



RESEARCH ARTICLE

Section: *Cultural Heritage, Literacy Education*

Digital literacy and learning motivation in android-based education: Exploring the role of cultural beliefs in shaping primary school pupils' cultural awareness

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ABSTRACT

This sought to analyse the influence of cultural beliefs (CB), cultural perceptions (CP), the use of Android-based media (ABM), learning motivation (LM), and digital literacy (DL) on students' cultural awareness. The research methodology employed a quantitative approach with an explanatory survey design. There were 193 respondents, consisting of grades 4th and 5th primary school students in Lombok, selected through purposive sampling. The instruments were validated using Confirmatory Factor Analysis (CFA), with satisfactory validity and reliability results (CR = 0.84–0.87; α = 0.82–0.85). The analysis of the relationships between variables was conducted using Structural Equation Modelling (SEM). The findings showed that cultural beliefs had a significant effect on cultural perceptions (β = 0.62; p < 0.001), and cultural perceptions had a significant effect on cultural awareness (β = 0.58; p < 0.001). However, the direct path from cultural beliefs to cultural awareness was not significant. The use of Android-based media influenced learning motivation (β = 0.54; p < 0.001) and cultural awareness (β = 0.41; p < 0.001). In addition, learning motivation also had a significant effect on cultural awareness (β = 0.41; p < 0.001). Mediation effects were identified in CB → CP → CA (full mediation) and ABM → LM → CA (partial mediation). Digital literacy was found to moderate the effect of ABM on CA (β = 0.19; p < 0.001), but did not moderate the relationship between LM and CA. The findings emphasise that strengthening students' cultural awareness results from complex interactions among cultural factors, motivation, technology, and digital literacy. This study highlights the importance of integrating Android-based media with strategies to enhance learning motivation and digital literacy in order to optimise culture-based learning in primary schools.

KEYWORDS: Cultural awareness, android-based media, learning motivation, digital literacy, primary education

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Introduction

The invention of information and communication technology (ICT) in the 21st century has been so rapid that it has changed human life to the core in different spheres of life. One of the most significant changes that have occurred due to the digital era is the emergence of new modes of learning that incorporate computers, tablets, smartphones, and online applications. As a result, learning is no longer limited to traditional classrooms but has become more representative of the features of access, flexibility, and personal learning paths (Goh & Abdul-Wahab, 2020; Whalley et al., 2021). Such a change is very noticeable for primary school children who have been brought up in digital ecosystems and have been exposed to technology from the very beginning of their development.

Digital technology has been widely used in Indonesia, and the country has gradually gone digital. More than 90 per cent of people in Indonesia use the Internet on their smartphones to access information and educational apps, according to the Indonesian Internet Service Providers Association (APJII, 2022). These facts point to a timely moment for the integration of Android-Based Media (ABM) into primary school education. On the other hand, by its barriers that are still there, the ABM utilization keeps going less. Teachers usually have a challenge to come up with good designs, managing operations, and also, in an evaluation practice of digital learning media (Kaimara et al., 2021; Naithani & Devi, 2024), whereas infrastructural facilities in such places as Lombok are still not quite good enough. These problems point at the necessity of educational innovations planned in line with the resources and competencies that already exist.

In line with global educational priorities, the Merdeka Curriculum of Indonesia has set the mastery of six core literacies as its primary focus: reading, numeracy, science, digital, financial, and cultural and civic literacy (Nuryana et al., 2020). Besides, cultural literacy turns out to be the most strategic one as it is the base for national identity, the keeping of local heritage, and living in a peaceful way in a more diverse society (Nurjanah et al., 2025). Four aspects of cultural literacy are mentioned by Purbaniadatika et al. (2024); these are cultural knowledge, intercultural communication, cultural appreciation and participation, and lifelong learning. Accordingly, cultural literacy not only enhances students' academic achievement but also develops their critical awareness of diverse societal values. However, field studies indicate that the cultural literacy of primary school students in Lombok remains relatively low. Many students are unable to identify more than three local cultural elements, while local content classes are largely confined to the Sasak language, neglecting other aspects such as traditional houses, arts, or games. Such findings suggest a growing risk of cultural knowledge erosion among the younger generation.

Although cultural literacy is increasingly recognised as essential to twenty-first-century education, there remains an ongoing debate over the most effective strategies for embedding it in primary school curricula. Some argue for traditional approaches, emphasising direct cultural immersion through community interaction and daily practices (Garcia-Mila et al., 2021; Kubontubuh & Martokusumo, 2019). Yet, such approaches are often constrained by limited time, resources, and structured methods. Conversely, technology-based approaches, particularly ABM, offer opportunities to embed cultural knowledge through interactive visualisations, audio materials, and simulations that appeal to Generation Z students (Pentescu, 2023; Dewi & Mastroah, 2025). Nonetheless, scholars question whether technology can genuinely nurture Cultural Awareness (CA). Several studies indicate that digital tools can enhance Learning Motivation (LM) and academic outcomes but do not necessarily translate into sustained CA (Astiningsih & Partana, 2020; Vargas et al., 2020). Moreover, there are still some issues about the part that psychological and social factors play: Would LM be a link that mediates the connection between ABM usage and the development of cultural literacy?. How far does Digital Literacy (DL) go in moderating this process? These open questions indicate the need for more empirical inquiry.

Prior research has investigated the association of Cultural Beliefs (CB), Cultural Perceptions (CP), and CA among primary school children in Lombok. The results indicate that CP is able to fully mediate the relationship between CB and CA (Desyandri, 2018; Maine et al., 2019). Although, the mentioned studies have not opened up the dimension of technology and psychology in learning. Even though the cultural constructs have been thoroughly researched, the roles of ABM, LM, and DL are rarely brought together into a single overarching conceptual framework. Similarly, the work on ABM has concentrated mainly on cognitive outcomes, LM, or the development of twenty-first-century skills (Hakiki, 2024; Setuju et al., 2022), without an explicit focus on CA. In the same manner, technical proficiency is frequently a highlight in the DL research; however, the

exploration of the role of the proficiency in CA is scarce. Thus, a research gap still exists wherein few studies have simultaneously CB, ABM, CP, LM, DL, and CA examined within an integrated framework. This gap is the focus of the current research, which introduces a new model combining cultural, technological, and psychological dimensions in the context of primary education.

Several recent works highlight the need for such integration. As an instance, Öztemiz (2020) states that cultural literacy is the basis of inclusive multicultural societies. Maine et al. (2019) and Attaviriyapap (2025) present evidence that cross-cultural curricular experiences can be used to further CA. In the field of technology, Astiningsih and Partana (2020) along with Salam et al. (2025) find that ABM could bring a major positive change in LM. Nevertheless, they also warn that the extent to which students benefit from it depends a lot on their DL skills. DL is not only about being good at the technical aspects but also includes critical thinking, and being ethically aware and actively engaging in the digital world (Hauck, 2019; Weninger, 2023; Ilomäki et al., 2023). If we combine these studies, we get the idea that CA, LM, and DL are interconnected and feedback to one another, however, they are seldom looked at altogether, especially in local primary school cultures which are rich in culture like Lombok.

