# Application of TOPSIS Method to Design a Decision Support System in Assessing Teachers Performance

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**Abstract**

The purpose of this project is to develop a decision support system for evaluating teacher performance based on the TOPSIS approach (a strategy that can be referred to by others based on its resemblance to an ideal solution). The investigator collected data through a variety of methods, including observations, literature reviews, online data searches, and interviewing. In the research, the author developed the system using the RAD (Rapid Application Development) paradigm. The approach is used by the author to compute teacher performance evaluations. Next, before running the code, manually simulate the TOPSIS calculations. The next step is coding, which is done using JavaScript and the PHP programming language. The web server is XAMPP, the database is MySQL, and the system creation framework is the Content Management System (CMS). The black box testing approach was employed by the author in this study. Compared to the prior duration of around one month, the black box testing approach has demonstrated the ability to complete calculations for teacher performance assessments in five minutes. Teachers with a final score above the average are considered to have good performance, while those with a score below the average indicate decreased or weak performance. Proves that from 100 teachers, there are 30 weakest teachers in the 1st criteria, 5 weakest teachers in the 13th criteria, 10 weakest teachers in the 7th criteria, 5 weakest teacher in the 10th criteria, 25 weakest teachers in the 4th criteria, and 10 weakest teachers in the 1st criteria. There are 45 weakest teachers in total, with 10 in the 11th criterion and 5 in the 12th criterion. That way, schools can follow up on each teacher's weak criteria appropriately so that they can improve teacher performance in the school.

**Keywords:** Decision Support System, Performance Assessment, Teacher, TOPSIS.

## 1. Introduction

The role of teachers in the implementation of education holds a central position and is very vital in shaping future generations. There are nine categories of teacher roles covering various aspects of education. The first category of teacher roles is to provide relevant information and support the learning process [1]. Second, teachers, as organizers, have a role in organizing and structuring learning activities so that they are effective and structured. Furthermore, teachers act as motivators, inspiring and encouraging students to achieve their best potential. As a director, the teacher provides direction and guidance in the learning process [2]. Teachers also act as initiators, initiating new and innovative ideas in the learning context. As a transmitter, the teacher conveys learning material clearly and comprehensively. Furthermore, the teacher, as a facilitator, creates a learning environment that supports and provides the assistance that students need [3]. As mediators, teachers help resolve conflicts and facilitate positive interactions between students. Lastly, the instructor evaluates the learning progress of the students in their role as an evaluator [4]. The primary responsibilities of instructors include instructing, guiding, directing, training, evaluating, and assessing pupils in different educational pathways, as per Law Number 14 concerning instructors and Lecturers [5]. Thus, the teacher's role is not only as a transmitter of information but also as a motivational driver, manager of learning activities, and assessor and guide of students [6]. By understanding and developing this role, teachers can more effectively help students achieve their maximum potential in the learning process [7].

This role makes teacher performance very important to improve in the world of education. Improving teacher performance is not easy [8]. Considering that there are many factors that influence the decline in teacher performance. One factor is the problem of teacher certification. The resulting output between certified and non-certified teachers turned out to be insignificant [9]. In terms of performance and professionalism, there is not much difference. In fact, certification is also prone to causing jealousy between teachers, which impacts the performance of the teachers themselves [10]. Seeing the importance of teacher performance in schools, there are some sub-competencies for teacher performance assessment to deal with the problem of declining performance. However, there are still schools that experience a decline in teacher performance [11]. According to the results of the basic competency test that has been carried out, many teachers' scores are below the national standard of 50% percent. Which means that many teachers experience a decline in performance [12]. The decline in teacher

performance occurs for several reasons, namely a lack of sense of responsibility for their duties and functions as a teacher, teachers lacking focus on teaching and learning activities at school because they are still thinking about other business activities outside of school, and a lack of motivation as a teacher [13]. The school principal also admitted that there were obstacles to increasing teacher performance in schools [14]. The causes are lack of motivation and responsibility in teaching among the teachers themselves; lack of discipline in teaching and learning activities and less supportive teaching competence among the teachers themselves [15].

