

Measuring E-Readiness in Implementing LMS Moodle at SMAN 10 Bandung Using the Technology Readiness Index (TRI) Model

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ABSTRACT

Technological advancements encourage the education sector to adopt information technology, including Learning Management Systems (LMS). This study aims to measure the level of technological readiness (e-readiness) for implementing LMS Moodle at SMAN 10 Bandung using the Technology Readiness Index (TRI) model. The TRI method assesses four main dimensions: Optimism, Innovativeness, Discomfort, and Insecurity. The results reveal that SMAN 10 Bandung has a moderate level of readiness, with a total TRI score of **2.92**. The Optimism variable received the highest score (0.84), while the Discomfort variable had the lowest score (0.51). Based on these results, SMAN 10 Bandung falls under the **Explorers** category, characterized by optimistic and innovative attitudes toward technology. The findings indicate moderate levels of optimism and innovativeness, reflecting positive attitudes toward Moodle's potential benefits, but highlight concerns related to discomfort and insecurity, including technical complexity and data security. SMAN 10 Bandung is identified as being in a transitional stage of technological readiness, requiring targeted interventions such as training programs, technical support, and improved security measures to ensure successful Moodle adoption. Recommendations include providing additional training to reduce discomfort and insecurity when using new technology. This research provides practical recommendations for enhancing e-readiness and contributes to the broader understanding of technology adoption in educational settings.

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1. INTRODUCTION

Education is a crucial process for developing students' knowledge, skills, attitudes, and character, which are essential for their personal growth and contributions to society [1],[2]. It encompasses both learning and assessment, where learning involves acquiring and applying knowledge through observation, practice, and reflection in various environments. Assessment, on the other hand, evaluates student progress and is categorized into summative functions for final evaluations and

formative functions for diagnosing challenges and improving learning quality[3]. Together, these elements ensure holistic student development, guided by feedback and strategies for continuous improvement[4]. The digital transformation in education has driven institutions to adopt technology as an integral part of learning strategies. One such technology widely implemented is Learning Management Systems (LMS), which enable the management of online learning processes. Moodle, in particular, has gained popularity due to its flexibility, comprehensive features, and open-source nature, allowing institutions to tailor it to their needs. At SMAN 10 Bandung, the implementation of Moodle is expected to support digital learning processes; however, its success heavily depends on the e-readiness of stakeholders, including teachers and administrative staff.

With advancements in technology, the education sector is increasingly adopting tools like LMS Moodle to enhance learning and assessment processes. Moodle, a web-based platform developed by Martin Dougiamas, offers a customizable learning environment supported by PHP and MySQL databases [5]. Its implementation at SMA Negeri 10 Bandung post-pandemic has highlighted the need to evaluate readiness for its effective use. The Technology Readiness Index (TRI) Model provides a framework to assess readiness, categorizing users into groups like Explorers and Skeptics based on psychological dimensions such as Optimism and Insecurity[6]. This evaluation helps refine strategies to optimize Moodle's impact in education.

Adopting new technology often faces challenges such as limited resources, resistance to change, and insufficient training or technical support. These issues raise critical questions about the extent of e-readiness at SMAN 10 Bandung for implementing Moodle, particularly concerning the technological attitudes and capabilities of its users. In this context, measuring e-readiness using the Technology Readiness Index (TRI) becomes highly relevant. The TRI model evaluates four key dimensions—optimism, innovativeness, discomfort, and insecurity—providing a comprehensive assessment of technological readiness in this institution. Previous studies have highlighted the significance of e-readiness in the successful adoption of educational technology. For instance, research has shown that optimism and innovativeness positively influence technology acceptance, while discomfort and insecurity often act as major barriers. However, studies specifically evaluating Moodle implementation readiness using the TRI model in secondary education environments, such as SMAN 10 Bandung, remain scarce. This creates a research gap that warrants a focused investigation tailored to the local context and the specific needs of secondary educational institutions.

This study aims to measure the e-readiness of SMAN 10 Bandung in implementing Moodle using the TRI model and to identify the key factors driving and hindering the adoption of this technology. The findings are expected to provide strategic recommendations for improving technological readiness at SMAN 10 Bandung and contribute to the broader literature on e-readiness, particularly in the context of LMS implementation in secondary education.

