

Digital Ethnopedagogy in Sociology Learning: Effects on Students' Local Cultural Awareness and Multicultural Competence

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Abstract: This study aims to analyze the effect of digital ethnopedagogy on students' local cultural awareness and multicultural competence, and to examine the role of integrating local culture and digital technology in the development of these outcomes. This study uses a quasi-experimental pretest-posttest non-equivalent control group design. The study subjects consisted of 67 grade XI students, divided into an experimental group ($n = 34$) and a control group ($n = 33$). The experimental group followed a Project-Based Learning approach integrated with digital ethnopedagogy, while the control group followed Project-Based Learning (PjBL) without digital ethnopedagogy integration. Data were collected using instruments for local cultural awareness and multicultural competency. Data analysis was carried out using Multivariate Analysis of Covariance (MANCOVA), followed by Analysis of Covariance (ANCOVA), with pretest scores as a covariate. The results of the multivariate analysis showed that digital ethnopedagogy-based learning had a significant influence on students' local cultural awareness and multicultural competence (Wilks' $\Lambda = 0.724$, $F(2, 62) = 11.836$, $p < 0.001$, partial $\eta^2 = 0.28$). Univariate analysis showed that treatment had a significant effect on local cultural awareness ($F(1, 64) = 21.656$, $p < 0.001$; $\eta^2 p = 0.23$) and multicultural ($F(1, 64) = 14.342$, $p < 0.001$, $\eta^2 p = 0.19$). Digital ethnopedagogy-based sociology learning has a positive effect on students' local cultural awareness and multicultural competence. The integration of local culture and digital technology within the framework of Project-Based Learning can serve as a contextual learning strategy to strengthen students' understanding of cultural identity and increase sensitivity to social diversity.

Keywords: digital ethnopedagogy, sociology learning, local cultural awareness, multicultural competence.

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■ INTRODUCTION

The development of globalization and digital technology in recent decades has brought significant changes to people's social lives, including in education. This transformation not only changes how individuals access information but also reshapes how they construct identities and interact within an increasingly interconnected global society (Farooq & Rehman, 2021). For the younger generation, especially students, the digital environment has become an integral part of daily life, such that the processes of learning, communication, and social participation increasingly take place within the digital

ecosystem (Tadlaoui-Brahmi et al., 2022; Alyoussef, 2023). In this context, education ideally plays a role not only in developing cognitive competence but also in shaping cultural awareness and adaptability in a multicultural society.

However, the reality on the ground shows that the rapid development of digital technology is not always accompanied by the strengthening of local cultural identity (Chanchaipitiphat et al., 2025; Tanaka, 2025). The dominance of global digital content tends to encourage cultural homogenization, where students are exposed to more global perspectives than to their own local

cultural heritage (Shah & Khan, 2023). This condition contributes to the decline of local cultural awareness, which in turn leads to low appreciation of one's own culture and an inadequate development of multicultural competence (Kurebwa, 2020). Consequently, students must balance openness to global influences with the preservation of their local cultural identity (Ozer & Kamran, 2023; Taptiani et al., 2024).

This issue becomes increasingly relevant in the context of Indonesia as a country with a very high level of ethnic, linguistic, and traditional diversity, thus positioning it as a multicultural society that requires an educational approach that is sensitive to cultural differences (Banks, 2014; Tilaar, 2004; Valbus et al., 2025). In line with these needs, the national education policy, through the implementation of the Independent Curriculum, has actually provided space for the development of more contextual, flexible, and student-centered learning, as well as emphasizing character strengthening through the Pancasila Student Profile, especially in the global diversity dimension, which aims to form inclusive and adaptive students in a diverse society (Daya et al., 2025; Delita et al., 2025; Jahidi et al., 2024). However, in practice, learning still tends to focus on cognitive understanding of diversity, while students' contextual and social reality-based learning experiences remain limited (Mariyono, 2024).

This is supported by empirical evidence indicating that the achievement of the global diversity dimension in the Rapor Pendidikan Indonesia (Kemendikdasmen, 2025) is still relatively low, as well as an increase in cases of violence in the educational environment from 285 cases in 2023 to 573 cases in 2024, with around 31% related to bullying. These findings indicate that students' ability to understand social diversity and to manage conflicts constructively remains suboptimal. In fact, local cultural awareness and multicultural competence are interrelated, with

understanding one's own culture as the basis for inclusively understanding other cultures (Chen, 2024; Genkova & Schreiber, 2025; Peña-Acuña et al., 2025).

As a discipline that examines social interactions, conflicts, integration, and cultural diversity, sociology has a strategic role in answering these challenges. Sociology learning focuses not only on mastering concepts but also on developing students' analytical skills, social awareness, and reflective attitudes (American Sociological Association). Therefore, sociological learning should help students understand social realities in context while developing cultural awareness and the ability to interact in a pluralistic society (Hammer & Itzigsohn, 2025; Hawa et al., 2019; Welsh, 2024).

However, the practice of sociology instruction in schools still has several limitations. The approach used tends to be conventional, teacher-centric, and less closely associated with students' real experiences (Afiah et al., 2025). This condition contributes to low student involvement and difficulty understanding the relationship between sociological concepts and daily life. As a result, learning becomes less meaningful and fails to encourage a deep understanding of social reality.

To overcome these limitations, a learning approach is needed that can relate the material to students' social and cultural contexts. Ethnopedagogy is a relevant approach because it treats local culture as both a source and a foundation for contextual and meaningful learning (Bakula, 2025; Chibuye & Singh, 2024; Hidayatullah et al., 2025; Sarmini et al., 2025). This approach views local culture not only as an object of learning but also as a foundation for building students' knowledge, attitudes, and skills in understanding social realities. This is based on the view that the educational process cannot be separated from the social and cultural context in which students live and develop (Rexhepi &

Bajrami, 2025; Sayfullaev, 2023). Through this approach, learning is expected to be more contextual and reflective, strengthening students' cultural identities while increasing the material's relevance to their real experiences.

Several studies show that the application of ethnopedagogy can increase student involvement, strengthen understanding of cultural values, and encourage more meaningful learning (Rustamovich, 2025; Tairova, 2025; Yan & Li, 2023). In addition, integrating local cultures into learning contributes to building cultural awareness and strengthening students' social identities, which is an important foundation for the development of multicultural competencies (Saiful Anuar et al., 2026; Schat et al., 2023; Yan & Li, 2023). These findings show that ethnopedagogy has strong potential in answering contextual and relevant learning needs.

Along with the development of digital technology, ethnopedagogical approaches need to evolve to align with the characteristics of the digital generation. Several studies show that the integration of technology in ethnopedagogy-based learning, such as the use of virtual reality, digital e-modules, and learning media based on local culture, can improve the learning experience, student involvement, and understanding of cultural values in a more in-depth manner (Mukhlis et al., 2026; Susanti & Rosa, 2026; Winara et al., 2026). These findings indicate that the use of digital technology has the potential to strengthen contextual learning while deepening students' connection to their cultural identity.

Theoretically, the integration of local culture and digital technology aligns with social constructivism, which emphasizes that knowledge is constructed through social interaction and meaningful cultural experiences (Almulla, 2023; Mohammed et al., 2020). In addition, this approach is also supported by the theory of connectivism, which views learning in the digital age as the process of building

connections between various sources of knowledge in the information network (Corbett & Spinello, 2020; Mayer, 2025; Mukhlis et al., 2024; Peter & Ogunlade, 2024). In the context of this research, the two perspectives provide a foundation for understanding how integrating local culture and digital technology can facilitate the simultaneous development of local cultural awareness and multicultural competence.