In developing a decision support system (DSS) for teacher performance assessment, the following steps can be taken, an intuitive user interface should be designed to ensure ease of use for users, such as school principals or assessment teams [16]. This interface should provide quick and easy access to teacher data, assessment results, and individual performance analysis [17]. The system can utilize web-based technology to be accessible online and minimize paper use [18]. Teachers and assessors can access this platform to fill in and view assessment results in real-time [19]. In addition, this technology allows for more efficient and accurate data processing. The use of algorithms or data analysis models can help identify the weakest criteria for each teacher. The system can provide each teacher with specific and detailed information regarding aspects they need to improve. This will be the basis for developing a more targeted performance improvement plan [20]. Adding an automatic notification feature will notify the principal or assessment team when there is an evaluation that needs to be completed or if there are critical aspects that require immediate attention [21]. This can help increase responsiveness to teacher performance problems. Integration with online training modules can also be a useful addition. Teachers who receive a low rating on a criterion should take special training to increase their competency in that area. Lastly, data security and privacy must be a top priority [22]. Strictly implementing data protection measures ensures the security and integrity of teacher performance assessment data, as it is sensitive information [23][24]. By combining these elements, decision support systems can provide effective solutions to address the problem of declining teacher performance, increase assessment efficiency, and provide targeted support in efforts to improve the quality of education in schools [25].

Based on references from multiple publications, the author selected the TOPSIS (Technique for Others Reference by Similarity to Ideal Solution) method to solve decision support system (DSS) problems for evaluating teacher performance [26][27]. This approach was selected because of its underlying principle, which uses the geometry concept of Euclidean distance to determine how far a solution is from the negative ideal solution and how near it is to the positive ideal solution [28]. This method's advantage is that it takes into account 10 National Education Standards Agency sub competences, which allows it to produce more detailed data for teacher performance assessments (BSNP) [29][30]. By using this technique in a decision support system, the teacher performance assessment process can be finished in less than five minutes and printed on fewer than five pages of paper [31]. It is anticipated that a decision support system utilizing this approach will deliver teacher performance evaluation findings in an expedient manner as well as more detailed information about each teacher's strongest and weakest criteria [32]. The school anticipates that this will help in decision-making and appropriate action-taking to improve teacher performance. The school anticipates that implementing the TOPSIS technique in SPK will have a favorable impact on raising student achievement and teacher effectiveness [33][34].

## 2. Research Methods

The author requires facts and information to support the validity and success of this research in order to prepare it. Through observations, literature reviews, interviews, and internet data searches, the author gathered the information. In the research, the author developed the system using the RAD (Rapid Application Development) paradigm. Conditions The information requirements that emerge are identified during the planning stage. After the knowledge has been thoroughly developed, the problem can be outlined and solved into modules to start the implementation step. Resolving current issues is this phase's primary focus. It will now be separated into two sections: the design system and the build system. The Unified Modeling Language, or UML, will be used in this system design. Build System: In this phase, the design outcomes are presented to the system. At this point, the author uses this algorithm to determine the teacher performance evaluations. Next, before running the code, manually simulate the TOPSIS calculations. The author employs JavaScript and PHP for the coding stage in the following step. The web server is XAMPP, the database is MySQL, and the system creation framework is Content Management System (CMS). Phase of implementation: at this point, the system is prepared for real operation, allowing for the determination of whether the developed system complies with the interface design from the system design stage. The black box testing approach, which is a software test on how to operate the input and output created by the system, is employed by the author in this study.

## 3. Results and Discussion

After going through all stages of developing a decision support system for evaluating teacher performance, the final result is a login page that has limited access. Only two users can access it, namely the school principal as

admin and the foundation chairman as visitor, with a customized password. Upon successful login, the system assigns different access rights to both users, creating a personalized user experience. Upon successful login, users are automatically directed to a home page that provides a comprehensive overview of the school. This page includes interesting photos of school activities, a clear management structure, and a brief profile about the school. The school presents this information attractively to create a positive picture and leave a good impression on users. This not only serves as a gateway for further access to the system but also as a means of promoting the school's image and identity. Thus, the final result of developing this decision support system is not only about technical effectiveness but also considers broader aspects related to the school's image and personality.

The home page of this decision support system presents a teacher data table that can be accessed by administrators and visitors. Admins, who have full access rights, can take further actions, such as deleting and editing teacher data, as needed. Visitors, on the other hand, can only view the contents of the teacher data table without having the right to make any changes. The importance of this access right is to maintain data security and provide full control to the admin in managing teacher-related information. Thus, administrators can easily manage teacher data without the risk of unwanted manipulation. Apart from that, there is an add-teacher page that can only be accessed by admins. Admins can use this page to add new teacher data to the system. Admins can fill out forms or provide the necessary information. Once they add the data, it is automatically integrated and appears in the teacher data table on the home page. By limiting access and giving special rights to administrators, this system ensures that teacher data management is carried out carefully and under control. In addition, it also creates a more secure and structured environment, supporting efficiency and accuracy in teacher information management.