2. METHOD

Research methodology is a method for researchers to collect data and information in order to conduct research according to research subjects and research subjects, and high-quality results are expected from the data.

2.1. Research Methods

This study uses a quantitative descriptive design to measure e-readiness or readiness in implementing the Learning Management System (LMS) Moodle at SMAN 10 Bandung. The descriptive research design was chosen because it allows the author to describe and analyze the level of technology readiness without manipulating variables or providing certain interventions. Descriptive research aims to provide an accurate picture of the characteristics of the population or phenomenon being studied, with a focus on collecting data that can be measured quantitatively [7]. A quantitative approach is used

in this study to allow for objective and standardized measurements of technology readiness among students at SMAN 10 Bandung. The data collected will be analyzed using statistical methods to provide a numerical picture of the level of readiness for implementing the LMS Moodle. The Technology Readiness Index (TRI) model is used as a measurement instrument in this study. TRI measures four main variables, namely optimism, innovativeness, discomfort, and insecurity which together reflect the readiness of an individual or organization to adopt new technology [10],[11]. Through this quantitative descriptive design, the study aims to provide an in-depth understanding of the readiness of SMAN 10 Bandung in implementing the LMS Moodle. Quantitative data obtained from the TRI questionnaire will be processed to produce information that can be used by schools to determine strategic steps in improving technology readiness in their educational environment.

2.2. Types and Sources of Data

The type of data collected in this study is quantitative data involving a number of data collection methods to obtain user readiness figures in using the Moodle LMS when the summative assessment takes place using the Technology Readiness Index (TRI) model. The data sources and data collection methods used in this study use questionnaires. The questionnaire will later be distributed to respondents to be answered, then from these answers will be processed again into data that will show the level of user readiness in using the Moodle LMS when the summative assessment takes place.

2.3. Research Model

The research model used is the Technology Readiness Index (TRI), which consists of four variables: two variables with positive perceptions of technology, namely Optimism and Innovativeness, and two variables with negative perceptions of technology, namely Discomfort and Insecurity. Positive variables tend to encourage individuals to adopt new technologies in their lives, while negative variables can hinder the adoption of new technologies. The calculation of the TRI value is done by multiplying the average value of each questionnaire by the weight of each question. Each variable has a weight of 25% of the total. Furthermore, the total weight is divided by the number of statements in each variable. After the weight of each question is determined, the average value of the statement is multiplied by the weight of each statement. This process produces a total score for each statement, and the score for each variable is obtained from the total score of the statements in that variable. The total TRI score is then calculated by adding up the values of all variables [12] – [13]. The TRI value calculation formula can be seen below:

$$\begin{aligned} \text{Statement Weight} &= \frac{25\%}{\Sigma \text{ Variable Statement}} \\ \text{Statement Value} &= \frac{\Sigma (\text{Number of Answers} \times \text{Answer Score}) \times \text{Statement Weight}}{\text{Number of Respondents}} \\ \text{Variable TRI Value} &= \Sigma \text{ Statement Value} \\ \text{Total TRI Value} &= \Sigma \text{ TRI Variable Value} \end{aligned}$$

Figure 2. Tri Value Calculation Formula

2.4. Population and Research Sample

The population of this study is students at SMA Negeri 10 Bandung City totaling 1,545 people, then from this population a research sample was obtained using the Slovin formula below:

$$n = \frac{N}{1+N(e)^2}$$

Description:

n = sample

N = population

e = percentage of tolerance limit (margin of error)

The population in this study was 1,545 people with a tolerance limit percentage of 5% (0.05), so the calculation for sampling is as follows:

$$n = N / (1 + N \times e^2)$$

$$n = 1545 / (1 + (1545 \times 0,05^2))$$

$$n = 1545 / 1 + (1545 \times 0,0025)$$

$$n = 1545 / 1 + 3,8625$$

$$n = 1545 / 4,8625$$

$$n = 318,737$$

$$n = 319$$

After calculations were carried out using the Slovin formula, the number of samples used was 319 students who were selected randomly using the simple random sampling technique.