Nonetheless, most previous research still treats ethnopedagogy and digital technology as separate or only limited approaches, generally at the level of learning media use, rather than as a complete pedagogical framework. Furthermore, empirical studies that systematically examine the combined impact of digital ethnopedagogy on various sociocultural learning outcomes remain relatively limited. In particular, it remains rare for research to simultaneously analyze local cultural awareness and multicultural competence within a single, integrated analytical framework, especially in the context of sociological learning. This is important because the two competencies are essentially interrelated and develop simultaneously in social interaction, so that separate analyses can yield only a partial understanding.

Therefore, this research makes a novel contribution by integrating ethnopedagogy and digital technology into a comprehensive learning framework. In contrast to previous studies that tend to separate the two approaches, this study shows that integrating the two creates a more contextual and meaningful learning experience. In addition, this study simultaneously analyzes its influence on local cultural awareness and multicultural competence, thereby providing a more comprehensive understanding of the development of socio-cultural competencies in learning in the digital era. This study aims to test and empirically demonstrate the effectiveness of socio-cultural learning based on digital ethnopedagogy compared to conventional

approaches in terms of two student learning outcomes. To answer the literature gap that has been described, this study focuses on two main research questions:

1. How does digital ethnopedagogy-based sociology learning affect students' local cultural awareness?
2. How does digital ethnopedagogy-based sociology learning affect students' multicultural competence?

Based on the formulation of the problem, this study proposes the main hypothesis that applying sociological learning based on digital ethnopedagogy significantly increases students' awareness of local culture and multicultural competence compared with learning methods that do not integrate digital ethnopedagogy. The findings of this research are expected to contribute to the development of a more adaptive and contextual sociology learning design, as well as to offer practical solutions for teachers to integrate local wisdom into the digital learning ecosystem amid the diversity of Indonesian society.

■ **METHOD**

Participant

The population in this study is all grade XI students at SMAN 1 Reteh in the 2025/2026 school year. In phase F (class XI), there were six classes, but only two took Sociology subjects that semester. Therefore, the affordable population in this study was the two classes. The sample was not randomly selected but was based on the class structure and distribution of subjects as determined by the school before the research was conducted. Thus, the sampling technique in this study is categorized as convenience sampling. All members of the affordable population were included in the study, so no additional selection process was required.

Class XI.5 was designated as the experimental group, comprising 34 students. In

comparison, class XI.4 served as the control group with 33 students, for a total of 67 participants in this study. The group's determination was carried out without randomization at both the individual and class levels. To minimize potential selection bias due to the absence of randomization, an initial equivalence test was conducted using Welch's independent-samples t-test on pretest scores for local cultural awareness (LCA) and multicultural competence (MC). The results of the analysis showed no significant difference between the experimental and control groups for local cultural awareness ($t(62.39) = 0.38$; $p = 0.704$) and multicultural competence ($t(60.66) = -0.14$; $p = 0.892$). These findings indicate that both groups had equal initial conditions before treatment.

The use of convenience sampling in this study limits the generalizability of the results, so the findings apply only to contexts with similar characteristics. In addition, because there is no randomization, there is a possibility of selection bias and the influence of unobserved factors, such as students' initial motivation or class dynamics. Although the initial test results show that the two groups are relatively similar, the influence of these factors still needs to be considered when interpreting the results.

Research Design and Procedures

This study employed a quantitative, quasi-experimental pretest-posttest non-equivalent control group design to examine the effect of digital ethnopedagogy-based learning on students' local cultural awareness and multicultural competence in Sociology. This design was chosen because neither individual nor class randomization is possible in a formal education context, so the classes that have been formed are naturally used as research groups. In this design, both groups completed a pretest to assess baseline conditions and a posttest to measure changes following the intervention.

The research procedure began with the preparation stage, which included preparing research instruments in the form of pretest and posttest questionnaires, as well as developing learning tools for both groups, adjusted to the applicable curriculum. The instruments used were first tested for validity and reliability to ensure their feasibility for measuring the research variables. After the preparation stage was complete, both groups were given a pretest to assess students' initial abilities before the intervention was implemented.

The intervention comprised six meetings on social conflict materials, with a total time allocation of 2×45 minutes per meeting. The material taught to both groups is aligned with the same curriculum so that any differences in results can be attributed to the learning approach used. The experimental group engaged in Sociology learning based on digital ethnopedagogy, supported by interactive e-modules. The e-module contained learning materials, LKPD, assessments, and reflection activities, all integrated into a single digital learning platform. During the learning process, students identified cases of social conflict in a local context, analyzed local cultural values related to conflict resolution, collected and documented information using digital media, and developed collaborative projects based on local wisdom for conflict resolution. The project was manifested as podcasts, short videos (such as TikTok content), and infographics. In the podcast project, students conveyed cultural narratives orally and, in some cases, involved teachers who understood the

cultural context discussed as resource persons to gain a more authentic understanding of local cultural values and conflict-resolution practices in the community. In the short video project, learners creatively packaged cultural messages in a concise and contextual format. Meanwhile, through infographics, students organized complex cultural information into a systematic, easy-to-understand visual format. The learning activity ended with a presentation of project results and a critical reflection on the digital products produced by students.

Meanwhile, the control group followed Sociology learning using the standard Project-Based Learning (PjBL) model, with the same six stages and time allocation. Students in this group identified cases of social conflict based on general contexts provided by the teacher, designed conflict resolution projects according to standard learning guides, collected information from textbooks and general online sources, and presented their project results through conventional in-class presentations. Unlike the experimental group, the learning activities in the control group did not incorporate the exploration of local cultural values, practices, or wisdom as the primary source of learning, nor did they involve digital media production centered on local cultural content. Both groups thus applied the same PjBL syntax. They used digital tools in a general capacity, with the key distinction being the explicit and systematic integration of local culture as the main pedagogical foundation in the experimental group.

Table 1. Learning stages based on project-based learning syntax

Sintak PjBL	Kelompok Eksperimen (etnopedagogi digital)	Control Group (PjBL)
1. Defining Fundamental Questions	Students identify cases of social conflict within local culture and formulate questions about their resolution through a local cultural lens.	Students identify cases of social conflict based on general contexts and teacher-provided materials.
2. Designing Project	Students design collaborative projects integrating local cultural	Students design conflict-resolution projects following

Planning	values, norms, and wisdom as the primary framework for conflict resolution.	standard learning guides without any specific reference to local cultural values.
3. Creating a Schedule	Students draw up a schedule including exploration of local culture and digital media production planning centered on local cultural content.	Students prepare a project implementation schedule based on standard PjBL work steps.
4. Monitoring Project Progress	Students collect data, document findings, and develop project products using digital media focused on local cultural exploration with teacher guidance.	Students collect information from textbooks and general sources and compile project outputs using digital tools in a general capacity.
5. Testing Results	Students present their project results as videos, digital posters, or interactive media grounded in local cultural content.	Students present project results through conventional in-class presentations or standard digital formats without a local cultural focus.
6. Evaluating Experience	Students reflect on the role of local culture in building cultural awareness and multicultural competence.	Students evaluate the project process and outcomes based on general PjBL assessment criteria.

As shown in Table 1, both groups followed the same Project-Based Learning structure. However, the experimental group achieved more explicit integration of local culture and the use of digital media at each learning stage. These distinctions were designed to provide a more contextual and reflective learning experience, and are expected to increase students' awareness of local culture and multicultural competence.

Instruments of Data Collection

This study used two non-test instruments, questionnaires, to measure the research variables, namely the Local Cultural Awareness (LCA) and Multicultural Competence (MC) instruments. Both instruments are structured using a five-point Likert scale with response options ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

Local Cultural Awareness (LCA) Instrument

The Local Cultural Awareness Instrument was developed through a conceptual adaptation of the local cultural awareness evaluation model

proposed by Fan et al. (2025). The adaptation process began with the translation from English into Indonesian by bilingual experts with experience in education, particularly English-language education. To maintain equality of meaning and conformity of constructs, the translation results were reviewed through discussions between translators and researchers, particularly regarding terms related to local cultural values and students' socio-cultural experiences in Indonesia.