Furthermore, the PKG criteria page aims to provide access to all users, including admins and visitors. All parties involved in the teacher performance assessment process have access to information related to PKG criteria. A table on this page presents a comprehensive overview of the assessment standards used, detailing the PKG criteria and their indicator weights. Admins can access the value input page to easily and efficiently add teacher criteria scores. Admins can access this page to add teacher criteria scores with easy and efficient steps. The admin simply selects the name of the teacher to be assessed, fills in the value based on the predetermined criteria, and saves the data. In this way, the system automatically integrates the grades entered into the database, creating an accurate and organized track record of teacher performance grades. Careful division of access rights, where visitors can view PKG criteria while admins can provide assessments, helps create balanced collaboration and transparency in the assessment process. Thus, this system not only supports efficiency but also promotes wider participation in monitoring and developing teacher performance in schools.

The PKG criteria page presents a table of teacher initial scores that users, both admins and visitors, can access. The purpose of this page is to provide transparency regarding the development of initial teacher performance scores to all parties involved. Visitors can easily see these initial values, supporting openness and participation throughout the school community. Admins have exclusive access to the report print page. Admins can access this page to print the teacher performance assessment (PKG) report in pdf file format. With the print report option, schools can store these documents physically or present them in various internal forums. Finally, the PKG results page can only be accessed by administrators, ensuring that information regarding the final results of teacher performance assessments is only seen by competent parties. This page contains tables detailing the final results of teacher performance assessments, providing a comprehensive picture of educators' achievements and development potential. By structuring access and functionality according to each user's role, the system creates a structured and secure environment. This not only facilitates the implementation of teacher performance assessments but also promotes transparency and balanced participation in school decision-making processes.

The Rapid Application Development approach was used in the creation of the teacher performance evaluation decision support system, and the Technique for Others Reference by Similarity to Ideal Solution algorithm was utilized for fundamental computations. The requirements planning phase, the design workshop phase, and the implementation phase are the three key steps of this development process. Building SPK PKG in the school setting is largely dependent on the first step, requirements planning phase, also often known as requirements planning stage. At this stage, we identify the system objectives for assessing teacher performance. These goals may include efficiency in the assessment process, transparency of information, and providing accurate assessment results. Apart from that, this stage also aims to identify the information requirements that arise from these objectives. For example, there are requirements regarding the type of data that needs to be collected, time limits, and data management procedures. Next, the second stage is the design workshop phase, where the design and construction of the SPK PKG system will be discussed in detail. At this stage, the development team and the school work together to detail functional requirements and design an intuitive user interface. This design includes home page displays, assessment forms, teacher data table layouts, and other elements to ensure understandability and ease of use. The third stage is the implementation phase, where the design that has been designed in the previous stage will be realized in real form. This process involves coding, testing, and applying the TOPSIS algorithm to calculate teacher performance scores. The results of this implementation are then tested

and evaluated to ensure suitability for initial requirements and operational sustainability. By combining the RAD method and the TOPSIS algorithm, it is hoped that the SPK PKG can provide solutions that are efficient, accurate, and support better decision-making in assessing teacher performance in the school environment.

During the design workshop phase, we focused on method design and TOPSIS algorithm calculations to design the decision support system. The design stage of the method involves determining alternatives and criteria (10 sub competencies from BSNP) used in assessing teacher performance. In the TOPSIS method calculation, the steps involve determining the decision value, weighted normalization, and calculating the vector V value as a reference. Next, we used Unified Modeling Language (UML) to carry out system design during the design workshop phase. Use case diagrams, activity diagrams, sequence diagrams, and class diagrams are among the UMLs that were used during the design workshop phase. The principal of the school serves as the managerial actor at SPK PKG, while the chairman of the foundation serves as the supervisor. The tasks that both actors can perform in the SPK PKG are illustrated visually in the use case diagram, which shows how the user and the system interact. Activity diagrams provide a comprehensive overview of the SPK-PKG work process by displaying the total activity of the system. Sequence diagrams illustrate the sequential interactions between actors and system objects, hence describing the behavior of actors in SPK PKG. Class diagrams, on the other hand, give an overview of the system structure and specify the classes that need to be made. It comprises the attributes and connections that every class possesses, including criteria, performance values, and teacher classes. Our goal is to apply SPK PKG more effectively and in compliance with the unique requirements of educational institutions by merging the method design and UML modeling. This offers a solid basis for the system's further development and upkeep in addition to assisting with the appropriate administration of teacher performance assessments.