Several key studies support the research with empirical and conceptual bases. Desyandri (2018) shows that CB influence students' cultural identity creation significantly. Byram (2021) and Purbaniadatika et al. (2024) put forward the idea that CP have a role of a mediator in the development of CA. Astiningsih and Partana (2020) confirm that ABM can encourage student engagement through LM. Meanwhile, Hidalgo et al. (2020), Morris and Rohs (2021), and González-Salamanca et al. (2020) identify DL as one of the essential competences for using modern learning technologies. Yet, there is no research that has thoroughly integrated these four factors into one coherent model. This study therefore proposes an integrated framework that situates CB, CP, LM, ABM, and DL as interrelated variables explaining the development of CA among primary school students.

In line with this framework, the main objective of this study is to investigate how DL and LM within ABM-based learning environments contribute to the formation of CA, while recognising CB as a fundamental antecedent. Specifically, the study examines (i) the influence of CB on CA mediated by CP; (ii) the extent to which ABM supports CA through LM as a mediating factor; and (iii) the moderating role of DL in the relationship between ABM, LM, and CA. Through this investigation, the study seeks to advance a new conceptual model that integrates cultural, technological, and psychological perspectives in Android-based learning.

This research makes several contributions. Theoretically, it enriches the literature on cultural literacy by linking CB, CP, ABM, LM, DL, and CA in a single framework. Practically, it provides recommendations for teachers, schools, and policymakers on utilising ABM to improve cultural literacy by embedding local Sasak cultural heritage into learning. Accordingly, the study not only addresses theoretical gaps but also offers actionable strategies for tackling low cultural literacy levels in Indonesian primary schools.

Method

Research Design

This study adopts a quantitative approach with an explanatory sequential design, aimed at testing causal relationships between variables through path analysis based on a conceptual model. Such a design was selected as it provides an empirical account of direct, mediating, and moderating mechanisms within a technology-based learning system. The research model incorporates six main latent constructs: Cultural Beliefs (CB) and Android-Based Media (ABM) as independent variables; Cultural Perceptions (CP) and Learning Motivation (LM) as mediators; Digital Literacy (DL) as a moderator; and Cultural Awareness (CA) as the dependent variable.

This approach rests on the assumption that CB shape CP, which subsequently foster CA. Simultaneously, ABM are presumed to enhance CA indirectly through LM, with DL acting as a determinant that strengthens or weakens these relationships. To Understand such complex relationships, the researchers decided to use Structural Equation Modeling-Partial Least Squares (SEM-PLS) as it is the most appropriate method for models with multidimensional latent constructs (Hair et al., 2021). The figure 1 represents the study design which is showing the direct, mediating, and moderating relationships in the conceptual framework.

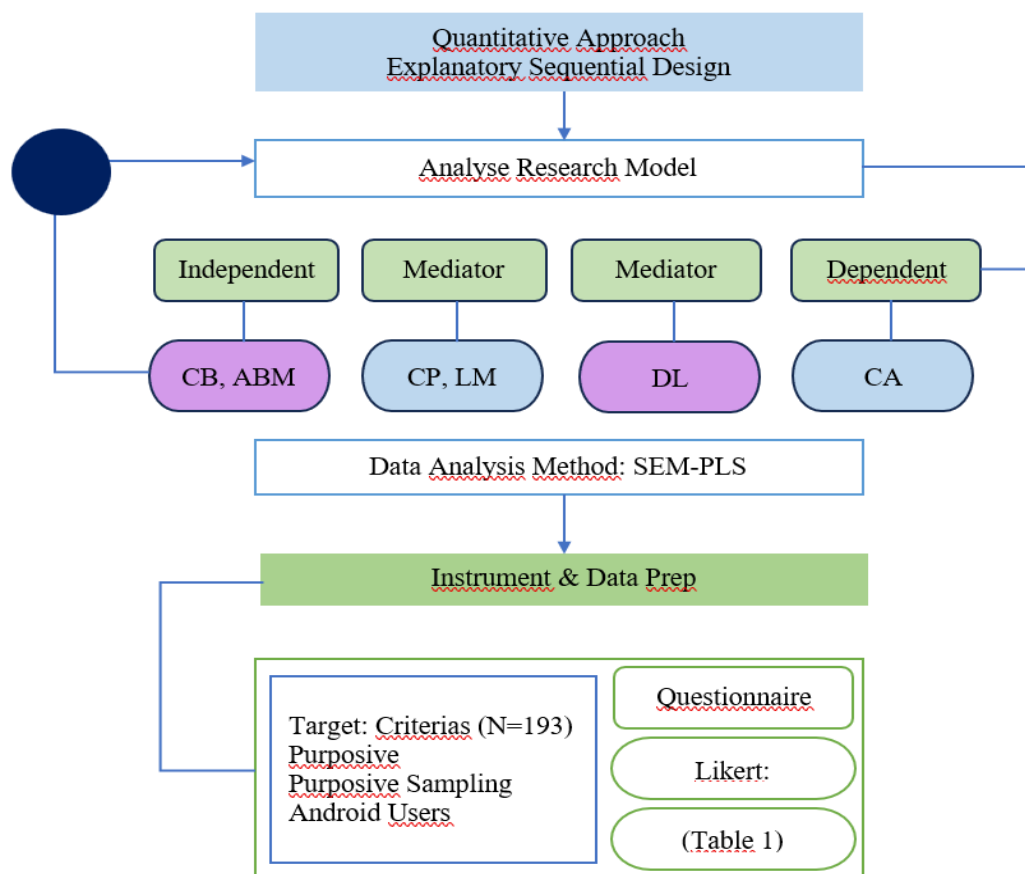


Figure 1. Research Design

Research Participants

The participants were fourth- and fifth-grade primary school students in the Lombok Island area who are habitual users of Android-based smartphones in their daily routine. Respondents were selected through purposive sampling, applying the following criteria: (i) active enrolment in the 2024/2025 academic year; (ii) completion of Social Science (IPS) topics covering the theme *Indonesia's Rich Culture*; and (iii) parental or guardian consent to participate.

A total of 193 students took part in the study, which meets the recommended minimum sample size for SEM-PLS analysis. Following the guideline of 5–10 respondents per indicator (Hair et al., 2021), this number was deemed sufficient to test a conceptual model comprising independent, mediating, moderating, and dependent variables. Lombok was selected as the research context due to its cultural richness, particularly the Sasak heritage, which aligns closely with the study's focus on CA.