Before the empirical test was carried out, the instrument underwent content validation through expert judgment by two experts in Sociology and multicultural education. The evaluation process focuses on the suitability of the items for the theoretical construct, the relevance to the Indonesian cultural context, language clarity, and readability for secondary school students. In addition, readability tests and limited cognitive reviews were conducted with several students to identify potential ambiguities and ensure that each item was understood as

intended. Based on input from experts and students, several items in the statement were revised to improve editorial clarity and context before it was deemed worthy of empirical testing.

This instrument consists of 30 statements covering three main dimensions: cognitive, affective, and behavioral. The cognitive dimension measured a student's understanding of the history,

values, norms, and practices of local cultures. The affective dimension measured students' emotional attitudes towards local culture, such as pride, attachment, and appreciation for regional cultural traditions. Meanwhile, the behavioral dimension measured students' tendency to apply local cultural values in daily social life. The distribution of items across dimensions and sub-indicators is presented in Table 2.

Table 2. Blueprint of the local cultural awareness instrument

Indicator	Sub-Indicator	No. of Items	Item Numbers
Cognitive (<i>Local Cognition and Understanding</i>)	Local History	2	1, 2
	Daily Life Experience	3	3, 4, 5
	Local Ethical and Legal Systems	2	6, 7
	Local Cultural Practices, Art, and Literature	3	8, 9, 10
Affective (<i>Local Affective Attitudes</i>)	Cultural Pride	3	11, 12, 13
	Emotional Attachment to Local Culture	2	14, 15
	Motivation to Express and Communicate Local Identity	2	16, 17
	Critical Openness in Cross-Cultural Engagement	3	18, 19, 20
Behavioral (<i>Local Expression and Application</i>)	Adaptation to Local Norms	5	21, 22, 23, 24, 25
	Promotion and Preservation of Local Image	6	26, 27, 28, 29, 30
Total		30	

The cognitive dimension captured students' knowledge of local history, cultural practices, ethical systems, and their social meanings. The affective dimension reflected emotional bonds to local culture, including pride, identity attachment, and openness toward cross-cultural interaction. The behavioral dimension assessed the extent to which students actively apply and promote local cultural values in daily social life. Sample items from each dimension include:

1. Cognitive: I understand that local cultural values influence how people behave and interact in society.
2. Affective: I feel that local culture is part of my identity.

3. Behavioral: I am willing to be involved in local cultural preservation efforts in my community.

Multicultural Competence (MC) Instrument

The Multicultural Competence (MC) variable was measured using a non-test instrument, a questionnaire adapted from the Pyramid Model of Intercultural Competence developed by Deardorff (2006). The instrument adaptation process followed the same cross-cultural adaptation procedure as the LCA instrument, beginning with translation by bilingual experts and continuing with expert review to ensure construct equivalence, relevance to the Indonesian cultural context, and language clarity.

In addition, readability tests and limited cognitive reviews were conducted with students to ensure that each statement could be understood in the intended sense before the instrument was empirically tested.

The MC instrument consisted of 30 statements covering three main dimensions: attitudes, knowledge and comprehension, and skills. The distribution of items across dimensions and sub-indicators is presented in Table 3.

Table 3. Blueprint of the multicultural competence instrument

Indicator	Sub-Indicator	No. of Items	Item Numbers
Attitudes (Requisite Attitudes)	Respect	3	1, 2, 3
	Openness	3	4, 5, 6
	Empathy (Internal Outcome)	1	7
	Curiosity & Discovery	3	8, 9, 10
Knowledge & Comprehension	Cultural Self-Awareness	2	11, 12
	Deep Cultural Knowledge	2	13, 14
	Understanding Others' Worldviews	2	15, 16
	Culture-Specific Information	2	17, 18
	Sociolinguistic Awareness	2	19, 20
Skills	Listen	2	21, 22
	Observe	2	23, 24
	Interpret	2	25, 26
	Analyze	1	27
	Evaluate	1	28
	Relate	2	29, 30
Total		30	

The attitudes dimension reflected students' internal orientations toward cultural difference, including respect, openness, empathy, and curiosity. The knowledge and comprehension dimension captured students' understanding of their own cultural background, other cultures' worldviews, and sociolinguistic differences. The skills dimension assessed students' practical abilities to listen, observe, interpret, analyze, evaluate, and relate across cultural contexts, representing external behavioral outcomes of multicultural competence. Sample items from each dimension included: (1) Attitudes: I am willing to learn from experiences of interacting with different cultures; (2) Knowledge: I understand that behavioral differences often stem from differences in cultural values; (3) Skills: I try to understand the reason behind a friend's behavior before making a negative judgment.

Construct Validity (Item Analysis).

Following expert validation, the two instruments were first tested for validity and reliability through a trial involving 55 respondents. The validity test was carried out using corrected item-total correlation analysis. An item is declared valid if it has a correlation value above the recommended minimum limit ($r > 0.30$). The results of the analysis showed that all items in the Local Cultural Awareness instrument had corrected item-total correlations (r_{drop}) ranging from 0.306 to 0.663. In contrast, in the Multicultural Competency instrument, r_{drop} ranged from 0.363 to 0.794. Thus, all items on both instruments were declared valid and suitable for use in the research.

Reliability Analysis.

The instrument's reliability was measured using Cronbach's alpha to assess internal

consistency. The results of the analysis showed that the Local Cultural Awareness instrument had Cronbach's alpha values of 0.813 for the cognitive dimension, 0.771 for the affective dimension, and 0.854 for the behavioral dimension. Meanwhile, the Multicultural Competency instrument had Cronbach's alpha values of 0.799 for the attitude dimension, 0.859 for the knowledge dimension, and 0.857 for the skill dimension. All of these values exceeded the $\alpha > 0.70$ threshold, indicating that the instrument has good internal consistency and is reliable for use in the study.

Factor Analysis

To test the construct structure, an Exploratory Factor Analysis (EFA) was conducted using a varimax rotation. The results of the feasibility test showed that the Kaiser-Meyer-Olkin (KMO) values were 0.71 for the Local Cultural Awareness variable and 0.76 for Multicultural Competence, both above the minimum limit of 0.50. In addition, the results of Bartlett's Test of Sphericity showed a significance value of < 0.05 , indicating that the data are suitable for factor analysis.

The results of the factor analysis showed that the items in both instruments generally grouped into three main factors that were in accordance with the study's conceptual framework. In the Local Cultural Awareness variable, the factors formed represented the cognitive, affective, and behavioral dimensions. Meanwhile, in the Multicultural Competency variable, the factors formed reflected the dimensions of attitudes, knowledge, and skills. The factor loadings indicated that the items contributed adequately to the factors, supporting the validity of the instrument's constructs.

Data analysis technique

Data analysis was conducted using R (version 4.4.1) within RStudio. In the initial stage, descriptive statistical analysis was conducted to obtain the mean and standard deviation of pretest

and posttest scores for the variables of Local Cultural Awareness and Multicultural Competency in the experimental and control groups.

Before testing the hypothesis, an analytical prerequisite test was conducted to ensure that the MANCOVA assumptions were met. The tests included a residual normality test, a variance homogeneity test using Levene's Test, a covariance matrix homogeneity test using Box's M Test, and a homogeneity of regression slopes test to ensure that the relationship between covariates and dependent variables is consistent across groups. Hypothesis testing was carried out using Multivariate Analysis of Covariance (MANCOVA) because this study involved two dependent variables that were analyzed simultaneously and controlled for differences in initial ability through covariates. The local cultural awareness and multicultural competence posttest scores were treated as dependent variables, while the pretest scores of each variable were included as covariates.

