

The Influence of Educational Level and Professional Training on Teachers' Ability to Implement Higher-Order Thinking Skills (HOTS) Learning: The Mediating Role of Teaching Experience

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ABSTRACT

The implementation of Higher-Order Thinking Skills (HOTS) is essential for equipping students with critical thinking, creativity, problem-solving, and decision-making competencies required in the twenty-first century. However, many teachers continue to face challenges in effectively integrating HOTS into classroom instruction. This study investigates the influence of teachers' educational level and professional training on their ability to implement HOTS-based learning, with teaching experience serving as an intervening variable. A quantitative survey design was employed involving teachers from public senior high schools in Pelalawan Regency, Indonesia. Data were collected using structured questionnaires and analyzed using inferential statistical techniques to examine both direct and indirect relationships among the variables. The findings indicate that teachers' educational level and participation in professional training significantly improve their ability to implement HOTS-oriented learning. Educational level and training also positively influence teaching experience. However, teaching experience does not significantly mediate the relationship between educational level, professional training, and teachers' HOTS implementation. These findings suggest that formal qualifications and continuous professional development contribute more substantially to HOTS implementation than accumulated teaching experience alone. Teachers' capacity to implement HOTS-based instruction is primarily strengthened through higher educational qualifications and sustained professional development rather than teaching experience. The study highlights the importance of designing evidence-based teacher development programs that prioritize pedagogical innovation and HOTS-oriented instructional practices. These findings provide practical implications for policymakers and school leaders seeking to enhance instructional quality and foster students' higher-order thinking competencies.

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1. INTRODUCTION

Teachers play a central role in determining the quality of education because they are responsible for designing, implementing, and evaluating learning processes that facilitate students' cognitive, affective, and psychomotor development. As the primary agents of educational change, teachers are expected not only to master subject content but also to adopt innovative pedagogical approaches that prepare students for the increasingly complex demands of the twenty-first century (Rahimah, 2022). Consequently, improving teachers' professional competence has become a strategic priority in many educational systems, as teacher quality is consistently associated with students' academic achievement, critical thinking ability, and lifelong learning outcomes.

The rapid development of science, technology, and globalization has transformed the competencies required of graduates. Contemporary education emphasizes not merely the acquisition of factual knowledge but also the ability to analyze information, solve complex problems, evaluate evidence, and generate innovative solutions. These competencies are collectively known as Higher-Order Thinking Skills (HOTS), which represent cognitive processes beyond memorization and comprehension (Kristiyono, 2018). According to the revised Bloom's Taxonomy, HOTS encompasses the abilities to analyze, evaluate, and create, enabling learners to transfer knowledge into authentic contexts rather than simply recalling information (Ruwaida & Selatan, 2019). Therefore, the successful implementation of HOTS-oriented instruction has become one of the primary indicators of educational quality in the twenty-first century.

The importance of HOTS is closely related to the development of twenty-first-century competencies. Students are expected to master the "4Cs"—critical thinking, creativity, communication, and collaboration—which are essential for adapting to dynamic social and professional environments (Dogara et al., 2020; Stauffer, 2022). These competencies are further supported by complementary abilities such as problem-solving, decision-making, and metacognitive regulation, all of which enable learners to manage complex information, reflect on their learning processes, and develop innovative solutions to real-world challenges (Miterianifa et al., 2021). Consequently, educational systems worldwide increasingly encourage teachers to integrate HOTS into classroom instruction as a means of preparing students for future academic and workplace demands.

Research has consistently demonstrated that HOTS-oriented learning enhances students' critical thinking, creativity, communication, collaboration, and problem-solving abilities (Jaenudin et al., 2020; Kristiyono, 2018; NACE, 2019; World Economic Forum [WEF], 2020). Furthermore, policymakers and educational researchers recognize HOTS as an essential component of curriculum reform because it promotes meaningful learning, independent thinking, and knowledge transfer across diverse contexts (Elfeky, 2019; Lu et al., 2021). Despite its recognized importance, implementing HOTS-based instruction remains a considerable challenge for many teachers, particularly in developing educational systems where instructional practices continue to emphasize lower-order cognitive skills.

Teacher competence is widely acknowledged as one of the most influential factors affecting the successful implementation of HOTS learning. Evidence from high-performing educational systems, such as Finland, illustrates that sustained investment in teacher preparation, professional development, and pedagogical competence contributes significantly to educational excellence (Iskandar & Senam, 2015). Teachers who possess strong pedagogical knowledge and professional expertise are better equipped to design learning experiences that promote critical inquiry, collaborative learning, and higher-order cognitive engagement. Therefore, improving teachers' competencies through formal education and continuous professional development has become an essential strategy for enhancing instructional quality.

However, empirical studies indicate that many teachers still encounter difficulties in implementing HOTS-oriented instruction effectively. Teachers' critical and creative thinking competencies often remain below expected standards (Cholis Sa'dijah, 2021), while their ability to implement problem-based and inquiry-oriented learning strategies is relatively limited (Ichsan et al., 2019). Similarly, several studies have reported that teachers' readiness to design and implement HOTS-based learning activities remains inadequate (Prastikawati et al., 2021; Wahyuningsih et al., 2023).

These findings suggest that strengthening teachers' professional competencies through systematic education and training programs remains an urgent educational priority.

Professional development programs, particularly education and training initiatives, have been identified as effective mechanisms for improving teachers' ability to implement HOTS-oriented instruction (Anita et al., 2022; Calavia et al., 2023; Chandra et al., 2020; Prihdayanti et al., 2019; Suyatno et al., 2022; Ucik Fitri Handayani & Hakim, 2022). In addition, teachers' educational qualifications have been found to influence pedagogical competence, with higher educational attainment generally associated with stronger instructional capabilities (Yasin et al., 2021). Teaching experience also contributes to instructional effectiveness by enabling teachers to refine classroom management, instructional strategies, and professional judgment over time (De Vries et al., 2019; Hidayat, 2020). Nevertheless, previous studies have produced inconsistent findings regarding the extent to which teaching experience mediates the relationship between teachers' professional development and their ability to implement HOTS learning. While some studies report a significant positive influence, others suggest that teaching experience alone is insufficient without continuous professional learning and pedagogical innovation.