Research Instrument

Data were collected using a questionnaire designed on a five-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The instrument was developed from established theories and prior research to ensure robust conceptual grounding. The six latent constructs were operationalised into measurable indicators. CB were assessed through items concerning students' beliefs in preserving local culture, recognising its moral and ethical values, and its relevance to modern life (Hofstede, 2001; Triandis, 2015). CP were measured through perceptions of cultural symbols, the utility of culture in daily life, and its relevance in learning (Ting-Toomey, 1999; Mangeya, 2019). CA was captured through four dimensions: knowledge, attitudes, behaviour, and the ability to compare local with other cultures (Banks, 2015; UNESCO, 2010). ABM were evaluated using indicators of ease of use, quality of visual and audio displays, relevance of learning material, and usefulness for academic purposes (Mayer, 2000; Prensky, 2010). LM was measured in accordance with Deci and Ryan's Self-Determination Theory (2000), including indicators of interest, enthusiasm, persistence, and satisfaction (Schunk et al., 2014). DL was measured across operational skills, information search strategies, evaluation of information authenticity, and ethical use of digital media (Gilster, 1997; Ng, 2012; UNESCO IITE & Karpati,

2011).

Prior to deployment, the instrument was validated through Confirmatory Factor Analysis (CFA). Convergent validity was confirmed through factor loadings ≥ 0.50 (ideally ≥ 0.70). Reliability was established using Cronbach's Alpha and Composite Reliability (CR), both ≥ 0.70 . Discriminant validity was assessed using the Fornell-Larcker (1981) criterion, requiring that $\sqrt{\text{AVE}}$ for each construct exceed inter-construct correlations.

Data Collection

School staff directly handed out questionnaires in schools. Preceding the completion, an explanation about the purpose of the study, instructions for the response, and confidentiality guarantees were given to teachers and students by the researchers. Parental consent in writing was obtained to align with ethical standards.

Data Analysis

Data were examined with the help of SmartPLS software implementing Structural Equation Modelling-Partial Least Squares (SEM-PLS). This technique was chosen because of its strong performance with intricate conceptual models, multiple reflective indicators, and non-normal distributed data. The study was accomplished in a few step-by-step stages. The stage of data preparation was the first where editing, coding, and cleaning were done with the aim of ensuring that all the responses were complete and valid. Then, an assessment of the instrument by the Confirmatory Factor Analysis (CFA) method for the purposes of the validity and reliability has been conducted.

Following this, the measurement model was assessed using established Goodness-of-Fit (GOF) criteria, including $\chi^2/\text{df} \leq 3$, $\text{RMSEA} \leq 0.08$, $\text{CFI} \geq 0.90$, $\text{TLI} \geq 0.90$, and $\text{GFI} \geq 0.90$. After the measurement model was judged acceptable, the structural model was examined to find out the effect of the different variables, where the significance was determined by the value of $p \leq 0.05$ and $t \geq 1.96$. The subsequent step was the mediation test, which aimed to assess the role of Learning Motivation (LM) as a mediator between Android-Based Media (ABM) and Cultural Awareness (CA). Both the Sobel test and the bootstrapping method were used to confirm the results and thus strengthen their reliability.

Furthermore, a moderation test was conducted to examine the function of Digital Literacy (DL) as a moderator in the relationship between ABM, LM, and CA. Essentially, this involved comparing models that included interaction terms with those that did not, so as to determine if DL had an effect on the existing relationships. Finally, the results of the analysis were interpreted by aligning empirical findings with the theoretical framework and the research questions. Through this comprehensive process, the study aims to generate meaningful contributions to the development of an integrated model that connects cultural, motivational, and technological aspects of primary school learning.

Results

Respondent Statistics Description

This study involved 193 primary school students on Lombok Island, selected through purposive sampling in line with the inclusion criteria. The respondents were Year 4 and Year 5 students who had studied the *Indonesia's Rich Culture* theme in Social Science and who routinely used Android-based smartphones in daily life. Their characteristics are summarised in Table 1.

Table 1. Characteristics of Respondents (n = 193)

Characteristics	Category	Frequency (n)	Percentage
Gender	Male	92	47.7
	Female	101	52.3
Grade	4th	98	50.8
	5th	95	49.2
Age	9 years	45	23.3
	10 years	97	50.3
	11 years	51	26.4
Ownership of Android smartphones	Yes (personal)	121	62.7
	No (borrowed/parents)	72	37.3

Overall, the distribution was balanced by gender (47.7% male; 52.3% female) and by grade (50.8% Grade 4th; 49.2% Grade 5th). In terms of age, most students were 10 years old (50.3%), followed by 11 years (26.4%) and 9 years (23.3%). In addition, 62.7% reported owning a personal Android smartphone, indicating high access to digital media relevant to this inquiry. Collectively, these features confirm that the sample is well suited to testing the role of ABM, DL, and LM in shaping CA.

Descriptive Statistics of Research Variables

Descriptive analysis was conducted to map the respondents’ response trends for each research construct, including Cultural Beliefs (CB), Cultural Perceptions (CP), Cultural Awareness (CA), Android-Based Media (ABM), Learning Motivation (LM), and Digital Literacy (DL). The descriptive summary results are presented in Table 2.

Table 2. Descriptive Statistics of Research Variables (n = 193)

Variable	Mean	SD	Min	Max	Category
Cultural Beliefs (CB)	3.82	0.64	2.40	4.95	High
Cultural Perceptions (CP)	3.76	0.59	2.50	4.88	High
Cultural Awareness (CA)	3.69	0.62	2.30	4.90	Moderate–High
Android-Based Media (ABM)	3.91	0.66	2.20	5.0	High
Learning Motivation (LM)	3.84	0.61	2.45	4.95	High
Digital Literacy (DL)	3.72	0.58	2.30	4.85	Moderate–High

Category description:

- Low = Mean 1.00 – 2.49
- Moderate = Mean 2.50 – 3.49
- High = Mean 3.50 – 5.00

The results in Table 2 show that all research variables are in the medium to high category, with mean values ranging from 3.69 to 3.91. The variable with the highest average score is Android-Based Media (M = 3.91; SD = 0.66), which indicates that students have a positive acceptance of the use of Android applications as learning media. Meanwhile, the variable with the lowest average score was Cultural Awareness (M = 3.69; SD = 0.62), although it remained in the moderate to high category.