The multivariate test was performed using Wilks' Lambda statistics to assess the effect of simultaneous treatment on both dependent variables. Follow-up analysis was conducted using univariate ANCOVA to assess the contribution of each dependent variable to differences between groups. The magnitude of the treatment effect was reported using partial eta squared (ζ^2p), with interpretation based on Cohen's criteria (0.01 = small; 0.06 = medium; 0.14 = large). All tests were conducted at a significance level of 0.05.

■ RESULT AND DISCUSSION

Descriptive Statistics of Local Cultural Awareness and Multicultural Competence Scores

Descriptive statistics were used to provide an overview of students' scores of local cultural awareness and multicultural competence in the experimental and control groups before and after the learning treatment.

Table 4. Descriptive statistics of local cultural awareness and multicultural competence

Variabel	Groups	N	Pretest Mean	Pretest SD	Posttest Mean	Posttest SD
Local Cultural Awareness	Experimental	34	100.00	18.10	118.00	13.30
	Control	33	102.00	14.30	108.00	9.16
Multicultural Competence	Experimental	34	106.00	15.20	120.00	13.90
	Control	33	105.00	19.40	109.00	10.40

Based on Table 4, both groups showed increases in scores from pretest to posttest for local cultural awareness and multicultural competence. However, the improvement in the experimental group appeared to be greater than in the control group. On the local cultural awareness variable, the experimental group scored higher than the control group. A similar pattern was observed in multicultural

competence, where the experimental group showed a greater increase in scores following the learning treatment.

These descriptive findings provide a preliminary overview of the difference in score improvement between the two groups. Therefore, further inferential analysis is performed to test whether the difference is statistically significant.

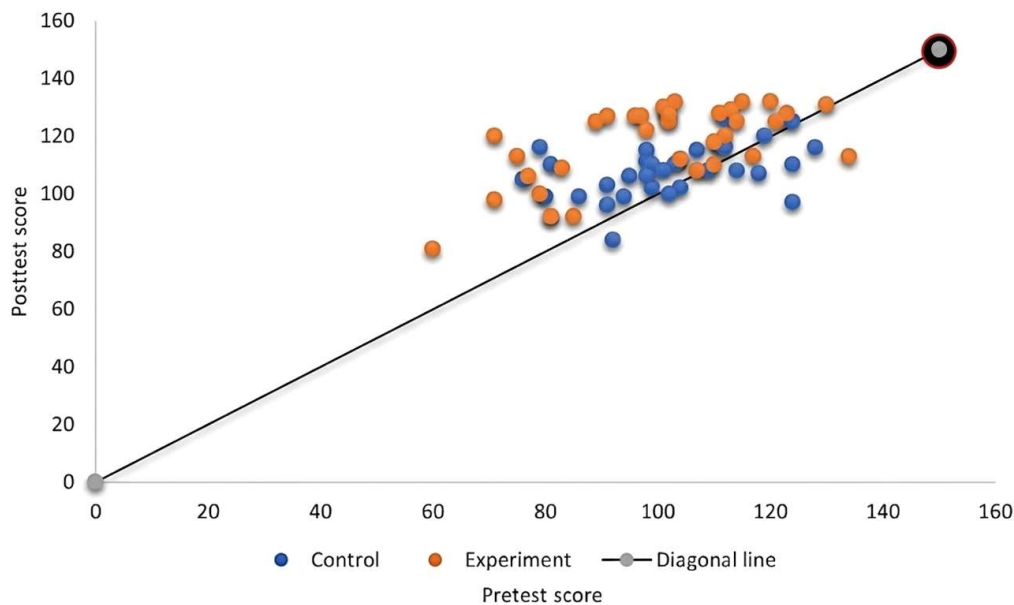
**Figure 1.** Scatter plot pretest-posttest local cultural awareness

Figure 1 presents the scatter plots of pretest and posttest scores for local cultural awareness in the experimental and control groups. Each point represents one student, with pretest scores displayed on the horizontal axis and posttest scores on the vertical axis. In general, the distributions of students' pretest scores in both groups were within a similar range, suggesting that

both groups had comparable initial conditions before the learning intervention was administered.

After the learning process, the experimental group (orange dots) tended to show higher posttest scores than the control group (blue dots). This pattern is evident in more points in the experimental group being above the diagonal line and concentrated in the upper area of the graph.

In contrast, the dots in the control group were spread out in the central area and were closer to the diagonal line. This visual pattern showed that

students in the experimental group generally experienced a greater increase in local cultural awareness scores than students in the control group.

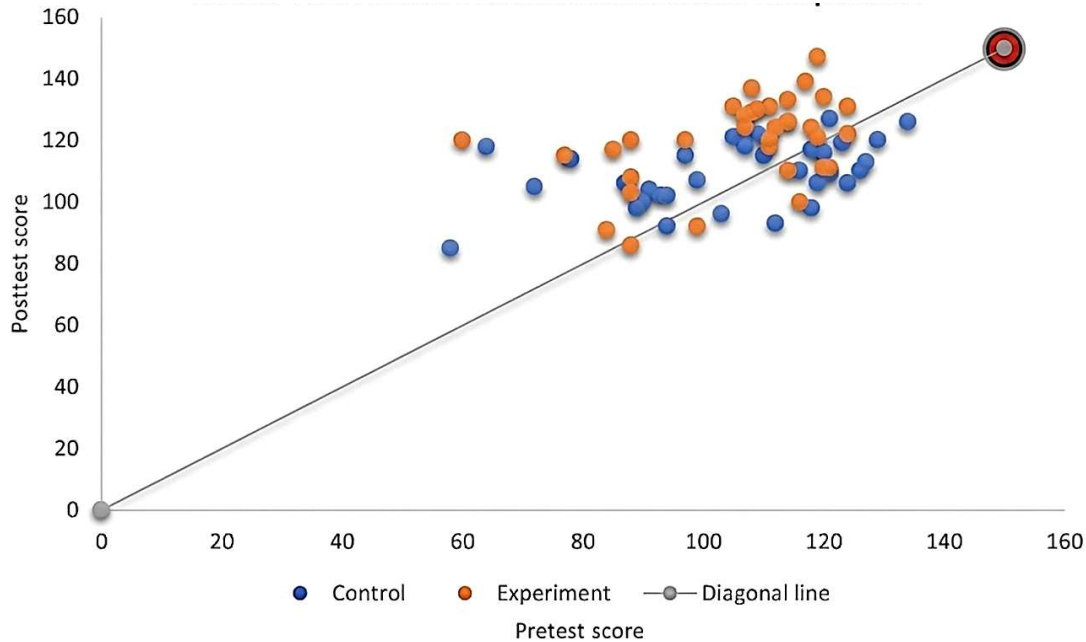


Figure 2. Scatter plot pretest-posttest multicultural competence

Figure 2 presents a scatter plot of pretest and posttest scores on the multicultural competency variable. Similar to the pattern observed for the local cultural awareness variable, the distribution of pretest scores in both groups appeared to fall within a similar range along the horizontal axis, suggesting that both groups had comparable initial conditions before treatment was administered.

After the learning process was completed, a similar pattern was observed for this variable: the data points of the experimental group (orange) tended to be higher on the posttest axis than those of the control group (blue) within the same pretest score range. In addition, more points in the experimental group were above the diagonal line than in the control group. The visual pattern showed that students in the experimental group generally experienced a greater increase in multicultural competence than students in the control group. These findings reinforce the initial

picture that digital ethnopedagogy-based learning is associated with higher improvements in both variables studied.

