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# Impact of Teachers' Understanding and Merdeka Curriculum Implementation on Teacher Competence and Student Academic Performance

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**Abstract**

*This study aims to examine the relationships between Teachers' Understanding of the Merdeka Curriculum (TUMC), Curriculum Implementation Quality (CIQ), Teacher Competence in Developing Instructional Materials (TCDIM), and Student Academic Achievement (SAA) in Indonesian high schools. The research aims to examine how teachers' comprehension of the curriculum affects instructional material development, curriculum implementation quality, and student academic achievement. A quantitative approach was employed, involving 487 high school teachers and students from DKI Jakarta. Data were collected through questionnaires and analyzed using structural equation modeling. The study findings reveal significant positive relationships between TUMC, CIQ, TCDIM, and SAA. Specifically, TUMC positively affects both TCDIM and SAA, while CIQ directly impacts TCDIM and SAA. Additionally, TCDIM significantly predicts SAA. This study contributes to the existing literature by clarifying the critical role of teachers' curriculum understanding in shaping instructional quality and student achievement. The findings underscore the importance of investing in teacher training and professional development to enhance teachers' comprehension of the curriculum and their instructional material development skills. Furthermore, the study highlights the need for policy initiatives that improve CIQ and foster collaborative partnerships among educational stakeholders. The novelty of this study lies in its focus on the Merdeka Curriculum and its implications for educational practices and policies in Indonesia.*

**Keywords:** *Teachers' Understanding of the Merdeka Curriculum, Curriculum Implementation Quality, Teacher Competence in Developing Instructional Materials, Student Academic Achievement.*

## Introduction

Education serves as the cornerstone of national development, with teachers playing an essential role in delivering instructional materials to students (Akour & Alenezi, 2022). In the context of Indonesia's educational advancement, the Merdeka Curriculum has gained attention from various stakeholders (Sari et al., 2023; Sormin et al., 2023; Wardani et al., 2023). This curriculum promotes a new approach that emphasizes freedom, creativity, and teacher autonomy in designing instructional materials that are both relevant and meaningful to students (Subkhan, 2023).

The Merdeka Curriculum, recently introduced in Indonesia, emphasizes freedom, creativity, and teacher autonomy in developing instructional materials (Fauzan et al., 2023; Prakoso et al., 2023). However, as the curriculum is still in its early stages of implementation, further investigation into teachers' understanding and the quality of its implementation is needed. Teachers' comprehension of the Merdeka Curriculum plays an essential role in its successful implementation (Defrizal et al., 2022). Those who possess a deep understanding of its concepts, objectives, and principles are more likely to implement it effectively, thereby enhancing the learning process (Andriansyah et al., 2022; Misnatun & Ummah, 2023; Yulianto, 2022).

The quality of curriculum implementation plays an essential role in the success of education (Little & Paul, 2021). Effective implementation requires a high level of teacher competence in developing instructional materials that align with the principles of the Merdeka Curriculum, employing diverse teaching strategies, and conducting comprehensive assessments of student achievement (Ferdaus & Novita, 2023; Nadya et al., 2023; Rahimah & Widiastuty, 2023). Teachers' ability to create instructional materials that are relevant,

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engaging, and tailored to students' needs is essential for successful learning. This requires creativity, expertise in integrating various learning resources, and the capacity to adopt approaches suited to students' characteristics (Bereczki & Kárpáti, 2021; Caena & Redecker, 2019; Swanzy-Impraim et al., 2023). Student academic achievement remains the primary goal of the educational process, and it is anticipated that teachers' strong understanding of the Merdeka Curriculum, high-quality curriculum implementation, and competence in developing effective instructional materials will enhance student achievement in high schools in DKI Jakarta, Indonesia.

This research holds substantial implications for education, particularly in the context of implementing the Merdeka Curriculum in high schools in DKI Jakarta. By examining how teachers perceive and execute the curriculum, the study aims to provide valuable insights into its implementation, highlighting both strengths and challenges. Furthermore, understanding the quality of curriculum implementation and teacher competencies in developing instructional materials can contribute to enhancing teaching practices in these schools. The findings may also inform the development of educational policies at both local and national levels, guiding the creation of more effective strategies to improve educational quality. Thus, the research seeks to examine teachers' understanding of the Merdeka Curriculum, assess the quality of its implementation, and analyze its impact on teacher competencies and student academic performance in high schools in DKI Jakarta, Indonesia. Through these objectives, the study aims to deepen understanding of the Merdeka Curriculum's implementation and its broader implications for teaching and learning outcomes.

## Literature Review and Hypothesis Development

*Teachers' Understanding of the Merdeka Curriculum and Teacher Competence in Developing Instructional Materials*

Kasman and Lubis (2022) claim that teachers' understanding of the Merdeka Curriculum refers to the depth of comprehension and insight that teachers possess regarding the principles, objectives, and methodologies outlined within the curriculum. This understanding encompasses their knowledge of the curriculum's conceptual framework, intended learning outcomes and the pedagogical approaches advocated for in teaching practices (Putri et al., 2023). A solid understanding of the Merdeka Curriculum provides teachers with the foundational knowledge necessary to design instructional materials that align closely with its principles and objectives (Restu et al., 2022). When teachers comprehend the underlying concepts and pedagogical strategies, they are better equipped to create relevant, engaging, and effective instructional materials tailored to their students' needs. Consequently, their competence in developing instructional materials is enhanced, leading to the creation of high-quality resources that facilitate meaningful and impactful learning experiences for students. Therefore, a strong understanding of the Merdeka Curriculum directly influences and enhances teacher competence in developing instructional materials, ultimately contributing to improved teaching and learning outcomes (Rosani et al., 2024; Rotty & Tinangon, 2024; Said et al., 2023). Based on this, the following hypothesis was formulated:

H1: There is a significant relationship between Teachers' Understanding of the Merdeka Curriculum and Teacher Competence in Developing Instructional Materials

*Teachers' Understanding of the Merdeka Curriculum and Student Academic Achievement*

Nurzen (2022) claims that a comprehensive understanding of the Merdeka Curriculum equips teachers with the required knowledge and skills for its effective classroom implementation. When educators understand the curriculum's core principles and pedagogical strategies, they are better equipped to design and deliver instruction that addresses the diverse needs of their students (Day et al., 2016). This, in turn, fosters an engaging and supportive learning environment, promoting both student participation and academic success. As a result, proficient implementation of the Merdeka Curriculum by teachers positively influences student academic performance by improving students' ability to acquire and apply knowledge effectively (Amalia et al., 2023). Therefore, a strong relationship exists between teachers' mastery of the Merdeka Curriculum and student achievement, highlighting the crucial role of effective curriculum implementation in advancing student learning and success (Latifa et al., 2023; Sofa et al., 2023; Yoto et al., 2024). Based on this, the following hypothesis was formulated:

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H2: There is a significant relationship between Teachers' Understanding of the Merdeka Curriculum and Student Academic Achievement

*Curriculum Implementation Quality and Teacher Competence in Developing Instructional Materials*

According to Twining et al. (2021), Curriculum Implementation Quality (CIQ) refers to the effectiveness and fidelity with which a curriculum is implemented in educational settings. It encompasses various aspects, including the alignment of instructional strategies with curriculum objectives, the appropriateness of learning materials, the use of assessment methods, and the overall coherence of the teaching-learning process. A high level of teacher competence in developing instructional materials directly influences the quality of curriculum implementation. Educators who possess the skills and knowledge to design and adapt instructional materials to meet students' needs are better equipped to translate the curriculum into meaningful learning experiences (Alam, 2021; Kilag et al., 2023). Moreover, teacher competence in developing instructional materials contributes to aligning teaching practices with curriculum goals, ensuring that learning activities are relevant, engaging, and conducive to student learning. Consequently, enhanced curriculum implementation quality leads to improved student outcomes (Bone & Ross, 2021; De Vincenzi et al., 2018; Ofei-Manu & Didham, 2018). Conversely, deficiencies in teacher competence may impede effective curriculum implementation, resulting in suboptimal learning experiences and outcomes for students. Thus, there is a reciprocal relationship between CIQ and teacher competence in developing instructional materials, with each factor influencing and reinforcing the other in the educational process (Albion et al., 2015; Lucenario et al., 2016; Tondeur et al., 2020). Based on this, the following hypotheses are proposed:

H3: There is a significant relationship between Curriculum Implementation Quality and Teacher Competence in Developing Instructional Materials

*Curriculum Implementation Quality and Student Academic Achievement*

Monte-Sano et al. (2014) claim that high-quality curriculum implementation, characterized by its effective and faithful translation into classroom practices, fosters an optimal learning environment for students. Quality implementation ensures that instructional strategies align with curriculum objectives, learning materials are appropriate and engaging, assessments are meaningful, and the overall teaching-learning process is coherent and conducive to learning (Whalley, 2019). In such an environment, students are more likely to engage actively in their learning, leading to a deeper understanding and mastery of the curriculum content (Uçar & Sungur, 2017). They benefit from effective support and guidance from teachers who are well-equipped to address diverse learning needs. As a result, students are better positioned to achieve their academic goals and demonstrate higher levels of academic achievement. Conversely, poor curriculum implementation quality can impede student academic achievement (Banerjee, 2016). Misalignment between instructional practices and curriculum objectives or the use of inadequate or irrelevant learning materials can lead to difficulties in grasping key concepts and skills, resulting in disengagement, frustration, and lower academic performance (McNeill et al., 2016). Thus, there is a direct and significant relationship between curriculum implementation quality and student academic achievement. High-quality implementation enhances student learning experiences and outcomes, whereas poor implementation can hinder academic progress. Therefore, efforts to improve curriculum implementation quality are crucial for promoting student success in education (Dolph, 2016; Valiandes & Neophytou, 2018). Thus, the following hypothesis was formulated:

H4: There is a significant relationship between Curriculum Implementation Quality and Student Academic Achievement

*Teacher Competence in Developing Instructional Materials and Student Academic Achievement*

Tekır and Akar (2020) define Teacher Competence in Developing Instructional Materials as the proficiency, knowledge, and skills educators possess in creating, adapting, and utilizing teaching resources to facilitate student learning. This competence includes the ability to design materials that align with curriculum

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objectives, are engaging, and effectively address diverse learning needs. When teachers are skilled in developing instructional materials, they can create resources tailored to the specific needs and abilities of their students (Solihatin et al., 2023). These materials are designed to support student learning by offering clear explanations, relevant examples, and meaningful activities that enhance understanding and mastery of the curriculum content.

Furthermore, teachers who are proficient in developing instructional materials are better equipped to differentiate instruction to meet the diverse needs of their students (Wan, 2017). They can provide additional support or enrichment activities as needed, ensuring that all students have the opportunity to succeed academically. Consequently, students are more likely to be engaged in their learning and achieve higher levels of academic success (Lynam et al., 2024). Effective instructional materials that are well-planned, organized and presented enhance student learning and improve academic performance. Conversely, when teachers lack competence in developing instructional materials, students may encounter poorly organized, irrelevant, or ineffective instruction, which can impede engagement and understanding, leading to lower academic achievement (Kelley & Knowles, 2016). Thus, there is a direct and significant relationship between teacher competence in developing instructional materials and student academic achievement. Competent teachers are essential in creating a supportive learning environment that fosters student success and achievement in education (Yelfianita et al., 2023). Hence, the following hypothesis was formulated:

H5: There is a significant relationship between Teacher Competence in Developing Instructional Materials and Student Academic Achievement

*Teacher Competence in Developing Instructional Materials as moderator*

When considering "Teacher Competence in Developing Instructional Materials" as a moderator in the relationship between curriculum implementation quality and student academic achievement, it plays an essential role in affecting the strength or direction of this relationship. As a moderator, teacher competence can either amplify or attenuate the impact of curriculum implementation quality on student academic achievement (Glewwe et al., 2021; Kraft et al., 2018; Sung et al., 2016). For example, when curriculum implementation quality is high, teacher competence can enhance its effects on student academic achievement. Teachers who excel in developing instructional materials can maximize the benefits of a well-implemented curriculum by creating engaging and effective resources that further support student learning and academic success (Castellano et al., 2017; Loncing et al., 2023). Conversely, when curriculum implementation quality is low, teacher competence can act as a buffer against its negative effects on student achievement. Competent teachers can mitigate some of the adverse impacts by providing supplementary resources and support, helping students achieve better academic outcomes despite suboptimal curriculum implementation. In summary, teacher competence in developing instructional materials moderates the relationship between curriculum implementation quality and student academic achievement, enhancing the positive effects of a well-implemented curriculum and mitigating the negative effects of a poorly implemented one, thus playing a vital role in promoting student success. Based on this, the following hypotheses were formulated:

H6: Teacher Competence in Developing Instructional Materials mediates the relationship between Teachers' Understanding of the Merdeka Curriculum and Student Academic Achievement.

