INFLUENCE OF INTERNAL FACTORS ANALYSIS ON THE PROBABILITY OF ACADEMIC ACHIEVEMENT USING LOGISTIC REGRESION

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Abstract

This research represents a comprehensive analysis of the internal factors associated with students' academic achievement in Indonesia. The study involves a sample of one hundred and ten students enrolled in the second semester at the prestigious State Islamic University of Maulana Malik Ibrahim Malang, Indonesia. This sample represents a significant proportion, accounting for 74% of the entire even-semester student population in 2022. The research utilizes a well-designed set of instruments consisting of thirty-six statements focusing on internal factors. These factors explore various dimensions, including health, intelligence, talent, interest, motivation, and learning style. The age range of participating students spans from 19 to 20 years, ensuring a diverse and representative sample. To assess and understand the impact of these internal factors, the research employs a logistic regression approach. This approach allows for the analysis of the relationship between internal factors and students' academic performance. The analysis results indicate that the variables of learning style and health play a significant role in influencing academic achievement. There is a strong relationship between these variables and academic performance.

Keywords: internal factors, logistic regression, learning outcomes.

INTRODUCTION

Measuring students' learning outcomes is a significant challenge due to the diverse factors contributing to these outcomes. These factors encompass internal components within the students themselves. Therefore, measuring students' learning outcomes holds great significance in the field of education as it can significantly enhance the performance of higher education and the overall academic progress of students [1]. In this context, analyzing internal factors that influence students' learning outcomes is crucial for understanding their profound impacts and developing strategies to enhance academic performance holistically.

Assessing students' learning outcomes is one of the key processes in university business process management. Additionally, this measurement serves as a tool to evaluate the effectiveness of the university's business processes. It is important to understand that students' academic achievements significantly impact program performance [2] [3]. Therefore, measuring students' academic achievements plays a vital role in the field of education. By carefully considering and evaluating students' learning outcomes, universities can identify areas that require improvement and develop strategies to enhance overall educational effectiveness.

However, it should be noted that measuring students' learning outcomes cannot be quickly achieved due to the lack of integration in the existing information systems. Without integrated information systems, accurately predicting students' learning progress becomes a challenging task. Therefore, early anticipation of students' learning outcomes is crucial for developing effective learning strategies within a study program [4] [5]. With proper information system integration, universities can monitor students' learning progress more efficiently jand identify areas that require more attention to enhance the quality of education in the learning process.

The learning process encompasses various entities, with students occupying a central position. Therefore, students' learning outcomes are measured as one of the variables aimed at assessing program performance. Educational institutions utilize various sources of information, including demographics, academic backgrounds, and behavioral characteristics, to ensure the factors influencing academic achievement are thoroughly considered [6] [7] [8] [9]. A comprehensive approach to measuring learning outcomes in the learning process enables institutions to gain insights into the diverse nature of academic performance and adjust their educational strategies accordingly.

The determining factors elucidate the elements that impact the learning process and subsequently influence academic performance [10]. Students may face challenges such as high or low academic achievement, or even failure, as a result of factors related to their learning. Barriers hindering learning achievement in the learning process can stem from internal factors within the students themselves. Internal factors encompass aspects such as family, social status, and the academic environment [11]. Thus, internal factors significantly influence academic achievement.
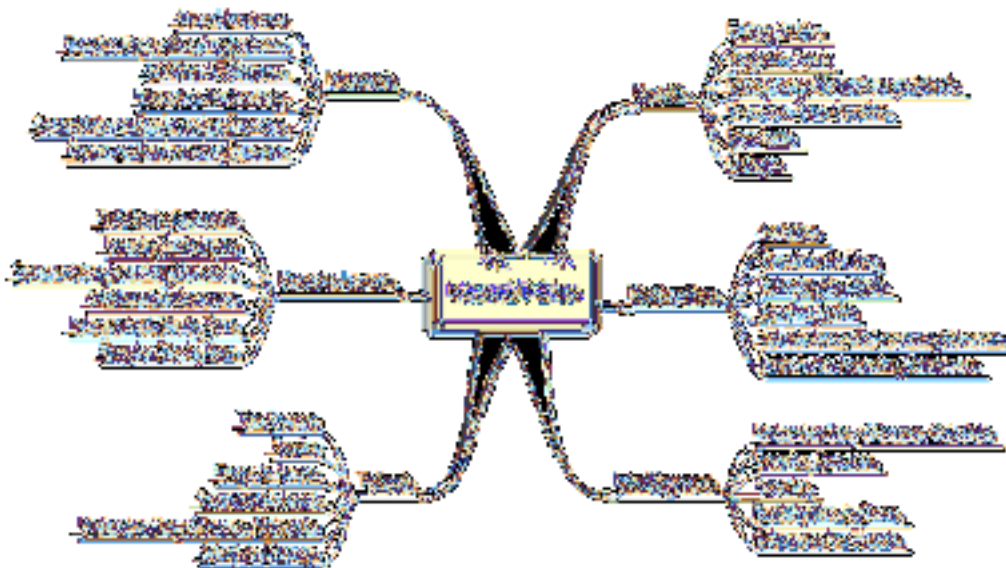
METHODS
DATA COLLECTION