Pretest Equivalence Test

Before further analysis, a pretest equivalence test was conducted to ensure that there were no significant differences in initial ability between the experimental and control groups for the two study variables. This test was conducted using an independent samples t-test on local cultural awareness pretest scores and multicultural competence.

As shown in Table 5, the analysis revealed no significant difference between the experimental and control groups on the local cultural awareness variable, $t(62.39) = 0.38, p = 0.704$. Similar results were also found for the multicultural competence variable, with no significant difference between the two groups, $t(60.66) = -0.14, p = 0.892$.

Table 5. Results of the initial equivalence test (pretest) between the experimental and control groups

Variabel	Groups	Mean	SD	t	df	p
Local Cultural Awareness	Eksperimen	100.12	18.10	0.38	62.39	0.704
	Control	101.64	14.30			
Multicultural Competence	Eksperimen	105.79	15.20	-0.14	60.66	0.892
	Control	105.21	19.40			

These results confirm that both groups had comparable baseline conditions before the implementation of the learning treatment. Thus, both groups can be considered to have baseline equivalence, allowing further analysis to focus on the effect of the learning treatment on changes in scores for both research variables.

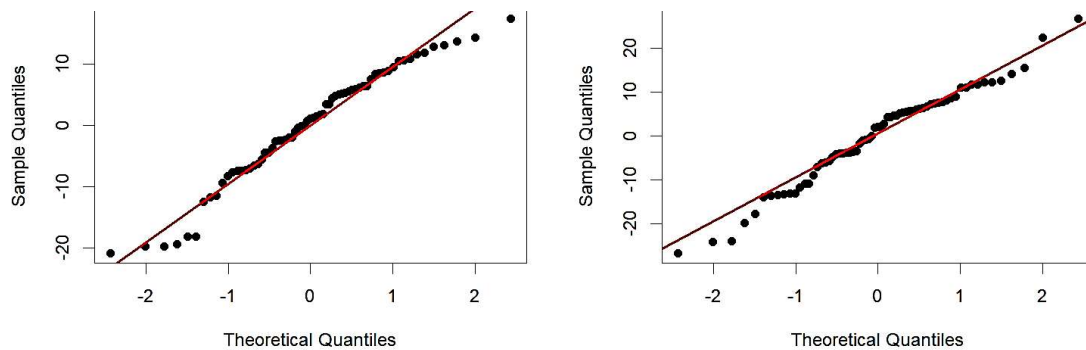
Statistical Assumption Testing

Before conducting the multivariate analysis of covariance (MANCOVA), several statistical assumptions were tested to ensure the data met the prerequisites for MANCOVA. Assumption testing includes residual normality, homogeneity of variance, homogeneity of the covariance matrix, and homogeneity of regression slopes. All

tests were carried out at a significance level of $\alpha = 0.05$.

Residual normality was assessed for each dependent variable in the residual regression model using the Shapiro-Wilk test. The test results showed that the residual model was well-fitted to the local cultural awareness variable ($W = 0.964$; $p = 0.052$) and multicultural competence ($W = 0.976$; $p = 0.231$). A visualization of the residual distribution is shown in Figure 3, which shows that the residual points follow a diagonal line pattern, thus supporting the fulfillment of the normality assumption.

The homogeneity of variance between groups was tested using Levene's test. The results showed that the variance between groups was

**Figure 3.** Normal Q-Q plot of residuals

homogeneous for both the local cultural awareness variable ($F(1, 65) = 2.714$; $p = 0.104$) and the multicultural competence variable ($F(1, 65) = 0.891$; $p = 0.349$), indicating that the homogeneity of variance assumption was satisfied for both dependent variables.

The homogeneity test for the covariance matrix was conducted using Box's M test. The

results of the analysis showed that $\lambda^2 = 5.265$, $df = 3$, $p = 0.153$, indicating that the covariance matrix across groups is homogeneous.

Furthermore, the assumption of homogeneity of regression slopes was tested through the interaction between covariate variables (pretest scores) and group factors. The results of the analysis showed that the interaction

of the local cultural awareness Pretest Group \times was not significant ($F = 1.029$; $p = 0.314$), as well as the interaction of the \times multicultural competence Pretest Group ($F = 0.754$; $p =$

0.388). A visualization of the relationship between covariates and dependent variables is shown in Figure 4, illustrating the slope of the regression line for each group relative to a parallel line.

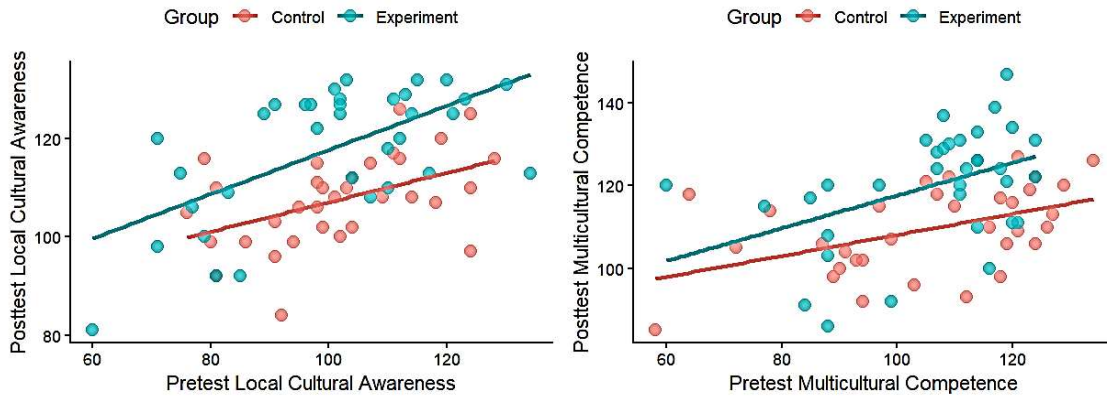


Figure 4. Scatterplot of covariate and dependent variables

A summary of the assumption testing results is presented in Table 6.

In addition, Pearson correlation analysis was conducted to identify relationships among

the dependent variables in this study. The results of the analysis showed a significant relationship between local cultural awareness and multicultural competence ($r = 0.663$; $p < 0.001$). The

Table 6. MANCOVA assumption test results

Assumptions	Statistics	p-value	Verdict
Residual normality (LCA)	W = 0.964	0.052	Normal
Residual normality (MC)	W = 0.976	0.231	Normal
Homogenitas varians (LCA)	F = 2.714	0.104	Homogeneous
Homogenitas varians (MC)	F = 0.891	0.349	Homogeneous
Homogenitas matriks kovarians	$\chi^2 = 5.265$; df = 3	0.153	Homogeneous
Homogeneity of regression slopes (LCA)	F = 1.029	0.314	Fulfilled
Homogeneity of regression slopes (MC)	F = 0.754	0.388	Fulfilled

correlation values in the medium-to-strong category indicate that the two variables are sufficiently correlated to be analyzed simultaneously using a multivariate approach.

The visualization shows a positive relationship between local cultural awareness and multicultural competence. The distribution of data points shows a tendency that students with higher levels of local cultural awareness tend to have higher multicultural competence scores. The pattern of point distribution, with an increasing trend, indicates a positive linear relationship

between the two variables. These findings suggest that local cultural awareness and multicultural competence tend to develop simultaneously and are positively associated with one another, such that students who demonstrate stronger local cultural awareness also tend to exhibit higher multicultural competence.