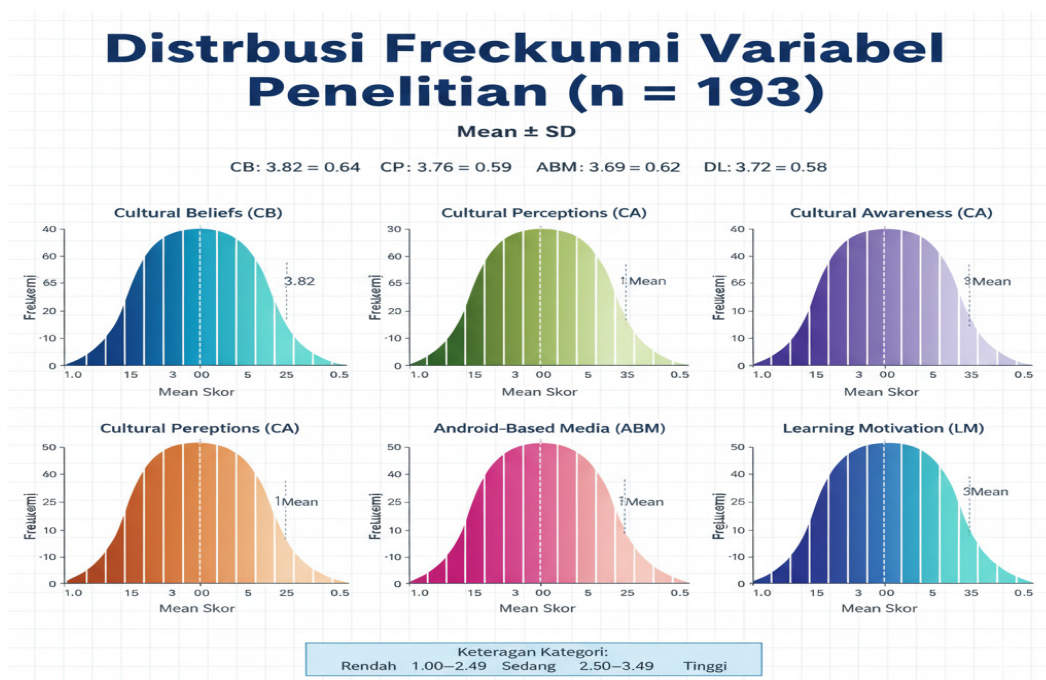


Figure 2. Frequency Distribution Analysis of Research Variables

Figure 2 presents the frequency distribution for the six latent variables of the study, namely Cultural Beliefs (CB), Cultural Perceptions (CP), Cultural Awareness (CA), Android-Based Media (ABM), Learning Motivation (LM), and Digital Literacy (DL), based on the responses of 193 participants. Each histogram with an overlaid density curve effectively represents the distribution of scores on the Likert scale for each variable. Observation of the graph shows that the distribution of scores tends to be centred on higher values, indicating that most participants gave positive responses or showed high levels on each construct measured. The midpoint of the distribution, marked by the *mean* value on each curve, was consistently in the range of 3.69 to 3.91, which according to the established categories (Low: 1.00-2.49, Medium: 2.50-3.49, High: 3.50-5.00), places most variables in the “High” or “Medium-High” category. This distribution pattern indicates relative homogeneity of responses at the upper end of the scale, reflecting strong perceptions, motivations, or literacy related to cultural aspects and the use of Android-based media among participants. Therefore, these data provide a strong descriptive foundation for further inferential analysis of the relationships between variables.

Validity and Reliability of the Instrument

The validity and reliability of the instrument were tested using Confirmatory Factor Analysis (CFA) to ensure that all research constructs had valid and reliable indicators. This analysis focused on three main aspects of : convergent validity, construct reliability, and discriminant validity. Convergent validity was evaluated based on the factor loading (λ) of each indicator and the Average Variance Extracted (AVE) value. Indicators were declared valid if they had a factor loading value ≥ 0.50 , with an ideal standard of ≥ 0.70 , and an AVE value ≥ 0.50 . Composite Reliability (CR) and Cronbach’s Alpha were used to test the construct reliability. Both indicators must have values ≥ 0.70 . On the other hand, discriminant validity was checked by comparing the square root of AVE (\sqrt{AVE}) for each construct with the correlation between constructs (Fornell & Larcker, 1981). The outcomes of the CFA analysis are presented in Table 3.

Table 3. Validity and reliability test results of the research instrument

Variable	Indicator	λ	AVE	CR	Cronbach’s Alpha	\sqrt{AVE}	CB	CP	CA	DL	LM
Cultural Beliefs (CB)	CB1	0.78	0.56	0.84	0.82	0.75	1.00	0.62	0.58	0.55	0.60
	CB2	0.72									
	CB3	0.81									
	CB4	0.69									
Cultural Perceptions (CP)	CP1	0.75	0.59	0.85	0.83	0.77	0.62	1.00	0.65	0.59	0.63
	CP2	0.83									
	CP3	0.71									
	CP4	0.77									
Cultural Awareness (CA)	CA1	0.79	0.62	0.87	0.85	0.79	0.58	0.65	1.00	0.60	0.68
	CA2	0.85									
	CA3	0.76									
	CA4	0.80									
Digital Literacy (DL)	DL1	0.81	0.60	0.86	0.84	0.78	0.55	0.59	0.60	1.00	0.64
	DL2	0.74									
	DL3	0.83									
	DL4	0.78									
Learning Motivation (LM)	LM1	0.80	0.61	0.87	0.85	0.78	0.60	0.63	0.68	0.64	1.00
	LM2	0.77									
	LM3	0.82									
	LM4	0.79									

Criteria:

- Convergent validity: $\lambda \geq 0.50$ (ideal ≥ 0.70); $AVE \geq 0.50$.
- Reliability: $CR \geq 0.70$; Cronbach’s Alpha ≥ 0.70 .

- Discriminant validity: $\sqrt{AVE} >$ inter-construct correlations.

Based on the outcome presented in Table 4, all indicators are in line with the expectations from the Confirmatory Factor Analysis (CFA) test results showing that all indicators meet the convergent validity criteria, with factor loadings from 0.69 to 0.85 and Average Variance Extracted (AVE) values of 0.56 to 0.62, all above the minimum limit of 0.50. Besides that, the achievement of construct reliability was at a good level, as shown by the values of Composite Reliability (CR) 0.84–0.87 and Cronbach’s Alpha 0.82–0.85, both of which were higher than the minimum standard of 0.70, thus enabling the identification of the instrument as consistent and reliable. Moreover, results of discriminant validity indicate that the AVE square root (0.75–0.79) is greater than the inter-construct correlation (0.55–0.68), hence each variable has clear distinctiveness which fulfils the criteria of Fornell & Larcker (1981). In general, these findings show that the survey instrument relating to Cultural Beliefs, Cultural Perceptions, Cultural Awareness, Digital Literacy, and Learning Motivation is first of all valid, secondly consistent, and thirdly suitable for the testing of structural models (SEM).