H7: Teacher Competence in Developing Instructional Materials mediates the relationship between Curriculum Implementation Quality and Student Academic Achievement.

Based on the previous literature and hypothesis development, the researcher constructed a research framework (Figure 1). This conceptual model includes four main constructs: "Teachers' Understanding of the Merdeka Curriculum" (TUMC), "Curriculum Implementation Quality" (CIQ), "Teacher Competence in Developing Instructional Materials" (TCDIM), and "Student Academic Achievement" (SAA). Figure 1 illustrates the relationships among these constructs in a cross-sectional model, reflecting the proposed hypotheses. TUMC is considered the independent variable, while CIQ, TCDIM, and SAA are dependent

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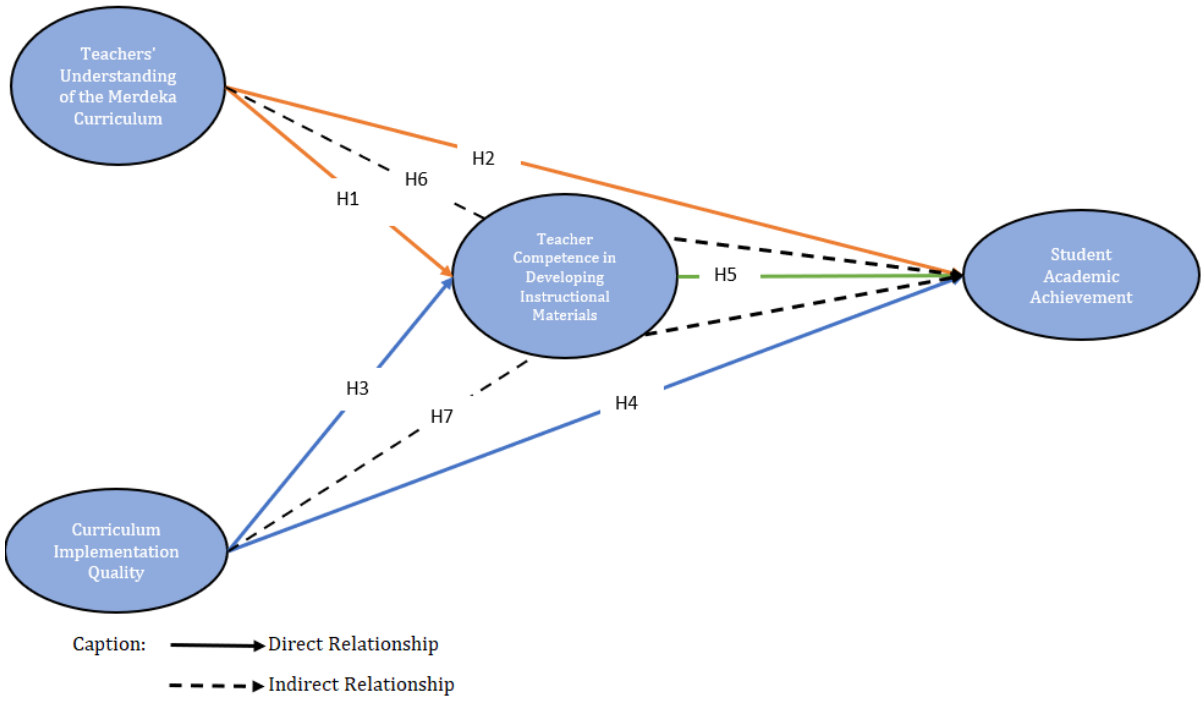
variables. CIQ is expected to mediate the relationship between TUMC and SAA, and TCDIM is anticipated to mediate the relationship between CIQ and SAA. Additionally, TCDIM is also expected to mediate the direct relationship between TUMC and SAA. This conceptual model provides a framework for evaluating the influences of TUMC and CIQ on SAA, both directly and through the mediator of TCDIM.

**Figure 1. Study Model**




## Methods

*Research Design, Population, and Sample*

This study employs a quantitative research design using a survey approach to collect data from high school teachers and students in DKI Jakarta. Of the 500 surveys distributed, 487 responses were received and deemed analyzable. This method allows for the comprehensive collection of data on teachers' understanding of the Merdeka Curriculum, curriculum implementation quality, teacher competence in developing instructional materials, and student academic achievement. The study population includes all high school teachers and students in DKI Jakarta, with samples randomly selected according to relevant inclusion and exclusion criteria. The sample size is considered sufficient to ensure representative and reliable results.

*Research Instruments and Data Collection Procedure*

The research employs various instruments to collect comprehensive data. This includes administering questionnaires to assess teachers' understanding of the Merdeka Curriculum, using checklists or observation rubrics to evaluate the effectiveness of curriculum implementation in classrooms, and utilizing questionnaires or tests to measure teachers' proficiency in developing instructional materials, as adopted by Ekayati and Meisuri (2023), Putri et al. (2023), and Restu et al. (2022). Additionally, data on student academic achievement is obtained from school records, as referenced by Maxwell et al. (2017). Data collection involves distributing and collecting questionnaires from both teachers and students, observing classroom dynamics during the teaching-learning process, and retrieving student performance records from school archives. This multifaceted approach provides a holistic understanding of the factors under investigation and supports robust analysis for the research objectives.

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*Validity and Reliability*

Validity and reliability are crucial components of research methodology that ensure the credibility and accuracy of findings. Validity refers to the extent to which a research instrument measures what it is intended to measure (Sudaryono et al., 2019). It encompasses various types, including content, construct, and criterion validity, each assessing different aspects of the instrument's ability to capture the intended construct accurately. Reliability, on the other hand, pertains to the consistency and stability of measurements obtained from the research instrument (Heale & Twycross, 2015). This includes test-retest reliability, inter-rater reliability, and internal consistency reliability, all ensuring that the instrument produces consistent results under the same conditions. Together, validity and reliability form the foundation of research design, allowing researchers to draw meaningful and confident conclusions from their data (Table 1).