Although previous research has extensively examined the relationships among teacher education, professional training, teaching experience, and HOTS implementation, relatively few studies have investigated the mediating role of teaching experience in explaining how educational qualifications and professional training contribute to teachers' capacity to implement HOTS-based instruction. Furthermore, empirical evidence from Indonesian secondary schools, particularly in rural and semi-rural contexts such as Pelalawan Regency, remains limited. Understanding these relationships is important because contextual factors may influence teachers' opportunities for professional development and instructional practice.

Therefore, this study aims to examine the influence of teachers' educational level and professional training on their ability to implement HOTS-oriented learning, with teaching experience serving as an intervening variable among teachers in public senior high schools in Pelalawan Regency. By investigating both the direct and indirect relationships among these variables, this study contributes to the growing body of literature on teacher professional competence and HOTS implementation. The findings are expected to provide empirical evidence for policymakers, school leaders, and teacher education institutions in designing more effective professional development programs that strengthen teachers' capacity to facilitate higher-order thinking and improve educational quality.

2. METHODS

This study uses quantitative data, collected in the form of numbers or through words and sentences that are then converted into numbers. The data source is primary data, namely information obtained directly from respondents. The respondents were teachers teaching at public high schools in Pelalawan Regency. This data was collected through a questionnaire covering topics such as educational level, training, teaching experience, and HOTS learning. Educational levels are structures that group various levels of education based on age, development level, and competencies that must be achieved by students. Teaching experience is the activity of providing material that has been experienced or carried out by a teacher, which becomes a learning experience for the teacher to become better than before (Ramadhanti, 2019).

All 581 of Pelalawan Regency's public high school teachers, who work in 12 subdistricts, participated in this study. The Proportional Random Sampling approach, which divides the population into many groups or strata based on particular characteristics and then randomly selects samples from each stratum, was used to determine the sample. Each stratum's sample size is modified based on its size or percentage within the total population. We used the Slovin formula to determine the sample size.

$$n = \frac{N}{1 + Ne^2}$$

Information:

n : Sample size
 N : Population size
 e : Error rate 5%

Therefore, the number of people to be studied is 238. The percentage for sampling from the population is 40.89% and is rounded to 41% (derived from) with a total of 238 people. $\frac{238}{582} \times 100\%$

2.1 Data Collection Techniques and Instruments

2.1.1 Questionnaire

This questionnaire contains a series of written questions addressing teachers' abilities in implementing HOTS learning, their educational level, HOTS training experience, and teaching experience. The goal was to collect data from respondents, namely teachers working at public high schools in Pelalawan Regency. To assess their responses, we used the Likert Scale, a type of scale developed by Rensis Likert. This scale is useful for measuring individual or group attitudes, opinions, and perspectives on various social phenomena. Details of the assessment weights can be seen in Table 1 below.

Table 1. Likert Scale Score Weighting

Answer	Symbol	Score
Strongly agree	SS	5
Agree	S	4
Disagree Less	KS	3
Don't agree	TS	2
Strongly Disagree	STS	1

Source: Sugiyono (2014)

2.1.2 Interview

Interviews are a data collection technique using direct questions and answers with teachers or parties directly involved in obtaining research data.

2.2 Data Analysis Techniques

2.2.1 Descriptive Analysis

A statistical technique called descriptive analysis describes or depicts the collected data exactly as it is, without attempting to draw broad conclusions or generalizations. Table 2 shows the measurements taken.

Table 2. Score Interpretation Categories

Category	Value Range
Very good	<4.50
Good	$3.50 < x \leq 4.50$
Pretty good	$2.50 > x \leq 3.50$
Not good	$1.50 < x \leq 2.50$
Very Bad	≤ 1.50

Source: (Umar, 2014)

2.2.2 Quantitative Analysis

This study employed quantitative analysis to gather data regarding the research aims, which were to examine the impact of training and education levels on teachers' capacity to apply HOTS learning using teaching experience as a variable, either all at once or in part. Using the picture that follows:

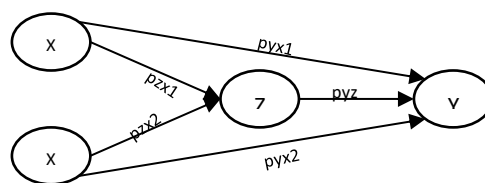


Figure 1. Path Diagram

Information :

X1 : Educational level

X2 : Training

Z : Teaching Experience

Y : HOTS Learning

PYX1 : Coefficient of education level on HOTS learning

PYX2 : Training coefficient on HOTS learning

PLS is a model, structural equations based on variants or components. Abdillah & Jogiyanto, (2015: 70), stated that SEM is a type of analysis that combine analysis method path analysis, structural model(structural model), and factor analysis.

2.2.3 Outer Model Analysis

An outer model is used to ensure that the measurements used are worthy of being used as a valid and reliable measurement (Husein, 2015). This model analysis specifies how latent variables and the indicators interact with each other. Several indicators can be used to view external analysis of the model:

1. The correlation between each score or its constituent parts and each construct score is the basis for evaluating convergent validity. According to Chin's view, which Ghazali (2017) repeated, an external loading value of 0.5–0.6 is seen as adequate, while an individual reflexive measure is deemed good if its correlation with the construct being measured surpasses 0.7.
2. Differential Validity (also known as Discriminant Validity) is a measurement model that assesses block size with cross-loading assessment using reflected indicators. This block is deemed superior to the others if the correlation between the concept and the measured item is greater than that of the other block sizes. However, an alternate approach to evaluating discriminant validity is to compare the square root Average Variance Extracted (AVE) values.
3. The value of the view latent variable coefficients indicates composite value reliability, which is a construct assessment indicator. Cronbach's alpha and internal consistency indicate that the construct has good reliability if the value is higher than 0.70.
4. The Cronbach's Alpha value is a reliability test that supports composite reliability findings. The variable is considered reliable if the Cronbach alpha value is greater than 0.7 (Eisingerich & Gaia, 2010).

2.2.4 Inner Model Analysis

Inner model analysis, also known as "structural model relationships and substantive theory," explains the connections between latent variables using substantive theory. The initial steps in assessing the inner model using PLS (Partial Least Squares) are the R-square for each dependent latent variable, the t-test and significance of the structural path parameter coefficients, and the Stone-Geisser Q-square test for predictor relevance. In that case, the interpretation is similar to regression. It is possible to

determine whether a particular independent latent variable significantly affects the dependent latent variable by looking at changes in the R-square value.

