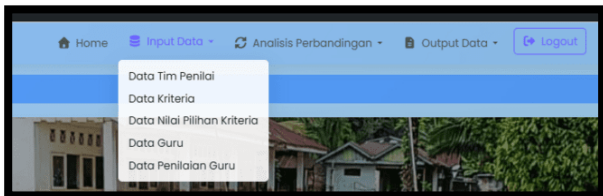


Figure 7. Data Input Sub Menu

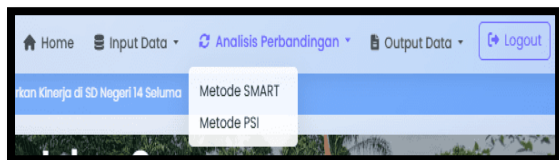


Figure 8. Comparative Analysis Sub Menu

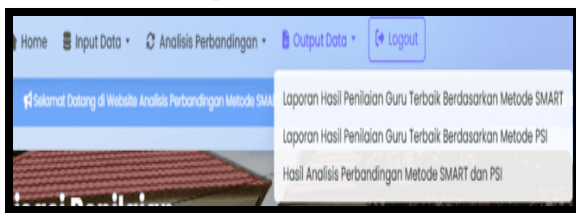


Figure 9. Data Output Sub Menu

3. Assessment Team Data Input Page

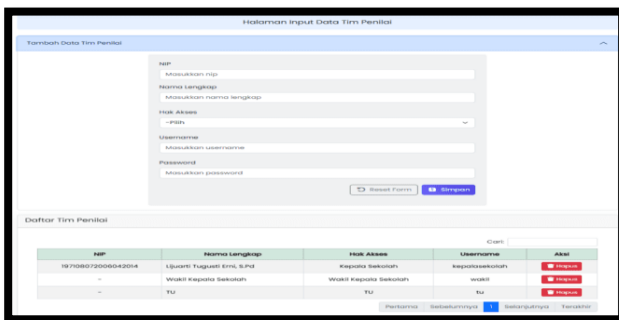


Figure 10. Assessment Team Data Input Page

4. Criteria Data Input Page



Figure 11. Error Message



Figure 12. Success Message

a) Data Correction



Figure 13. Data Correction Form



Figure 14. Update Message

b) Delete Data



Figure 15. Confirm Data Delete



Figure 16. Delete Message

5. Criteria Selection Value Data Input Form

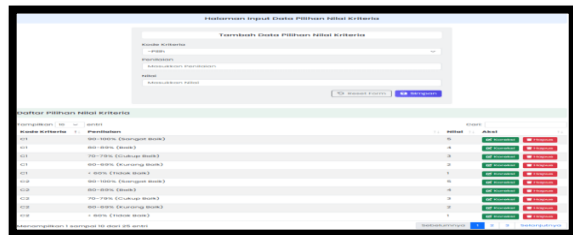


Figure 17. Criteria Selection Value Data Input Page

In the image there is a data processing process, where data can be added, corrected and deleted, as follows:

a) Add Data



Figure 18.. Add Data Form

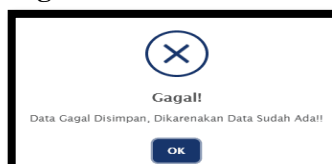


Figure 19. Error Message

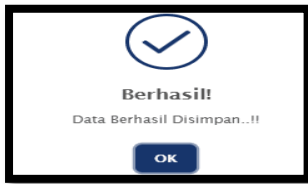


Figure 420. Success Message

b) Data Correction

Figure 21. Data Correction Form

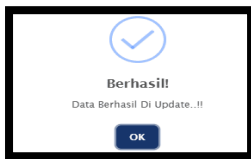


Figure 22. Update Message

c) Delete Data



Figure 23. Confirm Data Delete

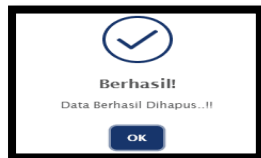


Figure 24. Delete Message

6. Teacher Data Input Page

Figure 25. Teacher Data Input Page

a) Add Data

Figure 26. Add Data Form



Figure 27. Error Message



Figure 28. Success Message

b) Data Correction

Figure 29. Data Correction Form

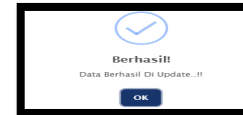


Figure 30. Update Message

c) Delete Data



Figure 31. Confirm Data Delete

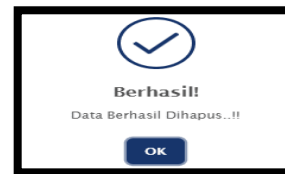


Figure 32. Delete Message

7. Teacher Assessment Data Input Page

Figure 33. Teacher Assessment Data Input Page
In the image there is a data processing process, where data can be added, corrected and deleted, as follows:

a) Add Data

Figure 34. Add Data Form

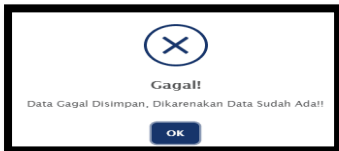


Figure 35. Error Message



Figure 36. Success Message

b) Data Correction

Figure 37. Data Correction Form

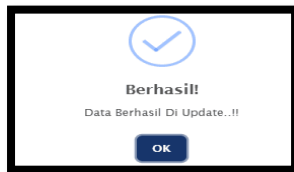


Figure 38. Update Message

c) Delete Data

To delete data, the user must select the data to be deleted in the table list, which will then display a confirmation message.



Figure 38. Confirm Data Delete

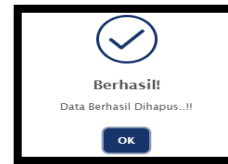


Figure 40. Delete Message

8. SMART Method Page

Kode Nilai	NIP	Nama Guru	C1	C2	C3	C4	C5
N0001	196508081986041001	Zeswadi, S.Pd	4	3	1	3	4
N0002	1987091202222014	En Daryanti, S.Pd	4	3	1	3	4
N0003	1992242019032005	Yeni Dwi Putri, S.Pd	4	4	1	4	4
N0004	1990044202222021	Mendi Fella Sari, S.Pd	4	3	1	3	4
N0005	19880915202012203	En Daryanti, S.Pd	4	3	1	3	4
N0006	1987091202222014	En Daryanti, S.Pd	4	3	1	3	4
N0007	1987091202222014	Nina Seva Rosadarni, S.Pd	4	3	1	3	4
N0008	1987091202222014	Septien Heri, S.Pd	4	3	1	3	4
N0009	1987091202222014	Perannadha Aprilal, S.Pd	4	3	1	3	4

Figure 41. SMART Method Page

9. PSI Method Page

Figure 42. PSI Method Page

C1	C2	C3	C4	C5
0.84	0.925	0.6	0.72	0.84
0.064	0.373	0.4	0.176	0.064
0.935	0.8688	0.6	0.824	0.936
0.2247	0.2088	0.1441	0.1979	0.2247

Figure 43. PSI Method Page (Continued)

10. Output of the Best Teacher Assessment Results Report Based on the SMART Method
 This is an output that provides information on the results of the best teacher assessment based on the SMART method,

No	NIP	NUPTK	Nama Guru	Gol/Ruang	Nilai Akhir SMART
1	196508081986041001	-	Zeswadi, S.Pd	IV/a	100
2	198111062022212014	-	lin Driyanti, S.Pd	III/a	90
3	199212242019032005	-	Yeni Dwi Putri, S.Pd	III/a	40
4	199004142022212021	-	Yesi Apriani, S.Pd	III/a	40
5	199709052023211003	-	Septen Heri, S.Pd	III/a	30
6	198709172022212011	-	Nina Seva Rosdharini, S.Pd	III/a	30
7	199203102020122013	-	Menti Felia Sari, S.Pd	III/a	30
8	198509152020122013	-	Nuryanto, S.Pd.I	III/a	10
9	196509292006042005	-	Eti Hartati, S.Pd	II/d	0
10	-	-	Perannada Aprizal, S.Pd	-	0