**Table 1. Validity and Reliability**

| Construct | Items and indicators | Outer loading | α | rho_A | CR | AVE |
|---|---|---|---|---|---|---|
| Teachers' Understanding of the Merdeka Curriculum | TUMC1= Understanding of Merdeka Curriculum Principles | 0.938 | 0.975 | 0.975 | 0.979 | 0.888 |
| | TUMC2= Knowledge of Merdeka Curriculum Objectives | 0.953 | | | | |
| | TUMC3= Alignment of Teaching Strategies | 0.945 | | | | |
| | TUMC4= Integration of Merdeka Curriculum Values in Instructional Materials | 0.949 | | | | |
| | TUMC5= Awareness of Challenges and Opportunities | 0.917 | | | | |
| | TUMC6= Engagement in Curriculum Development and Evaluation | 0.951 | | | | |
| Curriculum Implementation Quality | CIQ1= Adherence to Curriculum Guidelines | 0.891 | 0.968 | 0.970 | 0.974 | 0.862 |
| | CIQ2= Effective Instructional Delivery | 0.934 | | | | |
| | CIQ3= Resource Availability and Utilization | 0.942 | | | | |
| | CIQ4= Student Engagement and Participation | 0.931 | | | | |
| | CIQ5= Assessment and Feedback Practices | 0.948 | | | | |
| | CIQ6= Curriculum Adaptation and Innovation | 0.925 | | | | |
| Teacher Competence in Developing Instructional Materials | TCDIM1= Mastery of Subject Matter | 0.926 | 0.959 | 0.961 | 0.967 | 0.830 |
| | TCDIM2= Creativity in Material Design | 0.921 | | | | |

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| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | TCDIM3= Alignment with Curriculum Objectives | 0.943 | | | | |
| | | TCDIM4= Adaptability to Student Needs | 0.923 | | | | |
| | | TCDIM5= Integration of Technology | 0.738 | | | | |
| | | TCDIM6= Evaluation and Improvement | 0.906 | | | | |
| Student Achievement | Academic | SAA1= Mastery of Core Concepts | 0.887 | 0.949 | 0.951 | 0.960 | 0.802 |
| | | SAA2= Performance on Standardized Tests | 0.925 | | | | |
| | | SAA3= Completion of Assignments and Projects | 0.935 | | | | |
| | | SAA4= Classroom Participation and Engagement | 0.912 | | | | |
| | | SAA5= Progress Over Time | 0.911 | | | | |
| | | SAA6= Attainment of Learning Objectives | 0.897 | | | | |

Table 1 presents the results of the validity and reliability analyses for each construct in the study, including TUMC, CIQ, TCDIM, and SAA. Each construct is evaluated based on several items and indicators, with their corresponding outer loadings, Cronbach's alpha (α), rho_A coefficient, composite reliability (CR), and average variance extracted (AVE). For TUMC, all six items demonstrate high outer loadings ranging from 0.917 to 0.953, indicating strong associations between the observed variables and the latent construct. The reliability measures are as follows: Cronbach's alpha (0.975), rho_A (0.975), CR (0.979), and AVE (0.888), suggesting excellent internal consistency and reliability of the scale. Similarly, for CIQ, all six items show substantial outer loadings ranging from 0.891 to 0.948, indicating robust relationships with the underlying construct. The reliability measures are: Cronbach's alpha (0.968), rho_A (0.970), CR (0.974), and AVE (0.862), demonstrating high internal consistency and reliability of the scale.

TCDIM demonstrates strong outer loadings for five out of six items, ranging from 0.738 to 0.943. However, the item "Integration of Technology" (TCDIM5) has a lower loading of 0.738, suggesting a potentially weaker relationship with the latent construct. The reliability measures for TCDIM show high internal consistency and reliability, with Cronbach's alpha (0.959), rho_A (0.961), CR (0.967), and AVE (0.830) surpassing acceptable thresholds. For SAA, all six items show substantial outer loadings ranging from 0.887 to 0.935, reflecting strong associations with the latent construct. The reliability measures for SAA also indicate high internal consistency and reliability, with Cronbach's alpha (0.949), rho_A (0.951), CR (0.960), and AVE (0.802) meeting acceptable criteria. Overall, the results suggest that the measurement models for all constructs exhibit satisfactory validity and reliability, with most items demonstrating robust associations with their respective constructs and high internal consistency. However, further investigation may be needed for the item "Integration of Technology" within the Teacher Competence construct due to its relatively lower loading compared to other items.

*Data Analysis and Ethical Procedures*

The collected data were analyzed using descriptive statistical methods and inferential analyses, such as correlation tests and linear regression. This approach facilitates the evaluation of the relationships between teachers' understanding, curriculum implementation quality, teacher competence in developing instructional materials, and student academic achievement. The research was conducted in accordance with research ethics principles, including privacy and data security, obtaining informed consent from participants, and ensuring fair and objective data usage.

*Data Processing and Interpretation Procedure*

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The collected data were thoroughly processed using statistical software, specifically Smart PLS, for comprehensive analysis. The outcomes of this analysis were meticulously interpreted, considering the predefined research objectives and questions. To uphold the credibility of the findings, the utmost attention was given to ensuring the reliability and validity of the data. This involved employing validated research instruments, utilizing appropriate sampling techniques, and performing meticulous statistical calculations. Such measures are essential for safeguarding the integrity and accuracy of the research outcomes.

## Findings

*Latent Variable Descriptive*

Latent variables are variables that cannot be directly observed but are inferred from observable indicators (Rabbitt, 2018). Descriptive statistics for latent variables typically involve summarizing the distribution of scores or responses on the indicators used to measure the latent variable (Hayduk & Littvay, 2012). This includes measures of central tendency (such as mean, median, and minimum or maximum) and measures of dispersion (such as excess kurtosis and skewness) for each indicator. Additionally, descriptive statistics can involve examining the distributional properties of the latent variable itself, including its mean and standard deviation, as estimated through factor analysis or structural equation modeling techniques. These descriptive statistics provide insights into the characteristics and properties of the latent variable and its indicators, helping to elucidate its role and significance within the research context (Table 2).

Table 2. Latent Variable Descriptive

| Construct*) | No of Obs. | Median | Min | Max | Excess Kurtosis | Skewness |
|---|---|---|---|---|---|---|
| TUMC | 487 | -0.023 | -4.384 | 0.953 | 3.601 | -1.594 |
| CIQ | 487 | -0.180 | -3.430 | 1.067 | 1.389 | -1.030 |
| TCDIM | 487 | -0.263 | -3.324 | 1.278 | 0.792 | -0.566 |
| SAA | 487 | -0.174 | -3.353 | 1.154 | 2.575 | -1.283 |

*) TUMC=Teachers' Understanding of the Merdeka Curriculum; CIQ=Curriculum Implementation Quality; TCDIM=Teacher Competence in Developing Instructional Materials; SAA=Student Academic Achievement