2.3 Hypothesis Testing

When testing a hypothesis, the t-statistic and probability values were compared in this investigation. The t-statistic results were compared in order to test the hypothesis. For an alpha of 5%, the t-statistic value was 1.96; hence, when the t-statistic value is greater than 1.96, the hypothesis H_a is accepted and H_0 is rejected. If the p-value is less than 0.05, H_a is accepted in probability-based hypothesis testing.

3. FINDINGS AND DISCUSSION

This study involved state high school teachers in Pelalawan Regency as respondents, with the aim of analyzing their abilities in implementing Higher Order Thinking Skills (HOTS)-based learning and the factors that influence the implementation of HOTS.

3.1 Descriptive Statistics Results

3.1.1 Education level variable

Education level (X) is a methodical, deliberate attempt to enhance human potential in terms of attitudes, behaviors, and thought patterns through a planned, tiered educational path that includes basic education, secondary school, and higher education. Formal education characteristics are used to measure variables related to educational level. College, high school, middle school, and elementary school. Table 3 below shows how respondents' responses correspond to their educational attainment.

Table 3. Respondents' Responses on Education Level

No	Educational level	F(People)	Percentage (%)
1	D3	28	11.76
2	S1	183	76.89
3	S2	27	11.34
Amount		238	100

Data Source: Primary Data Processing Results, 2024.

Based on the results of Table 3, it was found that the majority of respondents in this study had a bachelor's degree, namely 183 people (76.89%), then 28 people (11.76%) had a diploma 3 education, and 27 people (11.34%) had a master's degree. With this assessment, high school teachers in Pelalawan Regency should have the ability to implement HOTS learning because they have a relatively good level of education.

3.1.2 HOTS Training Variables

The training was determined based on the instructor's competence in HOTS, participant motivation, the topicality of HOTS material, and the appropriateness of the training method. These training indicators were then developed to measure the responses of teachers who had attended the training. The results showed an average value of the variables training of 4.05. The perceived quality of senior high school teachers in Pelalawan Regency falls into the good category. Of all the indicators, the highest score was 4.20, for the statement "The method used helps me develop higher-order thinking skills." Based on this assessment, senior high school teachers in Pelalawan Regency should also possess HOTS competency.

3.1.3 Teaching Experience Variable

The teaching experience aspect can be seen from the indicators of years of teaching relevant to education, years of teaching irrelevant to education, and years of teaching HOST. The data collected is

determined based on the time span of each teacher's experience. The results of respondents' responses related to these indicators are shown in the table 4 the following.

Table 4. Respondents' Responses about Teaching Experience

No	Indicator	Old		
		Maximum	Minimum	Average
1	Relevant to education	20	2	8.76
2	Not relevant to education	14	0	3.10
3	Length of time teaching HOST	10	0	4.97
4	Total	38	3	16.83

Data Source: Primary Data Processing Results, 2024.

Based on the results of table 4, it was found that teachers' responses related to their teaching experience in accordance with their education had been teaching for an average of almost 9 years (8.76), while teaching not in accordance with their education was almost 3 years (3.10), during the teaching process, it was found that almost 5 years (4.97) had experience related to teaching HOST. These results prove that teachers of State Senior High Schools in Pelalawan Regency have sufficient experience in teaching at the high school level, with the longest teaching period in accordance with their field of study reaching 20 years.

3.1.4 HOTS Learning Implementation Ability Variable

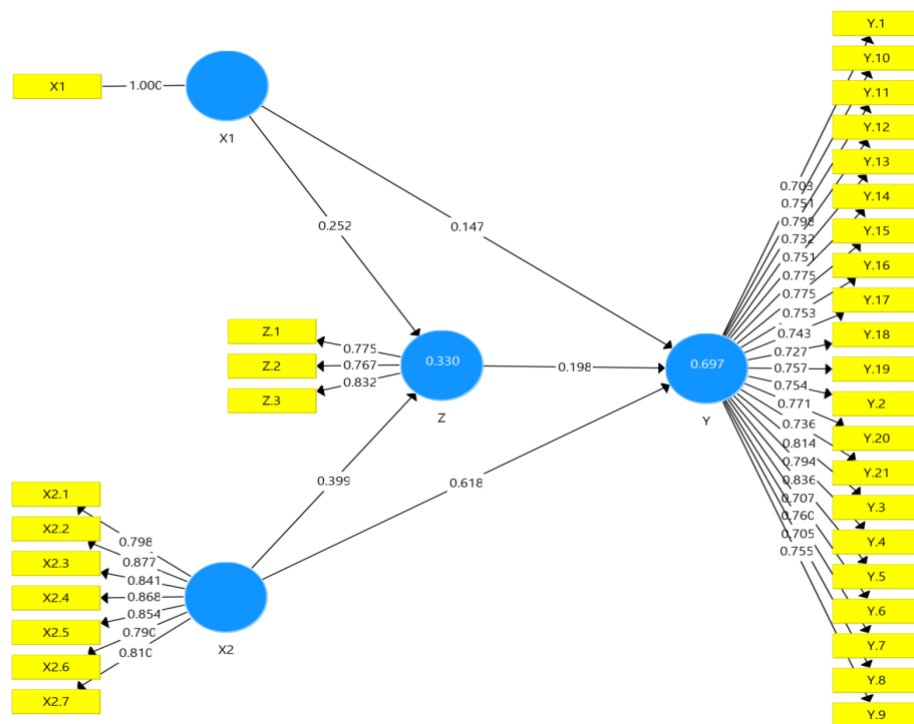
Teachers need these skills in order to plan, carry out, and assess learning. HOTS is a method of thinking that enables one to make meaningful connections between knowledge and apply those connections to problem-solving. Measuring higher-order thinking abilities, problem-solving, and various solutions reveals the traits of learning implementation. According to the study's findings, the average value of the HOTS learning capacity variable was 0.001 of 3.99, which indicates that their implementation of HOTS learning activities has fallen short of the good category.

3.2 Quantitative Statistics Results

This study employed Technique analysis PLS and was carried out with the SmartPLS 3.0 software. A structural model, often referred to as the inner model, and a measurement model, sometimes referred to as the outer model, are the two submodels that make up PLS analysis. Each model's tests are displayed below:

3.2.1 Outer Model Testing

The measurement model, sometimes referred to as the outer model, illustrates how the indicator characterizes the latent variable being measured. The PLS program under test's outer model schematic is displayed below:



Data Source: Primary Data Processing Results, 2024.