Figure 1. Aspects measured in the questionnaire

This research utilized primary data sources in the form of questionnaires distributed to students enrolled in the digital electronics course at the Department of Informatics Engineering, Maulana Malik Ibrahim State Islamic University, Malang. The questionnaire consisted of thirty statements to be completed by the respondents. The aspects measured in the questionnaire as independent variables are depicted in Figure 1. The obtained Cronbach's alpha coefficient is 0.901, indicating a high level of reliability. Therefore, this instrument can be used for data collection purposes. Additionally, the learning outcome data in the form of end-of-semester grades were used as dependent variables in this study.

The population in this study consisted of second-semester students majoring in Informatics Engineering at UIN Maulana Malik Ibrahim, with a total of 110 students out of the entire population of 155, comprising 60 male students and 50 female students. The sampling technique used was purposive sampling. The research method employed was the survey method. This method was chosen because the study aimed to elucidate the analysis of internal factors dominating the learning outcomes of the

digital electronics course. The instrument used was a questionnaire, designed to reference the variables influencing students' learning outcomes in the digital electronics course, and then distributed to the participants.

The data was tested using logistic regression to determine the influence of internal factors on learning outcomes. The data was analyzed using RapidMiner, which facilitates systematic data exploration and examination, enabling the identification and extraction of meaningful patterns and trends. The utilization of RapidMiner allows for a comprehensive understanding of the fundamental factors and variables influencing learning outcomes.
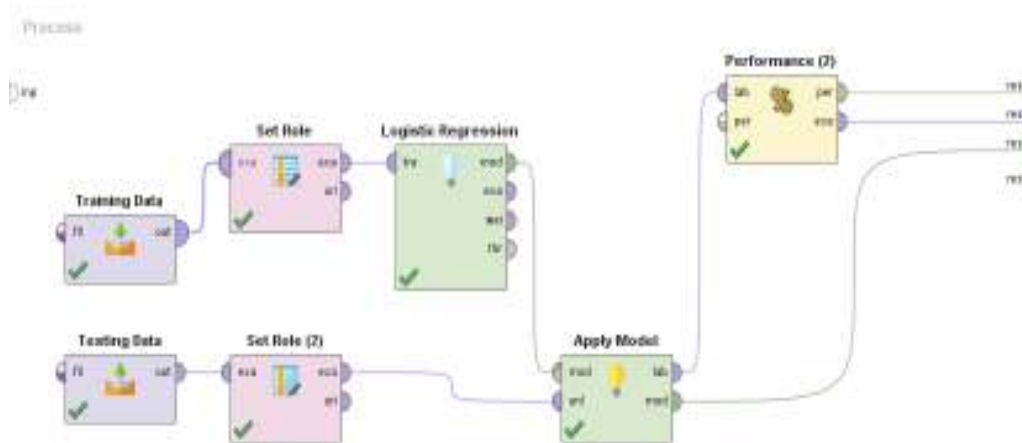
RESULTS AND DISCUSSION

Figure 2. Process Design on Rapidminer

We used RapidMiner to analyze student data and determine the internal factors influencing the probability of passing the course. These factors include health, intelligence, talent, interest, motivation, and learning style. The process design using RapidMiner is shown in Figure 2, which is explained as follows:

Read Excel - Training Data: This operator is used to read training data from an Excel file.