Table 2 presents descriptive statistics for the latent variables in the study, which include TUMC, CIQ, TCDIM, and SAA. Each row in the table corresponds to one of these variables, with columns showing the number of observations (No. of Obs.), median, minimum (Min), and maximum (Max) values, along with excess kurtosis and skewness. For TUMC, the median score is -0.023, with values ranging from -4.384 to 0.953. The excess kurtosis of 3.601 indicates a leptokurtic distribution, suggesting heavy tails and potential outliers, while the skewness of -1.594 suggests a negatively skewed distribution. Similarly, CIQ has a median score of -0.180, with values from -3.430 to 1.067. The excess kurtosis of 1.389 indicates a slightly leptokurtic distribution, while the skewness of -1.030 also points to a negative skew. TCDIM shows a median score of -0.263, with a range from -3.324 to 1.278. The excess kurtosis of 0.792 suggests moderate tail weight, while a skewness of -0.566 indicates a slightly negatively skewed distribution. Finally, for SAA, the median score is -0.174, with values ranging from -3.353 to 1.154. The excess kurtosis of 2.575 suggests a leptokurtic distribution, and the skewness of -1.283 indicates a negative skew. These descriptive statistics provide valuable insights into the central tendency, variability, and distribution shapes for each latent variable, setting the stage for further analysis and interpretation in the study.

Classic assumption test

Figure 2. Normality Test

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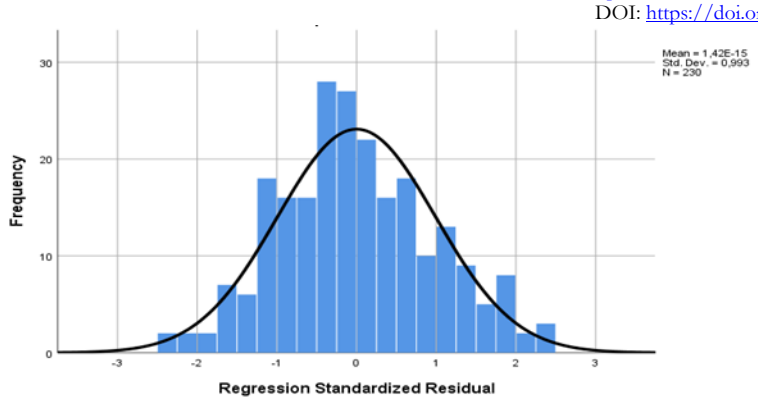


Sources: Primer data analysis 2024

Based on Histogram 2, it is evident that the curves for the dependent variable and the regression standardized residuals exhibit a bell-shaped distribution. Consequently, the normality test supports the appropriateness of regression analysis, as the data appear to be normally distributed.

**Table 3. Multicollinearity Test Results**

| Model | | Unstandardized coefficients | | Standardized coefficients | t | Sig. | Collinearity statistics | |
|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | | Tolerance | VIF |
| 1 | (Constant) | 43411 | 3,022 | | 11,424 | ,000 | | |
| | Teacher Understanding of Curriculum | ,021 | ,123 | ,009 | ,139 | ,854 | ,231 | 1,007 |
| | Curriculum Implementation Quality | ,031 | ,243 | ,017 | ,122 | ,334 | 1,000 | 1,001 |
| | Teacher competence | ,023 | ,102 | ,017 | ,232 | ,821 | ,954 | 1,004 |
| | Student academic achievement | ,031 | ,140 | ,008 | ,230 | ,811 | ,934 | 1,001 |
| a. Dependent Variable: student academic achievement | | | | | | | | |

Sources: Primer data analysis 2024

Based on Table 3, the VIF values are below 10 and the Tolerance (TOL) values are above 0.1 for all variables. Therefore, it can be concluded that the multiple linear regression model does not exhibit symptoms of multicollinearity or strong correlations between the independent variables, making it suitable for use in this research.

**Table 4. Heteroscedasticity Test Results**

| Coefficientsa | | | | | | |
|---|---|---|---|---|---|---|
| Model | | Unstandardized coefficients | | Standardized coefficients | t | Sig. |
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 1,612 | 2,324 | | ,632 | ,503 |
| | Teacher Understanding of Curriculum | ,032 | ,051 | ,034 | ,543 | ,523 |

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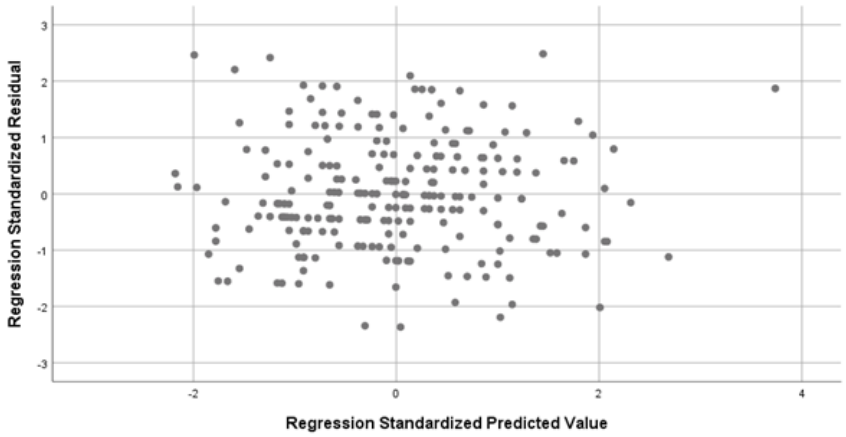
| | | | | | | |
|---|---|---|---|---|---|---|
| Curriculum Implementation Quality | | ,034 | ,065 | ,042 | ,512 | ,501 |
| Teacher competence | | ,097 | ,143 | ,052 | ,821 | ,512 |
| Student academic achievement | | ,085 | ,103 | ,048 | ,731 | ,753 |
| a. Dependent Variable: ABRESID | | | | | | |

Sources: Primer Data Analysis 2024

Table 4 indicates that each variable has a significance level greater than 0.05: Teacher Understanding of Curriculum is 0.523, Curriculum Implementation Quality is 0.501, Teacher Competence is 0.512, and Student Academic Achievement is 0.753. Thus, it can be concluded that there is no heteroscedasticity problem in the regression model used.

**Figure 3. Linearity Test Results**




Sources: Linearity test based on primer data 2024

According to Figure 3, the plot spreads randomly both above and below zero on the standardized residual regression axis. Therefore, based on the linearity test using graphic analysis, the regression model is confirmed to be linear.

*Direct Relationship*

The hypothesis test results provide valuable insights into the relationships between key variables in the study. By analyzing the data using statistical techniques, we can assess the significance of the hypothesized relationships and draw conclusions about the underlying dynamics of our research framework (Table 5).