2.5. Research Instrument

The research instrument used is a questionnaire designed based on the TRI model with 4 variables, namely Optimism, Innovativeness, Discomfort, and Insecurity. This questionnaire contains statements with a closed format, where respondents must choose an answer from the options provided. The statements in the questionnaire refer to the table below:

Table 1. Research Statement

Variables	Statement	Code
Optimism	I prefer to use LMS Moodle when conducting Summative Assessment (End of Semester/Year Exam)	OPT1
	When using LMS Moodle I do not feel any difficulty because it is easy to use	OPT2
	LMS Moodle is comfortable to use	OPT3
	LMS Moodle is easy to learn its features	OPT4
	I can use LMS Moodle without help from others	OPT5
	I am sure my friends can also easily use LMS Moodle	OPT6
Innovativeness	Using LMS Moodle during summative assessment (Final Semester/Year Exam) is a step forward in the world of education	INV1
	In my opinion, LMS Moodle does not have many obstacles when used	INV2
	The features in LMS Moodle are very helpful in the summative assessment process	INV3
	LMS Moodle can be easily accessed because there is no need to install the application	INV4
	LMS Moodle does not require a lot of quota usage when used	INV5
	LMS Moodle makes me more enthusiastic in carrying out summative assessments	INV6
Discomfort	I prefer to do summative assessments (Final Semester/Year Exams) directly (offline/paper-based) compared to using the Moodle LMS	DIS1
	The Moodle LMS has a less attractive design	DIS2
	When working on questions, it is difficult to read	DIS3
	The Moodle LMS makes it too easy for me to get answers from other people	DIS4
	I feel embarrassed if I cannot operate the Moodle LMS properly	DIS5
	The Moodle LMS does not have a manual to learn its features	DIS6
Insecurity	I don't believe my personal data in LMS Moodle will be safe	INS1
	I don't believe my work in LMS Moodle will be safe	INS2
	I have to make sure the network is stable when submitting answers	INS3
	I'm afraid that when working on questions in LMS Moodle my device will experience an error and the answers will not be saved properly	INS4
	I feel unsafe if I have to give my account password to other people	INS5
	I feel unsafe if the answers I save can be seen by other people	INS6

In this study, the Likert scale was used as a weighting method. The Likert scale applied has 5 levels, with the neutral option located in the middle position or the third level. The details of this weighting can be seen in the following table:

Table 2. Research Questionnaire Answer Score

No	Jawaban	Skor
1	Strongly Agree (SA)	5
2	Agree (A)	4
3	Neutral (N)	3
4	Disagree (D)	2
5	Strongly Disagree (SD)	1

2.6. Validity Test

Validity, which comes from the word "validity," refers to the extent to which a measuring instrument is precise and accurate in carrying out its measurement function [8]. The validity test of the instrument is carried out by correlating the score value of one item with the total score of all existing items. The calculation of the correlation to produce the Pearson correlation value (r) can be seen in the following equation

$$r_{xy} = \frac{N \sum xy - (\sum x)(\sum y)}{\sqrt{N \sum x^2 - \sum x^2} \sqrt{N \sum y^2 - \sum y^2}} \dots\dots\dots(1)$$

- rx y = Correlation Coefficient
- N = Number of samples
- ∑ x = Total score for question items variable X
- ∑ y = Total score for question items variable Y

The Pearson correlation (r) value is used as a basis for decision making and compared with the r table which has the following criteria:

1. If the calculated r value is greater than the r table value, then the instrument is declared valid.
2. If the calculated r value is lower than the r table value, then the instrument is declared invalid.

2.7. Reliability Test

Reliability is a measure that shows the extent to which a measuring instrument can be used consistently, as well as how consistent the measurement results are if repeated more than twice [9]. Reliability testing is used to check the consistency of the questionnaire, ensuring that the results obtained remain the same if measured repeatedly. In this study, the Cronbach's alpha (α) formula was applied, as stated in the following equation.

$$\lambda = \left(\frac{k}{k-1} \right) \left(1 - \frac{\sum \sigma_h^2}{\sigma_t^2} \right) \dots\dots\dots(2)$$

- λ = Instrument reliability coefficient
- k = number of questions
- ∑ σ_h² = number of item variants
- σ_t² = Total number of variants of the reliability coefficient criteria