Results of Multivariate Analysis (MANCOVA)

After all the assumptions of the analysis were met, a Multivariate Analysis of Covariance

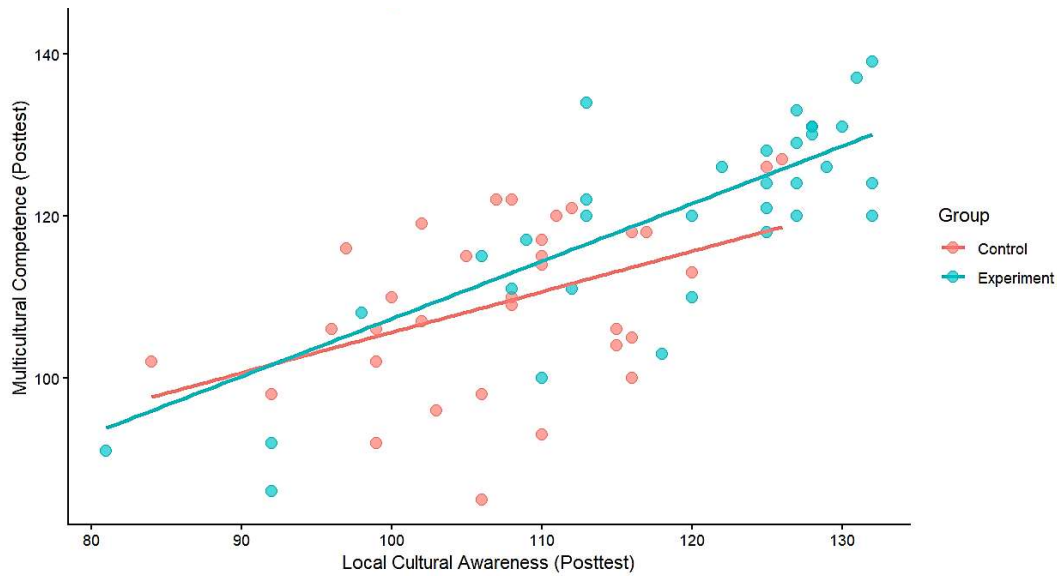


Figure 5. Scatterplot LCA vs MC

(MANCOVA) was conducted to test the influence of digital ethnopedagogy-based learning on two dependent variables, namely Local Cultural Awareness and Multicultural Competency, with the initial score (pretest) as a covariate.

The results of the multivariate test using Wilks' Λ showed that the group factor had a significant influence on the combination of the two dependent variables after controlling for the pretest score, Wilks' $\Lambda = 0.724$, $F(2, 62) = 11.836$, $p < 0.001$, with a large effect size ($\eta^2p = 0.28$). These results show that digital

ethnopedagogy-based learning has a significant effect on both local cultural awareness and students' multicultural competence.

In addition, the covariate, the Local Cultural Awareness pretest score, showed a significant multivariate influence on both dependent variables, Wilks' $\Lambda = 0.697$, $F(2, 62) = 13.451$, $p < 0.001$, with a large effect size ($\eta^2p = 0.30$). The covariate, the Multicultural Competency pretest score, also showed a significant influence, Wilks' $\Lambda = 0.847$, $F(2, 62) = 5.605$, $p = 0.006$, with a moderate effect size ($\eta^2p = 0.15$).

Table 7. MANCOVA test results using wilks' lambda

Source	Wilks' Λ	F	df (Hyp)	df (Error)	Sig. (p)
Groups	0.724	11.836	2	62	< 0.001
Local Cultural Awareness Pretest	0.697	13.451	2	62	< 0.001
Multicultural Competency Pretest	0.847	5.605	2	62	0.006

As shown in Table 7, the group factors show a significant multivariate influence on the combination of Local Cultural Awareness and Multicultural Competency variables. In addition, the two covariates, namely the Local Cultural

Awareness pretest score and the Multicultural Competency pretest score, also make a significant contribution in explaining the variation in dependent variables. Based on the results of the multivariate analysis, the next analysis was carried

out to identify the effect of treatment on each dependent variable separately through the Analysis of Covariance (ANCOVA) test.

Univariate Analysis (ANCOVA) of Local Cultural Awareness

To identify the effect of treatment on each dependent variable separately, an analysis of covariance (ANCOVA) was conducted with the pretest score as a covariate. This analysis aims to determine whether posttest scores differ between the experimental and control groups after controlling for students' initial ability.

The results of the analysis showed that in the Local Cultural Awareness variable, group factors had a significant influence on posttest scores after controlling for pretest scores, $F(1.64) = 21.656, p < 0.001$, with a relatively large effect size ($\eta^2p = 0.23$). The covariate of the local cultural awareness pretest score also showed a significant influence on the posttest score, $F(1.64) = 30.034, p < 0.001$, with a large effect size ($\eta^2p = 0.32$), as presented in Table 8.

Estimated marginal means analysis further showed that the experimental group had an adjusted mean value of 118 (SE = 1.63), while

Table 8. ANCOVA analysis results

Variabel	Source	F	df	p	η^2p
Local Cultural Awareness	Groups	21.656	1. 64	< 0.001	0.23
	Pretest	30.034	1. 64	< 0.001	0.32

the control group was 107 (SE = 1.66). Pairwise comparison results confirmed that the experimental group had a significantly higher adjusted mean than the control group, with a mean difference of 10.80 points (SE = 2.32; $p < 0.001$). The 95% confidence interval ranged from 6.17 to 15.43, indicating that the difference consistently favored the experimental group.

To provide a more detailed picture of changes across the cognitive, affective, and behavioral dimensions of local cultural awareness, Figure 6 presents a radar chart comparing pretest and posttest scores between the control and experimental groups.

Based on Figure 6, the increase in the experimental group was more pronounced than

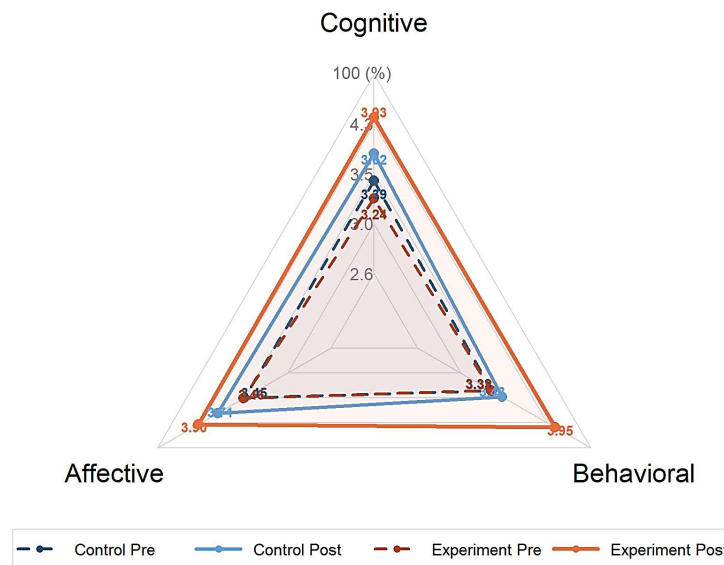


Figure 6. Radar chart of pretest-posttest changes across LCA dimensions

in the control group across all dimensions of local cultural awareness. The behavioral dimension showed the greatest improvement, followed by the cognitive and affective dimensions. Meanwhile, the control group showed only relatively small improvements across each dimension. These findings support the first hypothesis of the study, confirming that digital ethnopedagogy-based sociology learning has a significant positive influence on students' local cultural awareness.

Univariate Analysis (ANCOVA) of Multicultural Competence

To test the second hypothesis, that digital ethnopedagogy-based sociology learning has a

positive influence on students' multicultural competence, an Analysis of Covariance (ANCOVA) was conducted after controlling for pretest scores as a covariate.

In the Multicultural Competency variable, ANCOVA results showed that group factors also had a significant influence on posttest scores after controlling for pretest scores, $F(1, 64) = 14.342$, $p < .001$, with a large effect size ($\eta^2p = 0.19$). The multicultural competence pretest covariate also demonstrated a significant influence on posttest scores, $F(1, 64) = 15.174$, $p < .001$, with a large effect size ($\eta^2p = 0.19$), as presented in Table 9.