Figure 2. Structural Equation Model

3.2.2 Convergence Validity

Loading factor or outside loading values are used to test for convergent validity. If an indicator is classified as good or has an outer loading value more than 0.7, it is deemed to have met convergent validity. According to the data in the above table, all research variable indicators for education level, training, teaching experience, and the capacity to apply HOTS learning had outer loading values larger than 0.7.

3.2.3 Discriminant Validity

Determination of the cross-loading value is used to test discriminant validity. The average variance extracted (AVE) for each indicator must be greater than 0.5 for a good model; otherwise, the indicator lacks discriminant validity.

Table 5. Average Variant Extracted (AVE)

	Average Variance Extracted (AVE)
Educational level	1.000
Training	0.696
Ability to carry out HOTS learning	0.574
Teaching experience	0.627

Data Source: Primary Data Processing Results, 2024.

The level of education, training, teaching experience, and ability to implement HOTS learning have AVE values greater than 0.5, as shown by the data presented in Table 5 above. Thus, each variable has a good discriminant validity value.

3.2.4 Composite Reliability

The Composite dependability section evaluates the value dependability of each signal inside a variable. The composite reliability test can be made better by using the Cronbach alpha value.

Nonetheless, a variable may be considered to pass the composite reliability test if its value is more than 0.7. The composite reliability values for each variable used in this study are shown in the table below:

Table 6 Composite Reliability

	Composite Reliability
Educational level	1.000
Training	0.941
Ability to carry out HOTS learning	0.966
Teaching experience	0.834

Data Source: Primary Data Processing Results, 2024.

All research variables have a composite reliability value exceeding 0.7, which indicates that each of them meets the composite reliability criterion. Therefore, it can be concluded that the total reliability of the research variables is very high.

3.2.5 Cronbach Alpha

To increase composite test reliability, the Cronbach alpha value is utilized. If a variable's value is greater than 0.7, it is deemed dependable or satisfies Cronbach's alpha. The Cronbach's alpha values for each variable are listed below.

Table 7. Cronbach's Alpha

	Cronbach's Alpha
Educational level	1.000
Training	0.927
Ability to carry out HOTS learning	0.963
Teaching experience	0.706

Data Source: Primary Data Processing Results, 2024.

Additionally, it is evident that each study variable's Cronbach alpha value exceeds 0.7, indicating that each variable's value satisfies the Cronbach's alpha standards. Thus, it may be said that every research variable has a high degree of reliability.

3.2.6 Inner Model Testing

The inner model, which represents the causal linkages between latent variables that have been generated from the theory's content, is used to forecast the causal relationship between latent variables, or variables that cannot be directly identified on the structural model. The relationship between latent constructs is examined by evaluating the structural model (inner model). The structural model is analyzed using four criteria: the coefficient of determination (R^2), the Q-square test (Q^2), the path coefficients, and the effect size (f^2). The endogenous construct's coefficient of determination, or R-squared. Predictive relevance is evaluated using the Q-square test. The model's quality is assessed using the effect size (F-Square) and path coefficients, or estimates for path coefficients, which represent the strength of the latent construct's association or influence.

a. Analysis of the Coefficient of Determination (R^2)

The following R-Square values were found after the data was processed using the smartPLS 3.0 program as shown in the following table 8:

Table 8. R-Square Value

	R Square	R Square Adjusted
Ability to carry out HOTS learning	0.697	0.693
Teaching experience	0.330	0.324

Data Source: Primary Data Processing Results, 2024.

Table 8's R-square value indicates that the R^2 value for teaching experience is 0.330, whereas the capacity to apply HOTS learning is 0.697. The degree of education and training has an impact on

teaching experience of 33.0%, while the degree of education and training combined with teaching experience has an impact on the ability to implement HOTS learning, reaching a percentage of 69.7%. All of these values are then multiplied by 100%.

b. Cross-Validated Redundancy (Q2)

Predictive relevance is evaluated using the Q-square test or cross-validated redundancy (Q2). When a model's Q2 value is greater than zero, it is considered to have correct predictive relevance to a given construct; when it is less than zero, it is considered to have no predictive relevance. The model's predictions are deemed significant in this study since the endogenous latent variable's Q2 value is greater than 0 (zero).

Table 9. Total Cross-Validated Redundancy (Q2)

	SSO	SSE	Q ² (=1-SSE/SSO)
Educational level	238.000		1,000
Training	1666.000	745,470	0.553
Ability to carry out HOTS learning	4998.000	2496.298	0.501
Teaching experience	714.000	528.855	0.259

Source: SmartPLS 3.0 Processed Results, 2024

Every Q2 variable analyzed had a value greater than 0, as shown in Table 9 above, suggesting that the model has exact predictive relevance to its construct.

c. F-Square Analysis

The f-square value is calculated based on the measurement of the influence of the predictor variable on the dependent variable. The results of data processing using the SmartPLS 3.0 program are as follows.

Table 10. F-Square Value

Educational level	0.048	0.068
Training	0.772	0.170
Ability to carry out HOTS learning		
Teaching experience	0.087	

Data Source: Primary Data Processing Results, 2024.

Three categories comprise Category F2, namely if its value A minor influence is represented by a value of less than 0.02, a moderate/fairly strong influence by a value between 0.15 and 0.02, and a strong influence by a value between 0.35 and 0.15. The aforementioned findings support the following conclusions:

1. The influence of education level on the ability to carry out HOTS learning has an F2 (0.048), which means it has a fairly strong influence.
2. The influence of training on the ability to implement HOTS learning has F2 (0.772), which means it has a strong influence.
3. The influence of teaching experience on the ability to implement HOTS learning has an F2 (0.087), which means it has an influence with a fairly strong category.
4. The influence of educational level on teaching experience has F2 (0.068), which means it has an influence with a fairly strong category.
5. The influence of training on teaching experience has an F2 (0.170) which means it has a strong influence.

d. Path Coefficients Test Results

Path coefficients are measured to test hypotheses and determine the significance and strength of the relationship between constructs. Path coefficients fall between -1 and +1. The closer it is to +1, the stronger the connection between the two structures. A relationship that is closer to -1 indicates a bad

relationship. Path coefficient evaluation is used to demonstrate the degree to which the independent variable affects the dependent variable. The results of figuring out the route coefficients for each variable are as follows:

Table 11. Path Coefficients

Educational level	0.147	0.252
Training	0.618	0.399
Ability to carry out HOTS learning		
Teaching experience	0.198	

Data Source: Primary Data Processing Results, 2024.