Figure 44. Output of the Best Teacher Assessment Results Report Based on the SMART Method

11. Output of the Best Teacher Assessment Results Report Based on the PSI Method
 This is an output that provides information on the results of the best teacher assessment based on the PSI method,

No	NIP	NUPTK	Nama Guru	Gol/Ruang	Nilai Akhir PSI
1	196508081986041001	-	Zeswadi, S.Pd	IV/a	1
2	198111062022212014	-	lin Driyanti, S.Pd	III/a	0.9604
3	199212242019032005	-	Yeni Dwi Putri, S.Pd	III/a	0.7985
4	199004142022212021	-	Yesi Apriani, S.Pd	III/a	0.7985
5	199709052023211003	-	Septen Heri, S.Pd	III/a	0.7589
6	198709172022212011	-	Nina Seva Rosdharini, S.Pd	III/a	0.7589
7	199203102020122013	-	Menti Felia Sari, S.Pd	III/a	0.7589
8	198509152020122013	-	Nuryanto, S.Pd.I	III/a	0.7464
9	196509292006042005	-	Eti Hartati, S.Pd	II/d	0.7068
10	-	-	Perannada Aprizal, S.Pd	-	0.7068

Figure 45. Output of the Best Teacher Assessment Results Report Based on the PSI Method

12. Output of the Comparative Analysis Report of the SMART and PSI Methods
 This is an output that provides information on the results of comparing the SMART and PSI methods.

No	Tahun Penilaian	Metode SMART			Metode PSI		
		Hasil Nilai Tertinggi	Hasil Nilai Terendah	Waktu Proses	Hasil Nilai Tertinggi	Hasil Nilai Terendah	Waktu Proses
1	2024	Zeswadi, S.Pd, lin Driyanti, S.Pd	Perannada Aprizal, S.Pd, Eti Hartati, S.Pd, Nuryanto, S.Pd.I	0,0356	Zeswadi, S.Pd, lin Driyanti, S.Pd	Eti Hartati, S.Pd, Perannada Aprizal, S.Pd, Nuryanto, S.Pd.I	0,0444

Figure 46. Output of the Comparative Analysis Report of the SMART and PSI Methods

a. Test Results

The Black Box method is used to test the functionality of an application to determine whether it is running properly. This method involves inputting correct and incorrect data into the system and then recording the test results. The components tested are shown in Table 4.8.

Based on testing using the black-box method, the results show that the application’s functionality operates as expected and is capable of providing information in the form of recommendations for the best teachers each year using the SMART Method and the PSI Method.

V. CONCLUSION

A. Conclusion

Based on the results of the discussion and testing conducted, it can be concluded that:

1. A comparative analysis of the SMART method and the PSI method in identifying the best teachers based on performance at Public Elementary School 14 Seluma was conducted by examining the processing time of each method, the final results for the best teachers, and measuring accuracy using a confusion matrix. Furthermore, the information derived from the data analysis can assist Public Elementary School 14 Seluma in streamlining the teacher evaluation process, providing information on the top-performing

teachers each school year, and serving as a basis for teacher evaluations to enhance motivation and the quality of instruction at the school.

2. Based on a comparative analysis of processing time, it was found that the SMART method has a faster processing time than the PSI method. Berdasarkan analisis perbandingan dari segi hasil akhir guru terbaik, maka diperoleh bahwa metode SMART dan metode PSI memberikan rekomendasi guru terbaik yang sama yang telah diurutkan dari nilai tertinggi ke nilai terendah
 3. Based on a comparative analysis of accuracy using a confusion matrix, it was found that the SMART method and the PSI method have the same accuracy rate of 80%.
- A.** Based on testing using the black-box method, the results show that the application's functionality operates as expected and is capable of providing information in the form of recommendations for the best teachers each year using the SMART Method and the PSI Method.

B. Recommendations

Based on the research conducted by the author, the author recommends that future studies employ alternative methods to compare the results of identifying the best teachers using the SAW, WP, TOPSIS, PROMETHE, and ELECTRE methods, as well as through accuracy-based approaches such as the Sensitivity Test Method, and others.

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