Estimated marginal means analysis further showed that the experimental group had an

Table 9. ANCOVA Analysis Results

Variabel	Source	F	df	p	η^2p
Multicultural Competence	Groups	14.342	1. 64	<0.001	0.19
	Pretest	15.174	1. 64	<0.001	0.19

adjusted mean of 119.88 (SE = 1.92), while the control group had an adjusted mean of 109.55 (SE = 1.94). Pairwise comparison results confirmed that the experimental group had a significantly higher adjusted mean than the control group, with a mean difference of 10.34 points (SE = 2.73; $p < .001$). The 95% confidence interval for this difference ranged from 4.83 to

15.80, indicating that the difference consistently favored the experimental group.

To provide a more detailed picture of changes in each dimension of multicultural competence, Figure 8 presents a radar chart comparing pretest and posttest scores on the attitude, knowledge, and skills dimensions between the control and experimental groups.

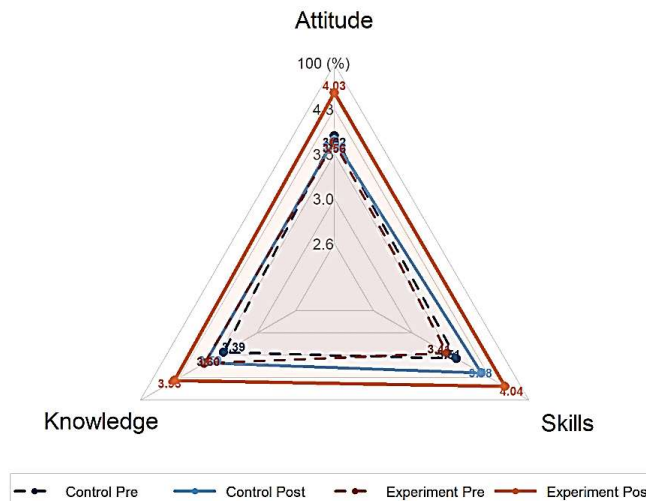


Figure 7. Radar chart of pretest-posttest changes across MC dimensions

Based on Figure 7, the experimental group showed a more pronounced improvement than the control group across all dimensions of multicultural competence. The largest improvement was observed in the skills dimension, followed by the attitude and knowledge dimensions. Meanwhile, the control group showed only relatively small changes in pretest-to-posttest scores across each dimension. These findings further support the study's second hypothesis, confirming that digital ethnopedagogy-based sociology learning has a significant positive influence on students' multicultural competence.

The Influence of Digital Ethnopedagogy-Based Sociology Learning on Students' Local Cultural Awareness

The results of this study show that sociology learning based on digital ethnopedagogy has a positive and significant effect on students' local cultural awareness. ANCOVA analysis showed significant differences between groups after controlling for pretest scores, $F(1, 64) = 21.656$, $p < .001$, with a large effect size ($\eta^2p = 0.23$). The experimental group had an adjusted marginal mean of 118.09 (SE = 1.63), compared with the control group at 107.27 (SE = 1.66), with an adjusted mean difference of 10.82 points (SE = 2.32; 95% CI [6.17, 15.43]; $p < .001$). These findings confirm the study's first hypothesis and show that digital ethnopedagogical approaches make a meaningful contribution to the development of students' local cultural awareness.

The magnitude of the influence obtained on this variable is likely related to the character of local cultural awareness, which is closely connected to students' daily social and cultural experiences. Learning that departs from a familiar cultural context tends to make cultural values easier to understand, interpret, and internalize than abstract concepts that are far from students' life experiences. When students connect sociological

concepts with the cultural realities they encounter in their daily lives, the learning process becomes more contextual and meaningful. This condition enables students not only to understand culture cognitively, but also to develop a more reflective awareness of their cultural identity. (Kamila et al., 2024; Rahmawati et al., 2020a; Sugiarto et al., 2025)

The integration of digital technology into learning also makes the learning process more participatory and reflective. Through interactive e-modules that contain audio, images, videos, comics, LKPD, and assessments, cultural materials become more interesting and accessible to students. More than just receiving information, learners are also actively involved in producing cultural knowledge through collaborative digital projects such as podcasts, short videos, and infographics. These activities encourage students to interpret cultural values, communicate cultural meanings, and connect local cultural perspectives with various contemporary social issues.

The quantitative findings are also strengthened by the results of observations and digital products produced by students during the learning process. In some podcast projects, students involve teachers from other subjects as resource persons with specific cultural backgrounds to gain a more authentic understanding of how local communities resolve conflicts in ways shaped by prevailing cultural values. Through the interview process, students not only gain theoretical knowledge of culture but also understand how local cultural values are applied in daily social life. Meanwhile, in short videos and infographics, students demonstrate the ability to creatively interpret cultural values by connecting them to various contemporary social conflicts, such as differences of opinion between friends, conflicts between groups, and the influence of social media on adolescent social relationships. The results of the observation also show that students become more active in

discussing, expressing opinions, and considering various cultural perspectives in the problem-solving process. This shows that learners not only understand local culture cognitively but also can reflect on, communicate, and internalize cultural values as part of real-life social practices.

From a theoretical perspective, these findings align with social constructivism, which posits that knowledge construction becomes more meaningful when rooted in real cultural experiences (Almulla, 2023; Milutinoviæ, 2011; Mohammed et al., 2020). In this study, the exploration of local culture combined with collaborative digital projects allows students to build cultural understanding in a more contextual and reflective manner. Students not only passively receive cultural information but also reflect on and interpret cultural values through discussion, observation, and the production of digital content. In addition, from a connectivity perspective, the use of digital media allows learners to integrate various cultural representations from the social environment and digital sources into a more integrated understanding (Corbett & Spinello, 2020).

Empirically, this study's findings reinforce previous research showing that integrating local culture into learning can improve students' cultural understanding and awareness. Ramírez et al. (2023), for example, found that learning that integrates the local cultural context is more meaningful and relevant than a foreign-culture-oriented approach, thereby increasing students' local cultural awareness. Similar findings were also conveyed by Toleubekova et al. (2022), who showed that ethnopedagogy-based learning is effective in increasing positive attitudes towards local cultural values. In addition, Erfan et al. (2025) found that ethnopedagogy-based e-learning can increase student engagement and understanding through a more interactive, contextual learning experience.

However, compared to previous studies, this study expands the implementation of

ethnopedagogy by integrating digital culture production into the learning process. Learners are not only involved in understanding cultural content but also in producing educational content, such as podcasts, short videos, and infographics, to analyze the resolution of social conflicts based on local cultural values. The participatory process allows learners to actively interpret, communicate, and reflect on cultural meanings in a more tangible social context. Thus, the integration of collaborative digital culture projects expands ethnopedagogical practices not only in cultural understanding but also in the development of more reflective, participatory, and contextual cultural awareness.

The Influence of Digital Ethnopedagogy-Based Sociology Learning on Students' Multicultural Competencies

The results of this study also show that sociology learning based on digital ethnopedagogy has a positive and significant effect on students' multicultural competence. ANCOVA analysis showed significant differences between groups after controlling for pretest scores, $F(1, 64) = 14.342$, $p < .001$, with a large effect size ($\eta^2p = 0.19$). The experimental group had an adjusted marginal mean of 119.88 (SE = 1.92), compared with the control group's 109.55 (SE = 1.94), with an adjusted mean difference of 10.34 points (SE = 2.73; 95% CI [4.88, 15.80]; $p < .001$). These findings confirm the hypothesis of both studies and show that the treatment provided resulted in a practically meaningful improvement in students' multicultural competence.