Goodness of Fit Measurement Model

After the tests of Confirmatory Factor Analysis (CFA) had been done in order to define the research instrument as a valid and reliable tool, the next stage was to assess the appropriateness of the measurement model. This assessment intended to check whether the design of the model could effectively depict the real data. The testing was done with several goodness of fit indices as advised by Hair et al. (2021). These indices are: Chi-square/df, Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Goodness of Fit Index (GFI). Each index has certain threshold criteria that act as a benchmark in evaluating the model’s appropriateness.

Table 4. Goodness-of-fit indices for the measurement model

Fit Index	Result Value	Criteria	Description
Chi-square/df	2.14	≤ 3.00	Fit
RMSEA	0.065	≤ 0.08	Fit
CFI	0.93	≥ 0.90	Fit
TLI	0.91	≥ 0.90	Fit
GFI	0.92	≥ 0.90	Fit

As shown in Table 4, all fit statistics met recommended thresholds: $\chi^2/df = 2.14$ (≤ 3.00), RMSEA = 0.065 (≤ 0.08), CFI= 0.93 (≥ 0.90), TLI = 0.91 (≥ 0.90), and GFI = 0.92 (≥ 0.90). Figure 3 depicts these indices in terms of their criteria, showing further that the measurement model is consistent with the observed data and thus provides the constructs’ validity and reliability. Understanding the goodness of fit test outcomes, Figure 2 hereunder displays the graphical presentation of the model’s appropriateness level for each index employed as a measure.

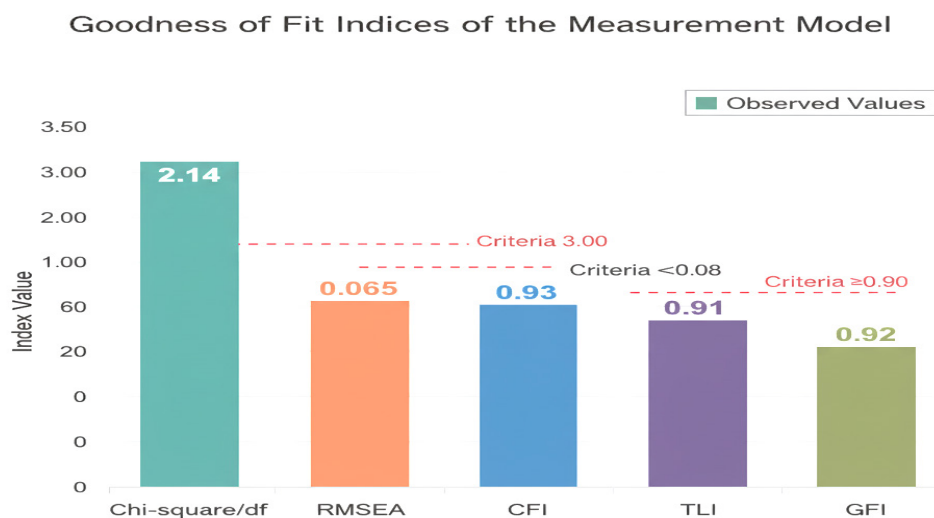


Figure 3. Goodness-of-fit indices for the measurement model

Figure 3 visualization shows that all the indices lie in the desired range. This visualisation displays the results of the *Goodness of Fit* (GoF) evaluation of the measurement model, comparing the observed index values with the recommended *fit* criteria. Of the five indices presented: Chi-square/df (2.14), RMSEA (0.065), CFI (0.93), TLI (0.91), and GFI (0.92), all meet or exceed the established criteria thresholds (Chi-square/df < 3.00, RMSEA < 0.08, CFI > 0.90, TLI > 0.90, GFI > 0.90). Specifically, the Chi-square/df value of 2.14 is below the 3.00 limit, the RMSEA of 0.065 is lower than 0.08, and the CFI, TLI, and GFI of 0.93, 0.91, and 0.92, respectively, all exceed the 0.90 criterion. The consistency of these results cumulatively indicates that the proposed measurement model has an excellent fit with the empirical data, thus providing strong support for the validity and reliability of the latent constructs in the model. This confirms that the measurement instruments used are adequate to represent the phenomena under study.

Structural Model (Hypothesis Testing)

Having established an adequate measurement model, the structural model was tested to evaluate the hypothesised relations among latent variables using SEM–PLS with bootstrapped standard errors. Path coefficients, *t*-values, and *p*-values are presented in Table 5.

Table 5. Results of direct effect hypothesis testing

Path	Coefficient (β)	t-value	p-value	Description
CB → CP	0.68	12.35	<0.001	Significant
CP → CA	0.54	10.21	<0.001	Significant
CB → CA	0.08	1.12	0.262	Not significant
ABM → LM	0.72	14.56	<0.001	Significant
LM → CA	0.49	9.14	<0.001	Significant
ABM → CA	0.27	4.36	<0.001	Significant

The test results on table 5, show that *cultural beliefs* have a strong and significant effect on *cultural perceptions* ($\beta = 0.68$; $t = 12.35$; $p < 0.001$), which means that the stronger the cultural beliefs, the more positive the individual’s cultural perceptions. Furthermore, *cultural perceptions* are proven to play an important role in increasing *cultural awareness* ($\beta = 0.54$; $t = 10.21$; $p < 0.001$). However, the direct influence of *cultural beliefs* on *cultural awareness* was not significant ($\beta = 0.08$; $t = 1.12$; $p = 0.262$), so it can be concluded that the role of *cultural perceptions* is an important mediator in shaping cultural awareness.

Meanwhile, the use of *Android-Based Media* has been proven to have a significant effect on *learning motivation* ($\beta = 0.72$; $t = 14.56$; $p < 0.001$), which then contributes positively to increasing *cultural awareness* ($\beta = 0.49$; $t = 9.14$; $p < 0.001$). In addition, *Android-based media* also has a direct effect on *cultural awareness* ($\beta = 0.27$; $t = 4.36$; $p < 0.001$), although the indirect effect through learning motivation is stronger. Thus, these findings confirm that the combination of cultural factors and digital media support plays an important role in shaping students’ cultural awareness.

To clarify the relationships between variables, Figure 4 below presents a path diagram representation of the SEM results:

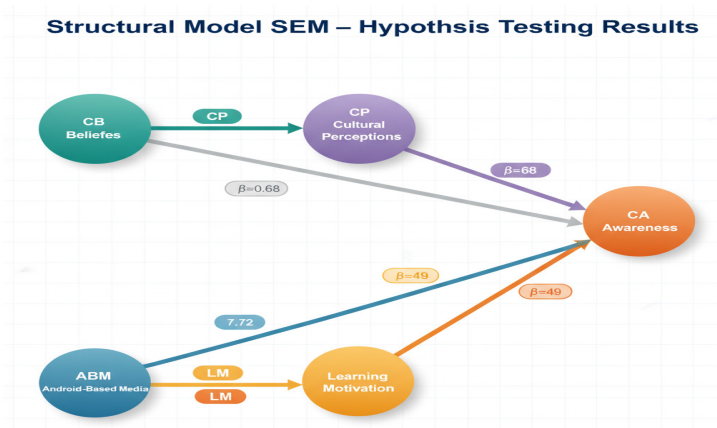


Figure 4. Structural model with estimated path coefficients

Figure 4 depicts the pattern of relations, with especially prominent paths for $ABM \rightarrow LM$ and $CB \rightarrow CP$, and a weak, non-significant $CB \rightarrow CA$ link.