3. RESULT AND DISCUSSION

3.1. Validity Test Results

Validity test was conducted using the Bivariate Pearson technique with the help of the SPSS application. This technique measures the correlation between the item scores of each statement with the total overall score, where the total score is the sum of all statements. If the calculated r value is greater than the table r value, the statement is considered to have a significant correlation (significance level 0.05) with the total score and is declared valid. The results of the validity test can be seen in the following table:

Table 3. Validity Test Results

Variable	Indicator	r count	r table (5%)	Results
Optimism	OPT1	0,708	0,113	Valid
	OPT2	0,786	0,113	Valid
	OPT3	0,790	0,113	Valid
	OPT4	0,773	0,113	Valid
	OPT5	0,719	0,113	Valid
	OPT6	0,621	0,113	Valid
Innovativeness	INV1	0,646	0,113	Valid
	INV2	0,654	0,113	Valid
	INV3	0,737	0,113	Valid
	INV4	0,684	0,113	Valid
	INV5	0,691	0,113	Valid
	INV6	0,794	0,113	Valid
Discomfort	DIS1	0,548	0,113	Valid
	DIS2	0,670	0,113	Valid
	DIS3	0,638	0,113	Valid
	DIS4	0,610	0,113	Valid
	DIS5	0,547	0,113	Valid
	DIS6	0,517	0,113	Valid
Insecurity	INS1	0,598	0,113	Valid
	INS2	0,620	0,113	Valid
	INS3	0,583	0,113	Valid
	INS4	0,699	0,113	Valid
	INS5	0,722	0,113	Valid
	INS6	0,766	0,113	Valid

Based on the table above, all existing statements are declared valid, because the calculated r of each statement has a value greater than the table r (0.113).

3.2. Reliability Test Results

The reliability test aims to see the consistency of the questionnaire distributed by the author, whether it will get the same results or not if it is done repeatedly. The method used is Cronbach's Alpha with data that has been tested for validity before, declared reliable if the Cronbach's Alpha value is greater than 0.60. The results of the reliability test can be seen in the table below:

Table 4. Reliability Test Results

Variable	N (Item)	Cronbach's Alpha	Results
Optimism	6	0,826	Reliable
Innovativeness	6	0,790	Reliable
Discomfort	6	0,609	Reliable
Insecurity	6	0,750	Reliable

Based on the table above, all variables are declared reliable, because the Cronbach's Alpha value is greater than 0.60. It can be concluded that the questionnaire that has been distributed by the author has passed the validity test and reliability test, then the data can be used for readiness calculations using the Technology Readiness Index (TRI) method.

3.3. TRI Analysis

The calculation of the TRI value is calculated from the average value of each statement. The average value is obtained from the sum of the weights of each statement and then divided by the number of respondents in the study. Each statement has a weight of 25%, then divided by the number of statement scores on each variable so that the weight of each statement is obtained. Then the average value of the statement is multiplied by the weight of each statement to get the score for each statement. The total TRI score is obtained from the sum of the values of all variables. Here is an example of the calculation for a statement. To calculate other statements using the same method. To find the weight of the optimism variable statement and the value of the statement (P1).

$$\text{Statement Weight} = \frac{25\%}{\Sigma \text{ Variable Statement}}$$

$$\text{Statement Weight} = \frac{25\%}{3.71+3.81+3.77+3.80+ 3.62 + 3.83}$$

$$\text{Statement Weight} = \frac{0.25}{22.54} = 0.01$$

$$\text{Statement Value} = \Sigma \frac{(\text{Number of Answers} \times \text{Answer Score}) \times \text{Statement Weight Number}}{\text{of Respondents}}$$

$$\begin{aligned} \text{Statement Value 1 (P1)} &= \frac{(1183 \times 3.71) \times 0.01}{319} \\ &= \frac{4387,1 \times 0,01}{319} \\ &= 0.14 \end{aligned}$$

To find the weight of the innovativeness variable statement and the value of the statement (P1).