However, the effect size on multicultural competence ($\eta^2p = 0.19$) was slightly smaller than that of local cultural awareness ($\eta^2p = 0.23$). This difference reflects the complexity of higher-order multicultural competency constructs, which encompass attitudes, knowledge, and behavioral skills that require longer, more diverse exposure to develop meaningfully (Deardorff, 2006).

Changes in attitudes and behavioral skills, in particular, require a longer developmental span than increased cognitive awareness of local cultures, so a single intervention period may not be sufficient to produce the full effect on these constructs. In addition, it is possible that self-report instruments used to measure multicultural competencies are less sensitive to detecting changes in attitudes and behaviors over a relatively short intervention period, which can moderately weaken the observed effects.

These quantitative findings are also supported by observations made during the learning process. In group discussion activities and project-based cultural exploration, learners show greater openness to differences of opinion and cultural perspectives. Students from different social and cultural backgrounds were observed to be more active in exchanging ideas, discussing social conflicts, and formulating solutions grounded in local cultural values. In several group discussions, students seemed to consider different points of view before drawing conclusions, especially when discussing social conflicts related to adolescents' values, social identities, and interactions in digital media. These interactions show that the learning process not only encourages a cognitive understanding of multicultural concepts, but also develops social communication skills, empathy, and the ability to understand other people's perspectives which are important parts of multicultural competence.

Furthermore, these findings deepen understanding of the zone of proximal development (ZPD), particularly in digitally mediated learning. In this study, the mechanism by which digital ethnopedagogy improves multicultural competence can be explained through Vygotsky's concept of the ZPD. The scaffolding process does not originate solely from the teacher but also emerges through interactions among students and through collaborative activities based on cultural exploration, supported by digital technology (Margolis, 2020; Xi & Lantolf,

2021). When students work together to analyze social conflicts within local cultures, those with a better understanding can help their friends grasp the meaning of culture and devise solutions grounded in local wisdom. Through this process, students can achieve a deeper understanding than they would if they studied on their own. Thus, learning becomes an active and dynamic social process in which knowledge is built through interaction, collaboration, and technology. This process strongly supports the development of multicultural competencies that are complex and multifaceted.

Empirically, this study's findings also reinforce previous research showing that ethnopedagogy can increase student engagement, strengthen cultural understanding, and encourage more meaningful learning (Rustamovich, 2025; Tairova, 2025; Yan & Li, 2023). Previous research has also shown that integrating local culture into learning contributes to the development of cultural awareness and social identity, which are important bases for the formation of multicultural competencies (Saiful Anuar et al., 2026; Schat et al., 2023). However, compared to previous research, this study shows that integrating digital ethnopedagogy into Sociology learning not only strengthens students' cultural understanding but also encourages openness to diverse perspectives, dialogue skills, and social reflection during collaborative conflict resolution. Thus, digital ethnopedagogical learning not only contributes to cultural understanding but also to the development of multicultural competencies that are more reflective, participatory, and socially interactive.

The Simultaneous Influence of Digital Ethnopedagogy-Based Sociology Learning on Local Cultural Awareness and Multicultural Competence

In addition to examining the influence on each variable, this study also examines whether sociological learning based on digital

ethnopedagogy can simultaneously affect local cultural awareness and multicultural competence. The results of the analysis show that this learning has a significant influence on both variables simultaneously ($p < 0.001$), with a relatively large effect size ($\eta^2p = 0.28$). This means that the applied learning not only affects one aspect but also improves both at the same time.

In addition, the results of the correlation analysis showed a fairly strong positive relationship between local cultural awareness and multicultural competence ($r = 0.663$; $p < 0.001$). These findings suggest that the two constructs are interrelated and do not develop separately. Students who have a better understanding and awareness of their local cultural values also tend to show greater openness to cultural differences, stronger social empathy, and a more reflective understanding of others' perspectives. These findings indicate that strengthening local cultural identities can be an important foundation for the development of broader multicultural competencies. By understanding and reflecting on their cultural values, learners become better prepared to appreciate, accept, and interact with individuals from different cultural backgrounds (Chen, 2024; Genkova & Schreiber, 2025; Peña-Acuña et al., 2025)

Previous research has generally addressed local cultural awareness and multicultural competencies separately, both focusing on engagement and cultural awareness (Rahmawati et al., 2020; Sugiarto et al., 2025) as well as on the development of multicultural values and competencies (Hidayat et al., 2023; Musayev, 2024; Sihite et al., 2022). In contrast to these studies, this study shows that both constructs can develop simultaneously within a single collaborative learning process grounded in digital ethnopedagogy. In this context, digital ethnopedagogy serves not only as a culture-based learning approach but also as a bridge that connects local cultural experiences with broader

multicultural understanding. Through learning activities, learners are not only encouraged to recognize and reflect on their own local cultural values, but also to communicate, discuss, and apply those values in more multicultural social interactions.

Overall, the results of this study have important implications, both theoretically and practically. From a theoretical perspective, this study shows that digital ethnopedagogy is not merely a learning method but an integrated approach that combines local culture, social interaction, and digital technology into a single learning process. From a practical perspective, these findings show that sociology learning should be designed more contextually by associating the material with students' local cultural experiences. In addition, digital technology needs to be used not only as a tool to convey material, but as a means for students to build their own knowledge. The active involvement of students in exploring, presenting, and reflecting on social realities through digital media has been shown to make learning more meaningful and relevant to their lives.

However, the results of this study need to be understood in the context of the school where the research was conducted. School environments that support collaborative learning, digital media use, and diverse backgrounds may also influence the research results. Although this research was conducted in one school, digital ethnopedagogy-based learning can still be applied in other schools, as it can be adapted to the local cultural characteristics of each region. In addition, this study still has limitations in the design of quasi-experiments without randomization, limited sample sizes, and the use of questionnaires, which can introduce subjectivity bias. Therefore, further research is recommended to include a wider sample, employ a more robust experimental design, and combine quantitative and qualitative approaches to yield more comprehensive results.

■ CONCLUSION

This research shows that integrating digital ethnopedagogy into sociology learning has a significant positive influence on students' local cultural awareness and multicultural competence. By combining local cultural exploration with project-based activities supported by digital technology, learning becomes more contextual, interactive, and meaningful, allowing students to connect sociological concepts to the social realities they experience. The multivariate analysis results (Wilks' $\Lambda = 0,737$; $F = 11,063$; $p < 0.001$; $\eta^2 p = 0.26$) confirm that this integrated learning approach makes a substantial contribution to the simultaneous development of both competencies. Furthermore, the study's findings reveal that local cultural awareness serves as a foundation for developing multicultural competencies, indicating that strengthening students' local cultural identities can support the formation of broader, more inclusive cross-cultural understanding.

In addition to the empirical findings, this research offers a theoretical contribution by demonstrating that digital ethnopedagogy-based sociology learning can serve as a contextual learning approach that advances the literature on culturally responsive pedagogy in a digital learning environment. In practical terms, these findings are expected to provide guidelines for sociology teachers and curriculum developers to design learning that explicitly integrates students' local cultural values and experiences and uses digital technology as an active space for constructing cultural knowledge, rather than merely a medium for information delivery. However, the generalization of the findings needs to be done carefully, given that this study uses convenience sampling from a single school, a quasi-experimental design without randomization, and that the potential teacher effect cannot be eliminated. The research is further encouraged to use a larger, more diverse sample from various schools and to adopt a mixed-methods approach

to gain a more comprehensive understanding of the sociological learning mechanisms based on digital ethnopedagogy across educational contexts.

■ DECLARATION OF GENERATIVE AI USAGE IN THE WRITING PROCESS

During the drafting of this manuscript, the author used ChatGPT (OpenAI) to assist with language editing, grammar checking, and improving the clarity of academic writing. All results have been reviewed and re-edited by the author, and the author is solely responsible for the final content of the published article.

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