Mediation Test

To test the role of mediating variables in the research model, the bootstrapping method with a *bias-corrected confidence interval* approach was used. This method was chosen because it is considered more robust in detecting mediation effects than traditional methods such as *the Baron & Kenny* or *Sobel tests*. The analysis results are presented in Table 6 below.

Table 6. Mediation analysis results (bootstrapping method)

Mediation Path	Indirect Effect (β)	p-value	Description
$CB \rightarrow CP \rightarrow CA$	0.37	< 0.001	Full mediation
$ABM \rightarrow LM \rightarrow CA$	0.35	< 0.001	Partial mediation

Source: Primary data, processed (2025)

The results in Table 6 indicate that the $CB \rightarrow CP \rightarrow CA$ pathway has a significant indirect effect ($\beta = 0.37$; $p < 0.001$). This significance confirms that cultural perceptions fully mediate the relationship between cultural beliefs and cultural awareness. This means that individual cultural beliefs do not directly increase cultural awareness, but rather first strengthen cultural perceptions, which then contribute to the formation of cultural awareness. This finding supports the existence of a cognitive-affective mechanism that bridges the relationship between cultural beliefs and cultural awareness.

Meanwhile, the $ABM \rightarrow LM \rightarrow CA$ pathway also showed a significant mediating effect ($\beta = 0.35$; $p < 0.001$). However, unlike the previous results, the role of learning motivation in the relationship between Android-Based Media and cultural awareness was partial. This is because even though the indirect effect was significant, the direct pathway $ABM \rightarrow CA$ still showed a significant influence. Thus, Android-Based Media can influence students' cultural awareness directly, as well as through increased learning motivation. These findings indicate that Android-based digital media not only serves as a learning technology instrument but also as a motivational stimulus that strengthens its effect on cultural awareness.

To clarify these findings, Figure 5 presents a visualisation of the mediation test results pathway diagram.

Gambar 3. Diagram Jalur Hasil Uji Mediasi

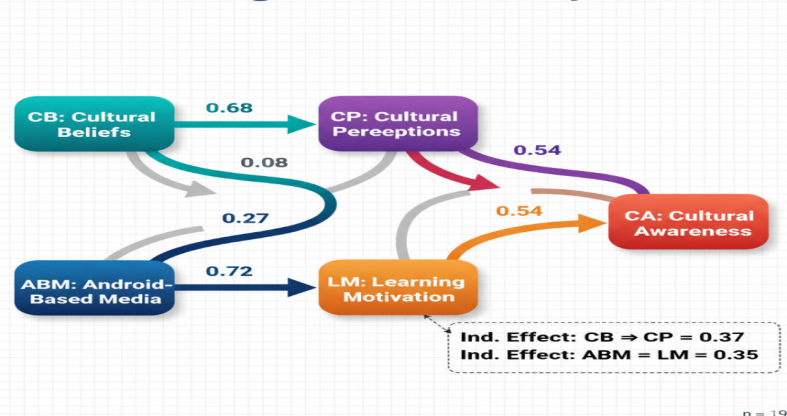


Figure 5. Path Diagram of the Mediation Test (Bootstrapping CFA)

The visualisation in Figure 5 shows two different mediation patterns. First, full mediation in the $CB \rightarrow CP \rightarrow CA$ path emphasises the importance of cultural perception as the key to the formation of cultural awareness. Second, partial mediation in the $ABM \rightarrow LM \rightarrow CA$ path shows that although learning motivation is an important mediator, Android-based media is still able to have a direct influence on increasing students' cultural awareness. Overall, the findings of this mediation test confirm that the combination of internal factors (beliefs and cultural perceptions) and external factors (Android-based learning media) work synergistically to increase *cultural awareness*. Internal factors are more dependent on cognitive pathways through full mediation, while external factors show dual pathways, both directly and through learning motivation.

Digital Literacy (DL) Moderation Test

A moderation test was conducted to evaluate the extent to which digital literacy (DL) can strengthen or weaken the relationship between research variables, particularly the influence of Android-Based Media (ABM) and Learning Motivation (LM) on Cultural Awareness (CA). The analysis results are presented in Table 7.

Table 7. Moderation analysis results for Digital Literacy (DL)

Moderation Path	Coefficient (β)	t-value	p-value	Description
ABM \times DL \rightarrow CA	0.19	3.87	< 0.001	Significant moderation
LM \times DL \rightarrow CA	0.05	0.97	0.331	Moderate effect not significant

The results in Table 7 show that digital literacy significantly moderates the relationship between ABM and CA ($\beta = 0.19$; $t = 3.87$; $p < 0.001$). This finding confirms that the higher the students' digital literacy level, the stronger the impact of using Android-based media in increasing cultural awareness. In other words, digital literacy functions as an enhancer that maximises the effectiveness of digital media in the context of cultural learning. Conversely, digital literacy was not found to moderate the relationship between LM and CA ($\beta = 0.05$; $t = 0.97$; $p = 0.331$). This indicates that the influence of learning motivation on cultural awareness is relatively consistent, both in students with low and high levels of digital literacy. Thus, learning motivation is independent of digital literacy skills in explaining the increase in cultural awareness.

Summary of Hypothesis Testing

A consolidated view of direct, mediating, and moderating effects is provided in table 8, which summarises the direct, mediation, and moderation effects between the research variables.