**Table 5. Path Analysis Result**

| Hypothesis | Construct*) | Original sample | STDEV | T statistics | P values | Result |
|---|---|---|---|---|---|---|
| H1 | TUMC -> TCDIM | 0.387 | 0.049 | 7.957 | 0.000 | Supported |
| H2 | TUMC -> SAA | 0.312 | 0.040 | 7.720 | 0.000 | Supported |
| H3 | CIQ -> TCDIM | 0.173 | 0.039 | 4.386 | 0.000 | Supported |
| H4 | CIQ -> SAA | 0.376 | 0.039 | 9.555 | 0.000 | Supported |

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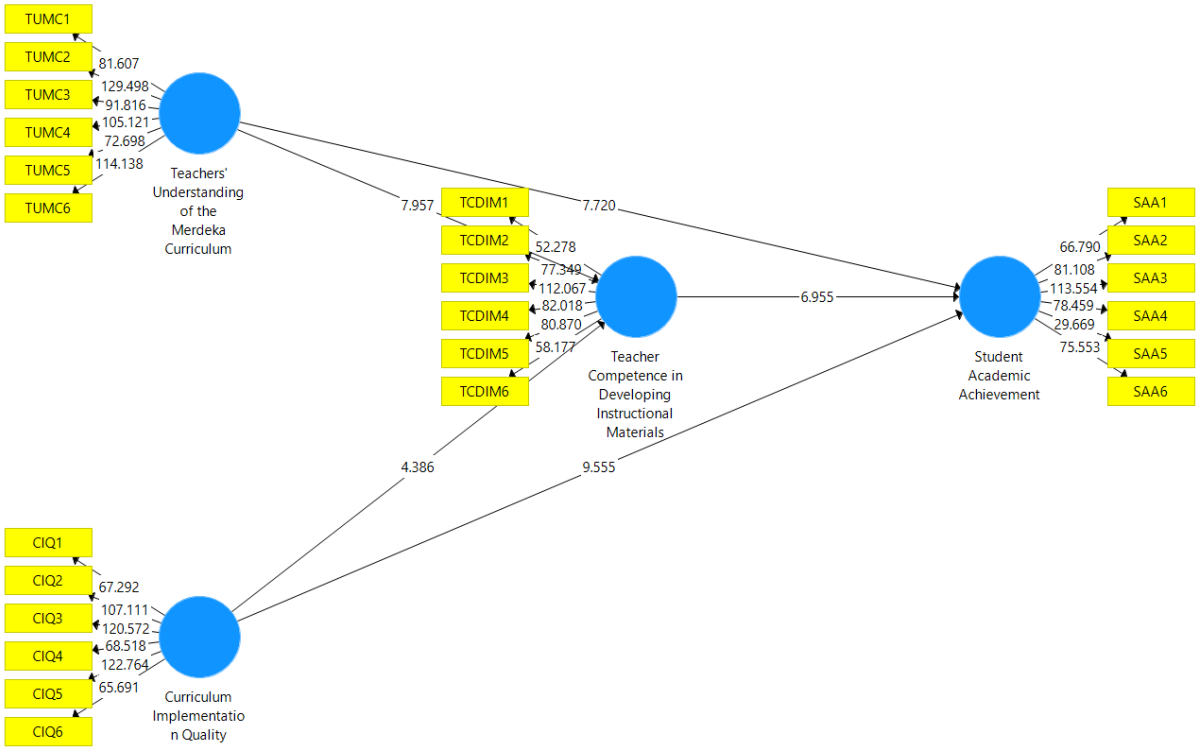
| | | | | | | |
|---|---|---|---|---|---|---|
| H5 | TCDIM -> SAA | 0.230 | 0.033 | 6.955 | 0.000 | Supported |

*) TUMC=Teachers' Understanding of the Merdeka Curriculum; CIQ=Curriculum Implementation Quality; TCDIM=Teacher Competence in Developing Instructional Materials; SAA=Student Academic Achievement

**Figure 4. Bootstrapping Smart PLS Output**




The hypothesis test results provide a robust analysis, confirming the relationships between the constructs examined in the study. A comprehensive summary of the analysis highlights the following key findings:

Hypothesis H1, which posits a relationship between TUMC and TCDIM, is strongly supported. This is evidenced by the high t-value (7.957) and a significant p-value (0.000), indicating a substantial and significant relationship between these two constructs.

Hypothesis H2, which links TUMC with SAA, garners strong support. The notable t-value (7.720) and low p-value (0.000) underscore a significant relationship between TUMC and SAA, highlighting the influential role of teachers' understanding of the curriculum on student academic success.

Hypothesis H3, which examines the relationship between CIQ and TTCDIM, is strongly supported. The substantial t-value (4.386) and the low p-value (0.000) confirm a significant relationship between CIQ and TCDIM, highlighting the critical role of curriculum implementation quality in enhancing teacher competence in developing instructional materials.

Hypothesis H4, suggesting a relationship between CIQ and SAA, receives strong empirical support. The notable T statistic (9.555) and highly significant p-value (0.000) highlight a substantial and significant relationship between CIQ and SAA, underscoring the crucial impact of curriculum implementation quality on student academic achievement.

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Hypothesis H5, exploring the relationship between TCDIM and SAA, is strongly supported. The considerable -t-value (6.955) and low p-value (0.000) confirm a significant relationship between TCDIM and SAA, highlighting the crucial role of teacher competence in instructional material development in affecting student academic achievement. In conclusion, the comprehensive analysis of hypothesis test results underscores the significant relationships among the examined constructs, providing valuable insights into the factors influencing teacher competence, curriculum implementation quality, and, ultimately, student academic achievement.

*Indirect Relationship*

An indirect relationship, also known as an indirect effect or mediated effect, describes a relationship between two variables that is mediated by a third variable. This means the effect of one variable on another is not direct but operates through the influence of the third variable. Understanding indirect relationships is crucial in research because it reveals the underlying mechanisms or pathways through which variables affect each other. By identifying these indirect relationships, researchers can gain a deeper insight into the complex interplay between variables and develop more targeted interventions or treatments (Table 6).

**Table 6. Mediation Test Result**

| Hypothesis | Construct*) | Original Sample | STDEV | T Statistics | P Values | Result |
|---|---|---|---|---|---|---|
| H6 | TUMC -> TCDIM -> SAA | 0.089 | 0.018 | 5.022 | 0.000 | Supported |
| H7 | CIQ -> TCDIM -> SAA | 0.040 | 0.012 | 3.418 | 0.001 | Supported |

*) TUMC=Teachers' Understanding of the Merdeka Curriculum; CIQ=Curriculum Implementation Quality; TCDIM=Teacher Competence in Developing Instructional Materials; SAA=Student Academic Achievement

The mediation test results from Table 6 provide compelling evidence of indirect relationships among the constructs examined in the study. The analysis reveals significant mediated effects, clarifying the complex pathways through which certain variables affect one another.