Based on these results, it is evident that the highest path coefficient value or magnitude of the relationship is between the training variable and the ability to implement HOTS learning of 0.618 with a positive coefficient value, which means there is a strong positive relationship between HOTS training and the ability to carry out HOTS learning.

3.3 Hypothesis Testing

The Bootstrapping method, which yields parametric coefficients, t-statistic values, and p-values, is used to test the hypothesis. The criterion states that if the p-value is larger than 0.05, H0 is rejected and Ha is accepted; if the p-value is less than 0.05, H0 is rejected and Ha is accepted. SmartPLS 3.0 software is used for hypothesis testing. At a significance level of p 0.05 (5%), the bootstrapping results show a positive beta coefficient and a t-statistic value larger than 1.96. The following figure shows the results of the study's hypothesis testing:

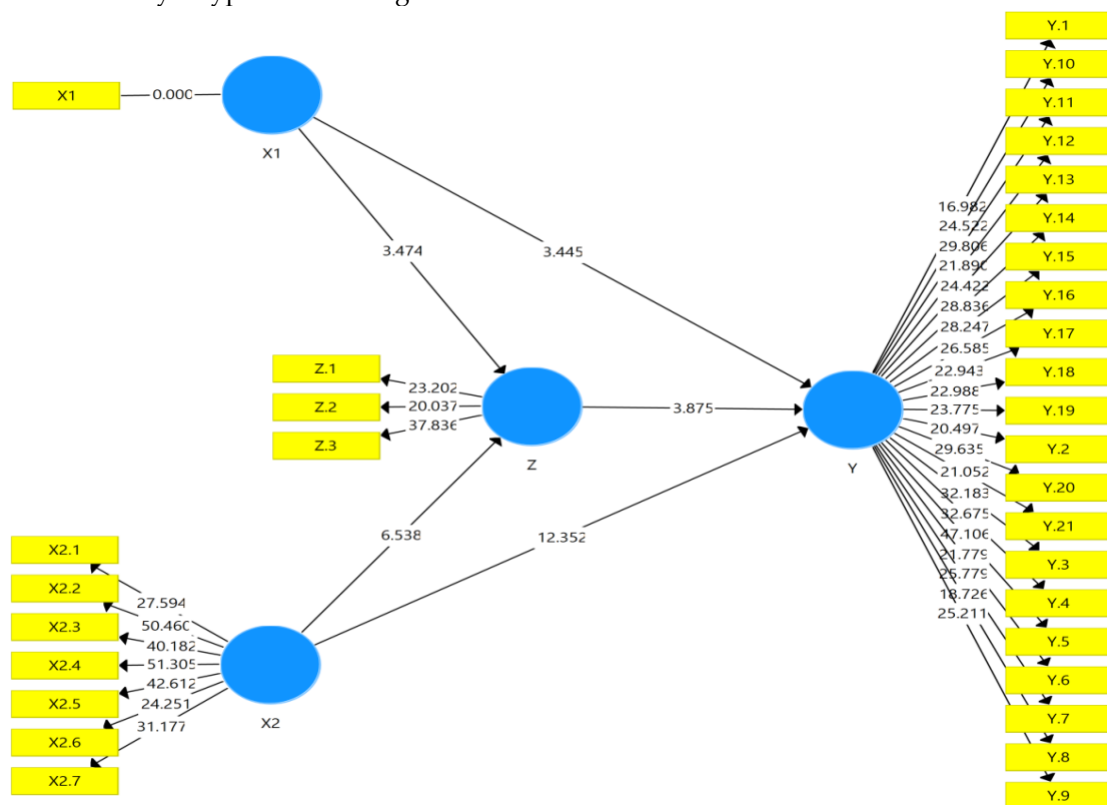


Figure 3. Significance Test Results

3.3.1 Direct Influence Hypothesis Test

The parameter coefficient shows the direction of impact by evaluating the initial sample's positive or negative value and the degree to which the independent variable influences the dependent

variable. Conversely, directed relationships and influences (direct influences) are deemed significant at a significance level of 5% if the p-value is less than 0.05 and the T-statistic value is more than 1.96. Table 12 below shows the test results that have a direct impact on the research variables.

Table 12. Results of the Direct Influence Hypothesis Test

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
X1→Y	0.147	0.140	0.043	3.445	0.001
X1→Z	0.252	0.253	0.072	3.474	0.001
X2→Y	0.618	0.621	0.050	12.352	0.000
X2→Z	0.399	0.404	0.061	6.538	0.000
Z→Y	0.198	0.199	0.051	3.875	0.000

Data Source: Primary Data Processing Results, 2024.

The above data were used to test the influence of educational level and training variables on teaching experience and its impact on the ability to implement HOTS learning. The test results show the following parameter coefficient values:

1) X1 against Y:

"It is suspected that the level of education influences the ability to implement HOTS learning at State Senior High Schools in Pelalawan Regency".

When comparing the quality of teaching experience (Y) to the level of education (X1), the t-statistic is as large as 3.445 with a p-value of 0.001. Since the p-value of 0.001 is shown to be less than 0.05, H_0 is rejected, indicating that the t-statistic has a substantial impact. indicates that the original study hypothesis was approved. This condition shows that educational level has a considerable and favorable impact on Pelalawan Regency State Senior High Schools' capacity to execute HOTS learning.

2) X1 against Z

"It is suspected that the level of education influences the teaching experience of teachers at State Senior High Schools in Pelalawan Regency."

The t-statistic for educational level (X1) versus teaching experience (Z) is 3.474, and the p-value is 0.001. Because the p-value of 0.001 is less than 0.05, the data demonstrate that the t-statistic has a significant influence. As a result, H_0 is rejected, indicating that the original study hypothesis is accepted. This condition demonstrates how educational level can have a substantial, favorable impact on the teaching experience in State Senior High Schools in Pelalawan Regency.