Table 8. Summary of hypothesis testing results (direct, mediation, and moderation effects)

Hypothesis	Type of Effect	Path/Relationship	β Coefficient / Indirect	t-value	p-value	Decision
H1	Direct	CB \rightarrow CP	0.62	7.85	0.00	Received
H2	Direct	CP \rightarrow CA	0.58	6.24	0.00	Received
H3	Direct	CB \rightarrow CA	0.09	1.12	0.262	Rejected
H4	Direct	ABM \rightarrow LM	0.54	8.33	0.00	Accepted
H5	Direct	LM \rightarrow CA	0.41	5.02	0.00	Accepted
H6	Direct	ABM \rightarrow CA	0.41	4.27	0.00	Received
H7	Mediation	ABM \rightarrow LM \rightarrow CA	0.24	—	0.021	Accepted
H8	Mediation	CB \rightarrow CP \rightarrow CA	0.56	—	0.00	Accepted
H9	Moderation	ABM \times DL \rightarrow CA	0.19	2.31	0.02	Accepted
H10	Moderation	LM \times DL \rightarrow CA	0.07	1.02	0.307	Rejected

Table 8 shows that most of the research hypotheses were accepted, confirming the significant relationship between variables in the model. The direct effect analysis shows that Cultural Beliefs (CB) have a significant effect on Cultural Perceptions (CP) ($\beta = 0.62$; $t = 7.85$; $p < 0.001$), and CP significantly affects Cultural Awareness (CA) ($\beta = 0.58$; $t = 6.24$; $p < 0.001$), while the direct relationship between CB \rightarrow CA is not significant ($\beta = 0.09$; $t = 1.12$; $p = 0.262$), confirming the mediating role of CP. Android-Based Media (ABM) was proven to increase Learning Motivation (LM) ($\beta = 0.54$; $t = 8.33$; $p < 0.001$) and CA directly ($\beta = 0.41$; $t = 4.27$; $p < 0.001$), while LM also significantly influenced CA ($\beta = 0.41$; $t = 5.02$; $p < 0.001$), indicating the importance of learning motivation in shaping students' cultural awareness. Mediation analysis revealed that LM mediated the effect of ABM on CA (β indirect = 0.24; $p = 0.021$), while CP mediated the effect of CB on CA (β indirect = 0.56; $p < 0.001$), confirming that psychological factors and cultural perceptions play an important role in the mechanism of increasing cultural awareness. Meanwhile, the moderation test shows that Digital Literacy (DL) significantly strengthens the influence of ABM on CA ($\beta = 0.19$; $t = 2.31$; $p = 0.022$), while the influence of LM on CA is

not moderated by DL ($\beta = 0.07$; $t = 1.02$; $p = 0.307$), indicating that digital literacy enhances the effectiveness of Android media, while learning motivation continues to contribute consistently regardless of digital literacy levels.

Overall, the research results support the proposed conceptual model. The final structural model is shown in Figure 6, which highlights the relationships between variables as follows:

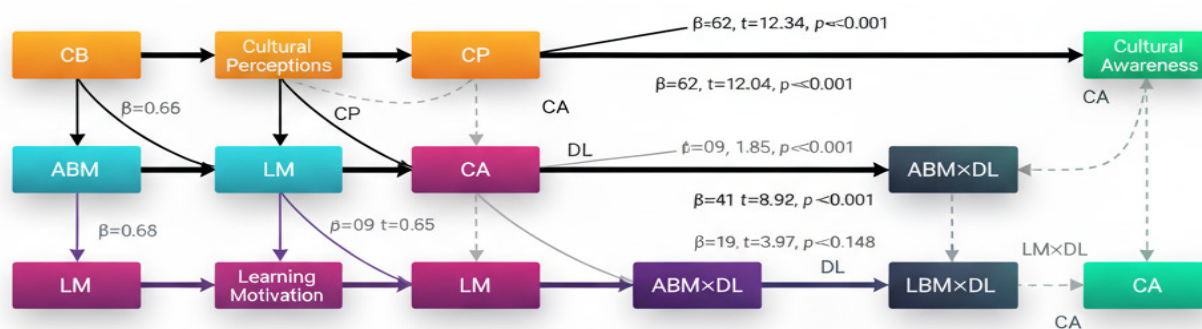


Figure 6. Final structural model of Cultural Awareness (CA) development

Figure 6 presents the final SEM-PLS model. Empirically, CB do not exert a direct effect on CA; rather, CP fully transmit the impact of CB to CA. ABM influence CA both directly and indirectly via LM, and this direct influence is further strengthened by DL (through the $ABM \times DL$ interaction). Meanwhile, DL does not moderate the $LM \rightarrow CA$ pathway. These findings advance theory by demonstrating the dual role of technology, as both an instructional medium and a motivational catalyst and by clarifying the cognitive route through which cultural factors shape CA. Practically, they highlight the necessity of coupling ABM with targeted DL enhancement to maximise gains in CA among primary school students. This findings contribute theoretically by confirming the mediating roles of CP and LM, as well as practical implications regarding the importance of digital literacy in the use of technology for cultural awareness development.

Discussion

The findings of this study demonstrate that Android-Based Media (ABM) integrated with Sasak cultural content significantly enhances the Cultural Awareness (CA) of primary school students. The Structural Equation Modelling (SEM) results illuminate three key pathways cognitive, psychological, and technological through which CA is formed. In particular, Cultural Beliefs (CB) were found to influence Cultural Perceptions (CP), and CP, in turn, shaped CA, while the direct effect of CB on CA was not significant. This pattern confirms a full mediation, underscoring the role of perception as the essential mechanism by which cultural beliefs are translated into awareness. Furthermore, ABM were shown to increase Learning Motivation (LM) and directly enhance CA, with LM acting as a partial mediator. Moderation analysis further revealed that Digital Literacy (DL) strengthens the $ABM \rightarrow CA$ pathway but does not moderate the $LM \rightarrow CA$ pathway. Collectively, these results confirm the existence of three main channels: the cognitive pathway ($CB \rightarrow CP \rightarrow CA$), the psychological pathway ($ABM \rightarrow LM \rightarrow CA$), and the technological pathway ($ABM \rightarrow CA$ reinforced by DL).

The hypothesis testing results align with these observations. Hypothesis 1 ($CB \rightarrow CP$) and Hypothesis 2 ($CP \rightarrow CA$) are accepted, indicating that the cognitive pathway of cultural belief \rightarrow cultural perception \rightarrow cultural awareness is valid. Conversely, Hypothesis 3 ($CB \rightarrow CA$) was rejected, confirming that CB does not directly shape CA without the intermediary of CP. From the media perspective, Hypothesis 4 ($ABM \rightarrow LM$) and Hypothesis 6 ($ABM \rightarrow CA$) were accepted, confirming the direct effect of media on motivation and cultural awareness. Hypothesis 5 ($LM \rightarrow CA$) was also accepted, showing the psychological mediating role of learning motivation. Mediation analysis confirmed that Hypothesis 7 ($ABM \rightarrow LM \rightarrow CA$) and Hypothesis 8 ($CB \rightarrow CP \rightarrow CA$) were significant. Meanwhile, moderation analysis shows that Hypothesis 9 ($ABM \times DL \rightarrow CA$) is accepted, while Hypothesis 10 ($LM \times DL \rightarrow CA$) is rejected, showing that digital literacy strengthens the media \rightarrow cultural awareness pathway but does not modify the motivation \rightarrow cultural awareness pathway.