Set Role: This operator assigns the "Value" attribute as the label in the training data, indicating that the "Value" attribute is the variable to be predicted by the model.

Read Excel - Testing Data: This operator is used to read the testing data from an Excel file.

Set Role (2): This operator also assigns the "Value" attribute as the label in the testing data, ensuring consistency in the model evaluation process.

Logistic Regression: This process involves building a logistic regression model. Several model parameters can be adjusted, such as solver selection, regularization settings, and handling of missing values.

Apply Model: The trained model is applied to the testing data using the "Apply Model" operator.

Performance Evaluation: The model is evaluated using the "Performance (2)" operator. Various classification evaluation metrics are enabled, such as accuracy, precision, recall, and others. These metrics provide insights into how well the model can predict the target class.

INTERNAL FACTOR ANALYSIS

Table 1. p-value for Each Attribute

Attribute	p-Value ↑
Learning Style	0.028
Health	0.045
Inteligence	0.349
Motivation	0.604
Intercept	0.646
Interest	0.768
Talent	0.802

In conducting the analysis, logistic regression was used to determine the influence of internal factors on the probability of passing the course. The analysis results indicate a significant influence of several internal factors on this probability. Table 1 shows the significant p-values for each attribute.

Figure 3. Confussion Matrix

Figure 3 is a Confusion Matrix used to evaluate the performance of a classification model. In the context of the given confusion matrix:
True Negative: There are 10 cases correctly predicted as "Bad".
False Positive: There are 5 cases that should be "Good" but are predicted as "Bad".
False Negative: There are 2 cases that should be "Bad" but are predicted as "Good".
True Positive: There are 2 cases correctly predicted as "Good".
From this confusion matrix, we can calculate several model evaluation metrics. Precision measures how well the model correctly identifies a specific class from all its predictions. The model has a precision of approximately 28.57% for the "Good" class and 66.67% for the "Bad" class. Recall measures how well the model can detect all actual cases of a class. This model has a recall of approximately 83.33% for the "Bad" class and 28.57% for the "Good" class. Precision and recall are two important metrics in evaluating the performance of a classification model. Precision focuses on how well the model can identify a specific class, while recall focuses on how well the model can detect all actual cases of a class.

INFLUENCE OF INTERNAL FACTOR ON LEARNING OUTCOMES
This study found that internal factors influence students' learning outcomes. The most dominant internal factor affecting students' learning outcomes is learning style (p-value < 0.05). There is a positive influence between students' learning methods and their learning outcomes. These findings are consistent with research conducted by Zahyah et al. [12] and Aldiyah [13], which state that when students' learning styles

match their abilities, their learning outcomes will also be good, and this is closely related to teachers as the key to creativity and innovation in selecting teaching methods. This conclusion is similar to that stated by Halim [14], Putri, and Halim [15], and Kadir, Permana, and Qalby [16], which states that there is a positive and significant influence between learning style and learning outcomes, and there is an influence of learning style on learning outcomes.

Another dominant factor from the analysis is students' health (p-value < 0.05). The direct implication of this finding is that more can be done to improve learning achievement by ensuring students' health. This study aligns with research by Zakharova et al. [17] and Suyati et al. [18], which states that a person's physical health plays an important role in shaping students' learning outcomes.

CONCLUSION

The conclusion of this study indicates that learning style and students' health have a significant effect. Logistic regression analysis results show that learning style has a significance of 0.026 and health has a significance of 0.045. This study is limited to the influence of internal factors, including health, intelligence, talent, interest, motivation, and learning style, on learning outcomes. Future research will be extended to include other internal variables, allowing for a broader discussion and enabling the prediction of students' academic performance.

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