In the design workshop phase, the database design process becomes one of the key aspects of developing a decision support system (DSS) for teacher performance assessment. We designed the database using the XAMPP Database Management System (DBMS), which provides an integrated development environment for MySQL, PHP, and Apache. The database design incorporates table structures, relationships between tables, and data types for storing information pertaining to teacher performance assessments. Apart from that, at this stage, the user interface (UI) is also designed to describe the appearance of the user interface. This UI includes the design of system pages, assessment forms, and navigation so that users can interact with SPK PKG intuitively and effectively. After the design stage, the coding process continues. This stage is system development, which involves a coding process based on a predetermined design. We used the PHP programming language to build SPK PKG modules using the TOPSIS method. These modules include steps such as determining alternatives, calculating decision values, weighted normalization, and calculating vector V values. Thus, the development of this system includes structured steps from database design to code implementation using the PHP programming language. This process aims to ensure that SPK PKG can function according to school needs and provide an optimal user experience in the teacher performance assessment process.

During the implementation phase, the team executes the previously designed system. The implementation phase involves executing the design produced in the previous phase. Testing utilizing the black box testing approach comes next after installation. This approach concentrates on assessing system functionality without requiring knowledge of internal workings or program structure. To make sure the system satisfies the user requirements specified at the start of development, testers run and test the system. Black box testing aids in confirming that every implemented module, feature, and capability can work effectively together and adhere to established standards. According to the results of the black box testing, the system has passed the test and is prepared for use in a classroom setting. These encouraging outcomes give hope that the SPK PKG, which employs the technique, has been successful in assisting teacher performance assessment. The method was created with RAD and tested using black box testing. The task of overseeing and enhancing the educational quality in these schools may now be accomplished with the completion of the creation of a decision support system for teacher performance assessments.

## 4. Conclusion

This system has proven effective in completing teacher performance assessment calculations in a very short time only 5 minutes, compared to the previous process, which took approximately one month. The results of the calculation simulation show that teachers who have a final score above 0.7 can be considered to have good performance, while those who have a score below 0.7 indicate a decline or weak performance by the teacher. The simulation results identified that out of the 100 teachers, 30 teachers met the weakest criteria in the 1st criterion, 5 teacher in the 13th criterion, 10 teachers in the 7th criterion, 5 teacher in the 10th criterion, 25 teachers in the 4th criterion, 10 teachers in the 9th criterion, 10 teachers in the 11th criterion, and 5 teacher in the 12th criterion. This information provides a clear picture of performance areas that need special attention. With this data, schools can appropriately follow up on any criteria that each teacher considers weak. Actions taken may include additional training, mentoring, or other performance development strategies. In this way, schools can effectively improve the quality of teacher performance in a specific and targeted manner. With the implementation of this

system, not only time efficiency is achieved but also a deep understanding of individual teacher performance. As a result, schools can take appropriate actions to improve the quality of education and achieve better learning goals at school.

To further enhance the decision support system research, we recommend expanding the functionality by incorporating additional comprehensive features. First, the addition of the school activity scheduling menu can enrich the system with the ability to plan teaching and learning activities and other school activities. This will help in managing time and resources more efficiently. Furthermore, integration of the student data collection menu from grades 1 to 6 will provide significant benefits in tracking and managing student information. With integrated student data, schools can easily manage students' personal, academic, and attendance information in a more structured manner. Developing a decision-support system that can be accessed online is a strategic step. This provides users with the flexibility to access information anytime and anywhere, enabling more effective collaboration between various stakeholders in the school environment. More adequate data security also needs to be a priority to protect sensitive information and privacy. In addition, building a system with multi-platform support will provide easy access via various devices, including desktops, tablets, and smartphones. This will improve system affordability and provide a better user experience. In the future, decision support systems should continue to incorporate aspects of lecturer or employee performance assessment. Apart from that, considering the development of features to determine the provision of scholarships for outstanding students can have a positive impact on the development of human resources in the educational environment. By implementing these suggestions, it is hoped that the decision support system can become a more holistic and integrated solution, making a positive contribution to operational efficiency and improving the quality of school management.

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