3) X2 against Y:

"It is suspected that the training has an impact on the ability to implement HOTS learning at Pelalawan Regency State Senior High Schools"

Training (X2) has a t-statistic of 12.352 and a p-value of 0.000 when compared to the caliber of teaching experience (Y). Because it is established that the p-value of 0.000 is less than 0.05, the results demonstrate that the t-statistic has a substantial impact. As a result, H_0 is rejected, indicating that the original study hypothesis is accepted. This circumstance demonstrates how training can have a major positive impact on Pelalawan Regency State Senior High Schools' capacity to implement HOTS learning.

4) X2 against Z

"It is suspected that the training has an impact on the teaching experience of teachers at state high schools in Pelalawan Regency."

Training (X2) had a t-statistic of 6.538 and a p-value of 0.001 when compared to teaching experience (Z). Because the p-value of 0.000 is less than 0.05, the data demonstrate that the t-statistic has a significant influence. As a result, H_0 is rejected, indicating that the original study hypothesis is accepted. This condition demonstrates that the training variable can have a substantial favorable impact on the teaching experience of State Senior High Schools in Pelalawan Regency.

5) Z against Y:

"It is suspected that teaching experience influences the ability to implement HOTS learning at State Senior High Schools in Pelalawan Regency"

The t-statistic between teaching experience (Z) and quality of teaching experience (Y) is as large as 3.875 with a p-value of 0.000. Because the p-value of 0.000 is less than 0.05, the data demonstrate that the t-statistic has a significant influence. As a result, H_0 is rejected, indicating that the original study hypothesis is accepted. This condition demonstrates how teaching experience can have a major positive impact on Pelalawan Regency State Senior High Schools' capacity to adopt HOTS learning.

3.3.2 Indirect Effect Hypothesis Test

Parameter coefficients that show the variable's direction of effect by determining whether the initial sample is positive or negative. Furthermore, the association and indirect influence can be deemed significant if the T-statistic value is larger than 1.96 or the p-value is less than 0.05 at a significance level of 5% (Ghozali, 2014). Table 13 below displays the findings of the mediation test on the research variables.

Table 13. Results of the Indirect Influence Hypothesis Test

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
X1→Z→Y	0.050	0.050	0.020	2,535	0.012
X2→Z→Y	0.079	0.081	0.026	3,056	0.002

Data Source: Primary Data Processing Results, 2024.

It can be seen from Table 13 regarding the indirect influence test, it can be seen that:

1) X1 against Y through Z

The capacity to apply HOTS learning through teaching experience at State Senior High Schools in Pelalawan Regency is said to be influenced by educational attainment. The association between educational level and the capacity to apply HOTS learning can be substantially mediated by teaching experience. The Path Coefficient data show a substantial influence with a T-Statistic of 2.535 and a p-value of $0.012 < 0.05$. This indicates that the capacity to apply HOTS learning through teacher teaching experience at State Senior High Schools in Pelalawan Regency is indirectly impacted by educational level.

2) X2 against Y through Z

It is believed that the training has an indirect impact on State Senior High Schools in Pelalawan Regency's capacity to use HOTS learning.

The relationship between training and the capacity to apply HOTS learning can be considerably mediated by teaching experience. The Path Coefficient data show a substantial influence with a p-value of $0.002 < 0.05$ and a T-Statistic of 3.056. This indicates that the ability of teachers in State Senior High Schools in Pelalawan Regency to use HOTS learning is indirectly impacted by training.

Results Hypothesis testing, both directly and indirectly, is statistically summarized in the following table 14:

Table 14. Summary of Hypothesis Test Results

Model	Explanation of the hypothesis	Test Results		Information
		T statistic	P value	
X1 -> Y	It is suspected that the level of education influences the ability to implement HOTS learning.	3.445	0.001	Influential positive and significant
X1 -> Z	It is suspected that the level of education influences teaching experience.	3.474	0.001	Influential in positive and significant
X2 -> Y	It is suspected that training has an impact on the ability to carry out learning.	12.352	0.000	Positive and significant impact
X2 -> Z	It is suspected that training has an impact on teaching experience.	6.538	0.000	Positive and significant impact
Z -> Y	It is suspected that teaching experience influences the ability to implement HOTS learning.	3.875	0.000	Positive and significant impact
X1 -> Z -> Y	It is suspected that the level of education has an indirect influence on the ability to implement HOTS learning through teaching experience.	2.535	0.012	Positive and significant impact
X2 -> Z -> Y	It is suspected that training has an indirect effect on the ability to implement HOTS learning through teaching experience.	3.056	0.002	Influential positive and significant

Data Source: Primary Data Processing Results, 2024.

Discussion

The findings of this study demonstrate that teachers' educational level significantly influences their ability to implement Higher-Order Thinking Skills (HOTS)-based learning in public senior high schools in Pelalawan Regency. This finding indicates that teachers with higher educational qualifications are more likely to possess the pedagogical knowledge, content expertise, and instructional competencies required to design learning experiences that promote higher-order cognitive processes. Advanced educational programs expose teachers to contemporary educational theories, learner-centered pedagogies, curriculum design, and assessment strategies that emphasize critical thinking, creativity, and problem-solving. Consequently, teachers with higher academic qualifications are better prepared to translate curriculum objectives into meaningful classroom practices that foster HOTS.

These findings support the theory that teacher education serves as the foundation for professional competence and instructional quality. According to Shulman's concept of pedagogical content knowledge, effective teaching requires the integration of subject-matter expertise and pedagogical knowledge, enabling teachers to transform content into meaningful learning experiences (Shulman, 1987). In the context of HOTS-based instruction, such integration becomes increasingly important because teachers are expected to design authentic learning tasks that encourage students to analyze, evaluate, and create rather than simply remember information. The present findings are consistent with previous studies showing that teachers with higher educational attainment demonstrate greater readiness to implement innovative instructional practices and higher-order learning strategies (Cholis Sa'dijah, 2021; Yasin et al., 2021). Therefore, strengthening teachers' academic qualifications should remain a priority in educational policy to improve instructional quality and student learning outcomes.