Firstly, Hypothesis H6 proposes an indirect relationship among TUMC, TCDIM, and SAA. The results indicate that the original sample showed a substantial indirect effect (0.089) with a standard deviation of 0.018, resulting in a T statistic of 5.022 and a notably low p-value of 0.000. This strongly supports the hypothesis, suggesting that TCDIM mediates the relationship between TUMC and SAA. This implies that teachers' understanding of the curriculum indirectly affects student academic achievement through its influence on teacher competence in developing instructional materials.

Similarly, Hypothesis H7 examines the indirect relationship between CIQ, TCDIM, and SAA. The analysis reveals a significant mediated effect, with an indirect effect size of 0.040 and a standard deviation of 0.012. This results in a t-value of 3.418 and a p-value of 0.001, providing strong support for the hypothesis. The findings suggest that CIQ affects student academic achievement indirectly through its effect on teacher competence in developing instructional materials. Overall, these mediation test results highlight the importance of considering indirect relationships in understanding the complex interplay between educational constructs. By clarifying the mediating role of teacher competence, the findings offer valuable insights into how various factors affect student academic achievement, with significant implications for educational policy and practice.

## Discussion

The acceptance of both Hypothesis 1 (H1) and Hypothesis 2 (H2) has significant implications for education in Indonesia, emphasizing the crucial role of the TUMC in shaping educational outcomes. These findings

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highlight the interconnectedness between teachers' comprehension of the curriculum, their competence in developing instructional materials, and, ultimately, student academic achievement. With H1 supported, it is clear that teachers' understanding of the Merdeka Curriculum significantly impacts their competence in creating instructional materials. This indicates that investing in improving teachers' comprehension of the curriculum can lead to tangible improvements in instructional quality and effectiveness.

By equipping teachers with a deep understanding of the curriculum, educational stakeholders can enable them to create instructional materials that align with curriculum objectives and address the diverse needs and learning styles of students (Restu et al., 2022). This approach can lead to more engaging, relevant, and impactful learning experiences, fostering an environment conducive to student learning and academic growth. Moreover, the acceptance of H2 reinforces that teachers' understanding of the curriculum directly affects SAA. This suggests that enhancing teachers' comprehension of the curriculum can positively affect student learning outcomes. As teachers gain a deeper grasp of the curriculum and its underlying principles, they are better positioned to design effective instruction that supports student learning and helps achieve academic goals (Amalia et al., 2023; Latifa et al., 2023). Thus, investing in improving teachers' understanding of the curriculum can be a strategic lever for enhancing student academic achievement at both individual and systemic levels.

The implications of H1 and H2 extend beyond individual classrooms to broader educational reform efforts in Indonesia. Recognizing the critical relationship between teachers' comprehension of the curriculum and educational outcomes allows policymakers to design evidence-based interventions and policy reforms that foster a supportive environment for teacher professional growth and development. This may involve targeted investments in teacher training and professional development programs, curriculum enhancement initiatives, and the provision of resources and support systems to facilitate effective curriculum implementation. In conclusion, the acceptance of both H1 and H2 highlights the significance of TUMC as a key determinant of instructional quality and student academic achievement. By utilizing insights from these findings, educational stakeholders can develop strategic interventions and policy reforms aimed at improving the quality, relevance, and impact of education delivery in Indonesia, ultimately supporting the holistic development and academic success of students nationwide.

The confirmation of both Hypothesis 3 (H3) and Hypothesis 4 (H4) provides critical insights into the educational landscape of Indonesia, highlighting the complex relationship between CIQ, TCDIM, and SAA. These findings have significant implications for educational policymakers, administrators, and practitioners, informing strategic interventions and reforms aimed at improving educational quality and outcomes. The acceptance of H3 reveals that CIQ directly affects SAA, underscoring the importance of effective curriculum implementation in promoting student learning and academic success (Bone & Ross, 2021; De Vincenzi et al., 2018; Ofei-Manu & Didham, 2018). Investments in enhancing curriculum implementation quality can result in more cohesive, structured, and rigorous educational experiences for students, fostering an environment that supports learning and academic growth. By ensuring that curriculum guidelines are effectively integrated into classroom practices, educational stakeholders can improve the overall quality and relevance of education delivery, ultimately contributing to better student outcomes and educational equity across diverse contexts in Indonesia.

Moreover, the acceptance of H4 highlights the importance of Curriculum Implementation Quality in shaping TCDIM. This indicates that the quality of curriculum implementation directly affects teachers' ability to design and develop instructional materials that align with curriculum objectives and address the diverse needs of students. By prioritizing initiatives to improve curriculum implementation quality, educational stakeholders can enable teachers to provide high-quality instruction that fosters student engagement, critical thinking, and academic achievement (Banerjee, 2016; Uçar & Sungur, 2017). This may include investments in teacher training and professional development programs, curriculum enhancement initiatives, and the provision of resources and support systems to support effective curriculum implementation practices.

The implications of H3 and H4 extend beyond individual classrooms to broader educational reform efforts in Indonesia. Recognizing the critical link between curriculum implementation quality, teacher competence,

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and student academic achievement allows policymakers to design evidence-based interventions and policy reforms that promote educational excellence. This may involve targeted investments in curriculum development and implementation processes, the establishment of quality assurance mechanisms, and the promotion of collaborative partnerships among educational stakeholders to ensure effective curriculum reforms and positive educational outcomes for all learners in Indonesia. In conclusion, the acceptance of both H3 and H4 emphasizes CIQ as a key driver of teacher competence and student academic achievement. By utilizing insights from these findings, educational stakeholders can develop strategic interventions and policy reforms to improve educational quality, relevance, and equity in Indonesia, ultimately supporting the holistic development and academic success of students nationwide.