The strong effect of *cultural beliefs* on cultural perceptions supports cultural value theories (Hofstede,

2001; Triandis, 2015), which assert that individuals' beliefs about norms and traditions determine how they interpret cultural experiences. This is consistent with Mahira et al. (2023) and Chen (2024), who found that cultural beliefs shape interpretations of local symbols and practices. For primary school students, strong *cultural beliefs* encourage positive interpretations of Sasak cultural artefacts, such as traditional houses, arts, and language. This reinforces the importance of embedding cultural values through local content, co-curricular activities, and experiential learning.

The significant role of cultural perceptions in fostering cultural awareness, combined with the non-significance of cultural beliefs to cultural awareness, aligns with Byram (2021), Purbaniadatika et al. (2024), Henrich et al. (2022), Onosu (2021), and Leung et al. (2021). These scholars emphasise that awareness arises not merely from belief but from perceptions shaped through cognitive–affective experiences. Similarly, Maine et al. (2019) demonstrated that cultural perceptions mediates between cultural values and awareness. Consequently, interventions that focus solely on transmitting normative values are insufficient; effective approaches must include strategies such as digital storytelling, culture-based projects, and experiential learning to cultivate positive perceptions.

The significant influence of android-based media on both learning motivations and cultural awareness corroborates Mayer's (2009) multimedia learning theory, which stresses the role of multimodal engagement in enhancing cognitive and emotional involvement. In fact, Prensky (2010), Mamina and Toistikova (2020), and Chang and Chang (2023) would also be in agreement on this point as they state that students of the digital age require the use of an engaging and interactive media for their studies. Digital tools can be used to support cultural literacy through a variety of means as per the literature. One of the ways is by digitising oral traditions (Zhou et al., 2025; Olasina, 2020) and the other is by using virtual reality in arts education (Skublewska-Paszowska et al., 2022; Chang et al., 2023). This research is supported by the present study, which not only shows the increase of motivation through the use of android-based media with local cultural content but also the direct impact of cultural awareness in primary schools.

The link between learning motivations as a mediating factor between an android-based media and cultural awareness signifies the validity of Self-Determination Theory (Deci & Ryan, 2000), which holds intrinsic motivation as the core for a successful learning process. This finding matches with Astiningsih and Partana's (2020) and Tirza et al.'s (2024) results, according to which one of the main reasons for students' motivation and engagement is the use of interactive media. When they provide an educational Android application that is visually attractive and interactive, students are motivated to not only revisit the cultural material but also to deeply explore and develop the learning they have gone through, thus, making cultural awareness their forte. The moderating effect of digital literacy (DL) on the relationship between android-based media and cultural awareness highlights the significance of digital skills in facilitating media effectiveness. Students with a higher DL level are more capable of using devices, critically evaluating the information, and interacting with the content in a responsible manner. This finding is in line with the study of Harmawati et al. (2024), who point out digital literacy as the major factor determining the successful use of media in Indonesian classrooms. The lack of moderation in the learning motivations to cultural awareness route, on the other hand, suggests that a strong motivation leads to cultural awareness irrespective of digital proficiency. To put it differently, although DL strengthens the technology pathway, it still doesn't have a significant impact on the psychological pathway. These results support previous research dealing with the influence of the culture, motivation, and media. For instance, Desyandri (2018) emphasized cultural beliefs as the basis of perception, and Maine et al. (2019) verified the mediator role of cultural perceptions. The current research extends these concepts by combining the use of android-based media and digital literacy, which are the areas that are hardly even touched in Indonesian primary schools. Thus, this research contributes empirically to the literature on multicultural education and digital literacy.

Beyond empirical results, this study offers a conceptual model that integrates cultural, psychological, and technological dimensions, an approach seldom applied in primary education contexts in Indonesia. Methodologically, the use of SEM–PLS allowed simultaneous testing of direct, mediating, and moderating effects, yielding comprehensive evidence. Practically, the findings indicate that schools can incorporate android-based media into Social Science curricula, teachers require training in digital and cultural literacy, and local governments can use culturally grounded digital media to support preservation programmes. Developers should

also design applications with user-friendly interfaces, attractive multimedia elements, and interactive features such as quizzes or creative projects to foster engagement.

Overall, the findings confirm that cultural awareness among primary school students can be enhanced through the synergy of cultural values, positive perceptions, interactive digital media, and digital literacy. The proposed model illustrates the interrelated cognitive, psychological, and technological pathways that shape cultural awareness. By integrating these dimensions, this study enriches multicultural learning theory and offers practical strategies for preserving local culture in an era of digitalisation and educational globalisation.

Conclusion

This study shows that Android-based learning media integrated with Sasak cultural content play a significant role in enhancing cultural awareness (CA) among primary school students. The path analysis demonstrates that cultural beliefs (CB) do not directly influence cultural awareness but operate through cultural perceptions (CP), which act as a full mediator. This finding highlights that cultural beliefs become effective in promoting awareness only when processed through positive perceptions. In addition, Android-based media (ABM) were found to increase learning motivation (LM) and directly contribute to cultural awareness, with learning motivation serving as an important mediating factor. The moderating role of digital literacy (DL) further strengthened the influence of Android-based media on cultural awareness, although it was not significant in the relationship between learning motivation and cultural awareness. Overall, these results are consistent with the research objective of examining the interaction between cultural values, motivational processes, and digital competencies in shaping cultural awareness among students. The findings contribute theoretically by integrating cultural, psychological, and technological dimensions into a single conceptual framework, thereby advancing the discourse on multicultural learning in the digital age. At the same time, they offer practical contributions by demonstrating the value of local wisdom-based digital media as a strategy for cultural preservation and as an instrument for increasing learning motivation in primary schools. Despite these contributions, the study has several limitations. Its cross-sectional design limits the ability to capture long-term causal relationships, and future studies are encouraged to employ experimental or longitudinal designs to examine the sustained effectiveness of digital media. Replicating the study in regions with different cultural contexts is also recommended to test the consistency and generalisability of the model. Furthermore, a more detailed measurement of digital literacy is needed, distinguishing its technical, evaluative, and ethical dimensions. Additional contextual variables, such as family support, exposure to cultural communities, and the quality of instructional materials, should also be considered, as these may significantly influence the development of cultural awareness among students. In conclusion, this research confirms that the enhancement of cultural awareness in primary education requires the synergy of cultural beliefs, perceptual processes, motivational dynamics, and digital competencies. By integrating these dimensions, the study not only enriches theoretical understanding but also provides practical guidance for embedding cultural preservation within twenty-first-century education.

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Conflicts of Interest

The author affirms that there are no conflicts of interest associated with this research. No personal, professional, or financial relationships exist that could be perceived to have influenced the research process, including the formulation of the research design, data collection and analysis, interpretation of findings, or the preparation and submission of the manuscript. The research was conducted with full academic independence, and all results are presented objectively and transparently, in accordance with the ethical principles of scientific publication.

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