Professional training also emerged as a significant predictor of teachers' ability to implement HOTS-oriented learning. Among all predictors examined in this study, training demonstrated the strongest statistical effect, suggesting that continuous professional development plays a critical role in enhancing teachers' instructional competence. Unlike formal education, which primarily develops

theoretical understanding, professional training provides opportunities for teachers to acquire practical pedagogical skills, instructional innovations, classroom assessment techniques, and collaborative learning strategies directly applicable to classroom practice (Dessler, 2020). Through training, teachers become more familiar with designing HOTS-oriented lesson plans, developing authentic assessment instruments, and facilitating inquiry-based learning environments that stimulate students' higher-order thinking.

This finding corroborates previous studies reporting that HOTS-focused professional development significantly improves teachers' pedagogical competence and instructional confidence (Anita et al., 2022; Calavia et al., 2023; Suyatno et al., 2022). Effective professional development enables teachers to reflect on their instructional practices, adopt evidence-based teaching strategies, and continuously improve classroom instruction. These findings are also consistent with the concept of lifelong professional learning, which argues that teacher competence develops continuously through sustained participation in professional learning communities, mentoring, workshops, and reflective practice rather than relying solely on initial teacher education (Darling-Hammond et al., 2020). Consequently, education authorities should prioritize sustained, practice-oriented professional development programs that focus explicitly on implementing HOTS-based pedagogy.

The present study further reveals that teaching experience positively influences teachers' ability to implement HOTS learning. This finding suggests that teachers accumulate valuable pedagogical knowledge through repeated classroom interactions, instructional reflection, and practical problem-solving over time. Experienced teachers generally possess greater classroom management skills, instructional flexibility, and professional judgment, allowing them to adapt HOTS-oriented learning strategies to diverse student characteristics and classroom contexts. Experience therefore contributes to teachers' confidence in facilitating complex learning activities requiring discussion, inquiry, collaboration, and authentic assessment.

However, although teaching experience significantly affects HOTS implementation, its influence should not be interpreted as sufficient in isolation. Previous studies have shown that years of teaching alone do not automatically guarantee instructional innovation if teachers do not continuously update their pedagogical knowledge (Hidayat, 2020). In rapidly changing educational environments, experienced teachers must continually engage in professional learning to remain responsive to curriculum reforms, technological advances, and evolving student learning needs. This finding reinforces the argument that teaching experience should be complemented by continuous education and professional development to maximize instructional effectiveness.

An important contribution of this study lies in demonstrating the mediating role of teaching experience in the relationship between educational level and HOTS implementation. The significant indirect effect indicates that higher educational attainment not only directly enhances teachers' instructional competence but also contributes to the accumulation of professional expertise that strengthens HOTS implementation over time. Teachers with stronger academic preparation are more capable of reflecting on classroom experiences, adapting instructional strategies, and transforming practical experiences into professional knowledge. This finding supports experiential learning theory, which emphasizes that knowledge develops through continuous interaction between formal learning and practical experience (Kolb, 1984). Therefore, educational qualifications and teaching experience should be viewed as complementary rather than independent determinants of instructional quality.

Similarly, teaching experience significantly mediates the relationship between professional training and HOTS implementation. Professional development programs appear to generate greater instructional impact when teachers are able to integrate newly acquired knowledge into their everyday teaching practice. Experience enables teachers to contextualize training outcomes, evaluate instructional effectiveness, and refine teaching strategies based on classroom realities. This result suggests that the effectiveness of professional training depends not only on the quality of the training itself but also on teachers' opportunities to apply, reflect upon, and continuously improve their instructional practices.

Overall, these findings contribute to the growing literature on teacher professional competence by demonstrating that educational qualifications, professional training, and teaching experience function as complementary factors in strengthening teachers' capacity to implement HOTS-oriented instruction. From a practical perspective, policymakers should prioritize integrated teacher development systems that combine advanced academic qualifications, sustained professional development, mentoring, and reflective teaching practice. Such comprehensive approaches are likely to produce teachers who possess not only theoretical knowledge but also the practical expertise required to cultivate higher-order thinking among students. Ultimately, strengthening teachers' capacity to implement HOTS-based learning represents a strategic investment in improving educational quality and preparing students with the critical, creative, and problem-solving competencies required in the twenty-first century.

4. CONCLUSION

This study demonstrates that teachers' educational level, professional training, and teaching experience significantly contribute to the implementation of Higher-Order Thinking Skills (HOTS)-based learning among teachers in public senior high schools in Pelalawan Regency. Professional training emerged as the strongest predictor of teachers' ability to implement HOTS-oriented instruction, highlighting the critical role of continuous professional development in strengthening pedagogical competence. Furthermore, teaching experience was found to partially mediate the relationships between educational level, professional training, and HOTS implementation, indicating that practical classroom experience enhances the effectiveness of formal education and training in fostering higher-order instructional practices. These findings underscore the importance of integrating advanced academic qualifications, sustained professional development, and experiential learning to improve teachers' capacity to facilitate critical, creative, and problem-solving skills among students. Nevertheless, this study has several limitations. First, the research was confined to public senior high schools in a single regency, limiting the generalizability of the findings to other educational contexts. Second, the use of a cross-sectional survey design and self-reported questionnaire data restricts the ability to establish causal relationships and may introduce common method bias. Future research should involve more diverse educational settings, including private schools and different educational levels, employ longitudinal or mixed-method approaches to better capture changes in teachers' competencies over time, and examine additional variables, such as school leadership, organizational support, teachers' self-efficacy, digital pedagogical competence, and institutional culture, to develop a more comprehensive understanding of the factors influencing the successful implementation of HOTS-oriented learning.

REFERENCES

- Amka, A., Mastur, M., & Najamudin, M. (2020). *Profesi keguruan: Menjawab problematika profesi dan kinerja guru*. Pustaka.
- Anita, Y., Arwin, A., Ahmad, S., Helsa, Y., & Kenedi, A. K. (2022). HOTS-based digital teaching material development training as a form of learning in the Industrial Revolution 4.0 era for elementary school teachers. *Dedication: Jurnal Pengabdian Masyarakat*, 6(1), 59–68. <https://doi.org/10.31537/dedication.v6i1.658>
- Calavia, M. B., Blanco, T., Casas, R., & Dieste, B. (2023). Making design thinking for education sustainable: Training preservice teachers to address practice challenges. *Thinking Skills and Creativity*, 47, Article 101199. <https://doi.org/10.1016/j.tsc.2022.101199>
- Chandra, D., Heryadi, D., & Keguruan, F. (2020). Indonesian language teachers' ability to create higher order thinking skills-based test questions. *Jurnal Pendidikan Bahasa dan Sastra Indonesia*, 16, 22–28.
- Cholis Sa'dijah, A. R. A. (2021). Teacher readiness to implement HOTS-based learning reviewed from knowledge and ability to package learning tools. *Padaringan: Jurnal Pendidikan Sosiologi Antropologi*, 3(2), 402–415. <https://doi.org/10.20527/padaringan.v3i2.3422>