The validation of Hypothesis 5 (H5) highlights a critical aspect of educational dynamics, emphasizing the significant influence of TCDIM on SAA. This finding has profound implications for education in Indonesia, underscoring the essential role of teachers' proficiency in crafting instructional materials to shape student learning outcomes. With H5 supported, it is clear that teachers' competence in developing instructional materials directly impacts student academic achievement. This underscores the importance of investing in initiatives to enhance teachers' capacity and proficiency in instructional material development. By equipping teachers with the necessary knowledge, skills, and resources to create high-quality instructional materials, educational stakeholders can empower them to deliver engaging, relevant, and effective instruction that supports student learning and fosters academic success. Furthermore, the acceptance of H5 highlights the interconnectedness of various components within the education system. Teachers are central in translating curriculum objectives into meaningful learning experiences for students. Therefore, their competence in developing instructional materials directly influences the quality, relevance, and impact of classroom instruction. By prioritizing initiatives to enhance teacher competence in instructional material development, educational stakeholders can create an environment conducive to student learning and academic achievement.

The implications of H5 extend beyond individual classrooms to broader educational reform efforts in Indonesia. Recognizing the critical link between teacher competence and student academic achievement allows policymakers to design evidence-based interventions and policy reforms that support teacher professional growth and development. This may include targeted investments in teacher training and professional development programs, curriculum enhancement initiatives, and the provision of resources and support systems to facilitate effective instructional material development practices (Lynam et al., 2024). The acceptance of H5 emphasizes the importance of Teacher Competence in Developing Instructional Materials as a key determinant of student academic achievement. By leveraging insights from this finding, educational stakeholders can develop strategic interventions and policy reforms to improve educational quality, relevance, and equity in Indonesia, ultimately supporting the holistic development and academic success of students nationwide.

The acceptance of Hypotheses 6 (H6) and 7 (H7) provides valuable insights into the nuanced pathways through which educational constructs interact to influence SAA. These findings underscore the mediating role of TCDIM in shaping the relationship between TUMC, CIQ, and student academic achievement. With H6 supported, it is clear that TCDIM mediates the relationship between TUMC and SAA. This implies that teachers' understanding of the curriculum indirectly affects student academic achievement through its impact on their competence in developing instructional materials. This highlights the need to enhance teachers' comprehension of the curriculum to improve their ability to design and deliver effective instruction, leading to better student learning outcomes. Educational stakeholders can use these insights to guide targeted interventions aimed at improving teacher competence in instructional material development, thereby creating an environment conducive to student academic success.

Similarly, the acceptance of H7 underscores the mediating role of TCDIM in the relationship between CIQ and SAA. This indicates that the quality of curriculum implementation indirectly affects student academic achievement through its impact on teacher competence in developing instructional materials. This emphasizes the need for high-quality curriculum implementation practices to empower teachers to create

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engaging, relevant, and effective instructional materials that support student learning and academic achievement. By prioritizing initiatives that enhance both curriculum implementation quality and teacher competence, educational stakeholders can foster a synergistic ecosystem conducive to student academic success (Castellano et al., 2017; Loncing et al., 2023).

The implications of H6 and H7 extend beyond individual classrooms to broader educational reform efforts in Indonesia. Recognizing the mediating role of teacher competence in instructional material development enables policymakers to design evidence-based interventions and policy reforms that support teacher professional growth and development. This may involve targeted investments in teacher training and professional development programs, curriculum enhancement initiatives, and the provision of resources and support systems to facilitate effective curriculum implementation practices and instructional material development.

*Theoretical and Practical Implications*

The theoretical implications of these findings indicate that teachers' comprehension of the curriculum has a significant impact on their ability to develop effective instructional materials and, consequently, on student academic achievement. This highlights the need to enhance teachers' understanding of the curriculum as a fundamental aspect of improving classroom learning outcomes. Additionally, the findings underscore the critical role of high-quality curriculum implementation in shaping teacher competence and student performance. Thus, educational stakeholders should prioritize improving both curriculum understanding and implementation quality, alongside enhancing teachers' skills in developing instructional materials.

On a practical level, comprehensive training and professional development programs are needed to enhance teachers' understanding of the curriculum. Additionally, concrete efforts must be made to improve the quality of curriculum implementation in schools by providing adequate support and resources for teachers in developing and implementing learning materials aligned with the curriculum. Furthermore, both formal and informal education for teachers in instructional material development should be strengthened. Consequently, it is anticipated that investments in improving teachers' curriculum understanding and the quality of curriculum implementation will lead to significant improvements in student academic achievement in Indonesia.

## Conclusion

The acceptance of H1 and H2 underscores the crucial role of TUMC in shaping educational outcomes, illustrating the interconnectedness between teacher comprehension, instructional material quality, and student achievement. These findings highlight the need to invest in enhancing teachers' understanding of the curriculum to improve instructional quality and effectiveness. Additionally, the validation of H3 and H4 emphasizes the significance of CIQ in influencing both teacher competence and student academic achievement. This underscores the importance of implementing effective curriculum practices to support teachers and foster student learning and success. Furthermore, the validation of H5 highlights the critical impact of TCDIM on student academic achievement, stressing the need to equip teachers with the necessary knowledge and skills to create high-quality instructional materials. The acceptance of H6 and H7 reveals the mediating role of TCDIM in the relationship between TUMC, CIQ, and student achievement. These findings emphasize the importance of investing in teacher training, curriculum development, and instructional material design to enhance educational quality and outcomes in Indonesia.

*Limitation and Recommendations*

While this study offers valuable insights into the relationships between teachers' understanding of the curriculum, curriculum implementation quality, teacher competence in developing instructional materials, and student academic achievement, several limitations must be acknowledged. Firstly, the findings are based on data collected from a specific geographic location or educational context, which may limit the generalizability of the results to other settings. Additionally, the study relies on self-reported data from teachers and students, which may be subject to biases or inaccuracies.

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To address these limitations and advance research in this area, several recommendations can be made. Firstly, future studies should replicate the findings in diverse educational settings to assess the robustness of the identified relationships. Additionally, incorporating multiple data sources, such as classroom observations and objective assessments of student learning outcomes, can enhance the validity of the findings. Moreover, longitudinal studies that track the impact of interventions designed to improve teachers' understanding of the curriculum and curriculum implementation quality on student academic achievement over time can provide valuable insights into the long-term effects of educational reforms.

Furthermore, policy initiatives are needed to enhance teacher training and professional development programs, aiming to strengthen teachers' understanding of the curriculum and their competence in developing instructional materials. Investing in the development and dissemination of evidence-based practices and resources to support curriculum implementation and instructional material development can also improve educational outcomes. Additionally, fostering collaborative partnerships between educational stakeholders—such as policymakers, administrators, teachers, and researchers—can facilitate knowledge exchange and the implementation of effective strategies to enhance teaching and learning practices. Addressing these recommendations can help overcome the limitations of this study and advance educational practices and policies aimed at improving student academic achievement in Indonesia and beyond.

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