$$\text{Statement Weight} = \frac{25\%}{\Sigma \text{ Variable Statement}}$$

$$\text{Statement Weight} = \frac{25\%}{3.88 +3.21 +3.79 +4.04 + 3.61 + 3.55}$$

$$\text{Statement Weight} = \frac{0.25}{22.08} = 0.01$$

$$\text{Statement Value} = \frac{\Sigma (\text{Number of Answers} \times \text{Answer Score}) \times \text{Statement Weight}}{\text{Number of Respondents}}$$

$$\begin{aligned} \text{Statement Value 1 (P1)} &= \frac{(1237 \times 3.88) \times 0.01}{319} \\ &= \frac{4796,8 \times 0,01}{319} \\ &= 0.15 \end{aligned}$$

To find the weight of the discomfort variable statement and the value of the statement (P1).

$$\text{Statement Weight} = \frac{25\%}{\Sigma \text{ Variable Statement}}$$

$$\text{Statement Weight} = \frac{25\%}{2.74 + 2.84 + 2.74 + 2.60 + 2.99 + 3.28}$$

$$\text{Statement Weight} = \frac{0.25}{17.20} = 0.01$$

$$\text{Statement Value} = \frac{\Sigma (\text{Number of Answers} \times \text{Answer Score}) \times \text{Statement Weight}}{\text{Number of Respondents}}$$

$$\text{Statement Value 1 (P1)} = \frac{(875 \times 2.74) \times 0.01}{319}$$

$$= \frac{2400,1 \times 0,01}{319}$$

$$= 0.08$$

To find the weight of the insecurity variable statement and the value of the statement (P1).

$$\text{Statement Weight} = \frac{25\%}{\Sigma \text{ Variable Statement}}$$

$$\text{Statement Weight} = \frac{25\%}{2.92 + 2.90 + 4.13 + 4.04 + 3.80 + 3.66}$$

$$\text{Statement Weight} = \frac{0.25}{21.45} = 0.01$$

$$\text{Statement Value} = \frac{\Sigma (\text{Number of Answers} \times \text{Answer Score}) \times \text{Statement Weight}}{\text{Number of Respondents}}$$

$$\text{Value Statement 1} = \frac{(930 \times 2,92) \times 0,01}{319}$$

$$= \frac{2711,3 \times 0,01}{319}$$

$$= 0.08$$

After performing calculations using the formula, the resulting score from the TRI calculation is as follows

Table 3. 1 Total Score of Technology Readiness Index (TRI) Value

No	Variabel	Nilai TRI
1.	Optimism	0,84
2.	Innovativeness	0,81
3.	Discomfort	0,51
4.	Insecurity	0,76
Total Nilai TRI		2,92

The total TRI value of 2.92 indicates that students of SMAN 10 Bandung fall into the Medium Technology Readiness category. Specifically, the optimism variable scored 0.84, reflecting confidence in

mastering technology like LMS Moodle and recognizing its positive role in summative assessments. The innovativeness variable scored 0.81, highlighting LMS Moodle as a promising innovation in education. However, the discomfort variable scored 0.51, showing that students still feel uneasy with the new technology, while the insecurity variable scored 0.76, indicating concerns about the safety of implementing LMS Moodle. These values categorize the students as "Explorers," as their high optimism and innovativeness scores are paired with lower discomfort and insecurity scores. Despite the relatively high insecurity score, it does not qualify them for the "Pioneers" group, which requires higher discomfort and insecurity scores compared to optimism and innovativeness.

4. CONCLUSION

Based on the use of the Technology Readiness Index (TRI) model, the results show that SMA Negeri 10 Bandung has a level of readiness in implementing LMS Moodle as an assessment medium included in the Medium Technology Readiness category with a total value of 2.92. The variable that gets the highest value is the Optimism variable with a value of 0.84 which shows that students of SMA Negeri 10 Bandung have confidence in mastering technology, especially LMS Moodle and provide positive benefits in the implementation of summative assessments. The variable that gets the lowest value is the Discomfort variable with a value of 0.51 which shows that students of SMA Negeri 10 Bandung still feel less comfortable implementing new technology in their lives, especially LMS Moodle. Students at SMA Negeri 10 Bandung are included in the Explorers group category, which is characterized by having relatively higher Optimism and Innovativeness dimension values compared to the Discomfort and Insecurity dimensions. Indicating that students at SMA Negeri 10 Bandung are very enthusiastic about new technology, especially LMS Moodle as an assessment medium.

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