- Darling-Hammond, L., Hyler, M. E., & Gardner, M. (2020). *Effective teacher professional development*. Learning Policy Institute.
- De Vries, S., Jansen, E. P. W. A., & van de Grift, W. J. C. M. (2013). Profiling teachers' continuing professional development and the relationship with their beliefs about learning and teaching. *Teaching and Teacher Education*, 33, 78–89. <https://doi.org/10.1016/j.tate.2013.02.006>
- Dessler, G. (2020). *Human resource management* (16th ed.). Pearson.
- Dogara, G., Saud, M. S. B., Kamin, Y. B., & Nordin, M. S. B. (2020). Project-based learning conceptual framework for integrating soft skills among students of technical colleges. *IEEE Access*, 8, 83718–83727. <https://doi.org/10.1109/ACCESS.2020.2992092>
- Elfeky, A. I. M. (2019). The effect of personal learning environments on participants' higher-order thinking skills and satisfaction. *Innovations in Education and Teaching International*, 56(4), 505–516. <https://doi.org/10.1080/14703297.2018.1534601>
- Fanani, M. Z. (2018). HOTS development strategy. *Edudeena*, 2(1), 57–76. <https://doi.org/10.30762/ed.v2i1.582>
- Hidayat, I. (2020). Teacher competence in Islamic education learning based on higher order thinking skills (HOTS) in junior high schools. *Khazanah Pendidikan Islam*, 2(2), 52–67. <https://doi.org/10.15575/kp.v2i2.9030>
- Ichsan, I. Z., Sigit, D. V., Miasyah, M., Ali, A., Arif, W. P., & Prayitno, T. A. (2019). HOTS-AEP: Higher order thinking skills from elementary to master students in environmental learning. *European Journal of Educational Research*, 8(4), 935–942. <https://doi.org/10.12973/EU-JER.8.4.935>
- Iskandar, D., & Senam, S. (2015). Study of high school chemistry teachers' ability in developing HOTS-based final examination questions. *Jurnal Inovasi Pendidikan IPA*, 1(1), 65–74. <https://doi.org/10.21831/jipi.v1i1.4533>
- Jaenudin, R., Chotimah, U., Farida, F., & Syarifuddin, S. (2020). Student development zone: Higher order thinking skills (HOTS) in critical thinking orientation. *International Journal of Multicultural and Multireligious Understanding*, 7(9), 11–19. <https://doi.org/10.18415/IJMMU.V7I9.1884>
- Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice Hall.
- Kristiyono, A. (2018). Urgency and implementation of higher order thinking skills. *Jurnal Pendidikan Penabur*, 17(31), 36–46.
- Lu, K., Yang, H. H., Shi, Y., & Wang, X. (2021). Examining the key influencing factors on college students' higher-order thinking skills in the smart classroom environment. *Smart Learning Environments*, 8, Article 1. <https://doi.org/10.1186/s41239-020-00238-7>
- Miterianifa, M., Ashadi, A., Saputro, S., & Suciati, S. (2021). Higher order thinking skills in the 21st century: Critical thinking. <https://doi.org/10.4108/eai.30-11-2020.2303766>
- Nursaumi, I., Mulia, F. Z., & Sunarya, E. (2022). Improving training and career development on employee work productivity. *Journal of Economic, Business and Accounting (COSTING)*, 5(2), 1328–1335. <https://doi.org/10.31539/costing.v5i2.2482>
- Prastikawati, E. F., Wiyaka, W., & Budiman, T. C. S. (2021). HOTS-based English question preparation training for junior high school English teachers. *Jurnal Pengabdian Masyarakat*, 6(1), 47–54.
- Prihidayanti, Y., Florentinus, T. S., & colleagues. (2019). The effect of the continuing professional development program on teachers' pedagogical and professional competence. *Unnes Journal of Educational Research*, 8(2), 90–97.
- Rahimah. (2022). Improving teachers' ability to develop independent curriculum teaching modules through mentoring activities. *ANSIRU PAI Journal*, 92–106.
- Ruwaida, H., & Selatan, K. (2019). Cognitive processes in the revised Bloom's taxonomy: Analysis of creative ability (C6). *Jurnal Pendidikan*, 4(1), 51–76.
- Shulman, L. S. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review*, 57(1), 1–22.
- Stauffer, B. (2022). *What are 21st century skills?* Applied Educational Systems.
- Suyatno, S., Sanjaya, I. G. M., Muchlis, M., Jatmiko, B., & Rahayu, Y. S. (2022). HOTS-based question preparation training for high school science teachers in Gresik Regency. *Jurnal Pemberdayaan*

- Masyarakat Universitas Al Azhar Indonesia, 5(1), 66–74. <https://doi.org/10.36722/jpm.v5i1.1770>
- Tasrif. (2022). Higher order thinking skills (HOTS) in social studies learning in senior high schools. *Jurnal Pembangunan Pendidikan: Fondasi dan Aplikasi*, 10(1), 50–61. <https://doi.org/10.21831/jppfa.v10i1.29490>
- Ucik Fitri Handayani, & Hakim, W. (2022). HOTS mathematics question preparation training for senior high schools and equivalent institutions. *Anugerah Journal*, 4(2), 135–144. <https://doi.org/10.31629/anugerah.v4i2.4384>
- Wahyuningsih, Agustina Sumardjoko, B., & Desstya, A. (2023). Implementation of HOTS-based learning in thematic learning. *Profesi Pendidikan Dasar*, 9(1), 45–52. <https://doi.org/10.30653/003.202391.41>
- World Economic Forum. (2020). *The future of jobs report 2020*. http://www3.weforum.org/docs/WEF_Future_of_Jobs_2020.pdf
- Yasin, N., Gunawan, Fattah, M. N., & Parenden, A. (2021). The influence of work experience, education and training, and educational level on employee performance. *Bata Ilyas Educational Management Review*, 1(1), 17–28.