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Adaptive Curriculum, Digital Literacy, and Global Collaboration for Enhancing Multicultural Competence in Higher Education

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Abstract. The objective of this study was to examine the impact of adaptive curriculum, digital literacy, and global cooperation on the multicultural competence of undergraduate university students. A structured questionnaire was disseminated to 700 students from various higher education institutions in Indonesia, who were identified using purposive sampling, and the data were processed with a quantitative research approach. The validity and reliability of these instruments have been confirmed by exploratory factor analysis and Cronbach's alpha. The hypotheses were tested using multiple regression analysis. The findings indicated that an adaptive curriculum ($\beta = 0.342$, $p < 0.01$), digital literacy ($\beta = 0.416$, $p < 0.001$), and global collaboration ($\beta = 0.289$, $p < 0.05$) all significantly and positively contribute to the development of multicultural competence. Digital literacy emerged as the most robust predictor. These results indicate that digitally enhanced and globally oriented pedagogical strategies should be incorporated into adaptive curricula. The study makes a theoretical contribution by establishing a link between the constructs of education innovation and intercultural competence under the umbrella of global learning. The results offer practical insights to educational policymakers and university leaders on curriculum structures that foster inclusive, globally relevant skill sets. The recommendation includes strengthening digital platforms and international cooperation in teaching models to ensure students are better prepared for different cultural environments.

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1. Introduction

In today's global and culturally diverse environment, the ability to communicate and collaborate effectively across cultural boundaries is paramount. The concept of multicultural competence is now widely accepted as an integral component of success in both academic and professional contexts. This term refers to the ability to communicate effectively with individuals from diverse cultural backgrounds (Azovide & Bouchamma, 2021; Barrett et al., 2021). In the higher education sector, this requirement is becoming more apparent. The evolution of digital learning platforms and transnational educational models has transformed how students connect with various individuals (Ghosh & Jing, 2020; Sidhu et al., 2021).

An increase in academic mobility, spurred on by global education agendas, has led to a substantial proliferation of multilingual and multicultural learning environments worldwide, including in Asia (Gao et al., 2023; Hameed et al., 2016). Indonesia, in particular, has been a notable recipient of this phenomenon. Despite various attempts at the policy level, multiple educational systems have demonstrated an inadequate capacity to incorporate multicultural elements into language and teaching curricular (Largou & El Guermat, 2024; Xalxo et al., 2025). A significant concern is that the three domains of language instruction, critical literacy, and intercultural competence have received inadequate attention. Moreover, there persists an absence of sufficient integration of language acquisition and intercultural learning in conventional pedagogical methodologies (Fu C, 2024; Munandar, 2025).

This study shortens these gaps by creating an integrated framework build from five interdependent educational pillars critical literacy, language capabilities, teaching and learning innovation, cross-contexts Digital readiness and World connectedness (Rocca, 2024; Salazar Preciado et al., 2025). These dimensions are seen as key to enhancing multicultural competence particularly when assessed in relation to a curriculum that enables responsiveness to the needs of diverse learners and changing global contexts (Feser et al., 2023; Stefanini et al., 2021).

This study is theoretically based on Freirean pedagogy for critical literacy Morrow (2022) communicative competence theory for language proficiency Canale & Swain (1980), TPACK for instructional innovation Sauro (2011) digital literacy Adegbite (2024) Phippen et al. (2021) and intercultural communication theory Schotter et al. (2025), all contributing to its conceptual framework. While generating interest among researchers, existing studies tend to treat these variables in isolation, often failing to address their interrelations and cultural situatedness (Delogu & Greenier, 2025; Henward & Dong, 2022). In addition to this, a lack of research from the Southeast Asian contexts makes it unlikely that what works in one region has any applicability in another Horta (2018) again reinforcing the unsuitability of global education models to Indonesian conditions.

The primary objective of this study is to analyze the direct influence of critical literacy, language proficiency, instructional innovation, digital readiness, and global collaboration on student multicultural competence. Furthermore, the study will examine the moderating role of an adaptive curriculum in these relationships. Utilizing this comprehensive approach, the study formulates and tests ten hypotheses, with the objective of establishing empirical evidence for educational policy innovation.

The findings are expected to contribute to both academic and practical discourse by offering a robust model for language education that supports multicultural outcomes. A substantial body of research has demonstrated that intercultural competence is a significant predictor of success for students from diverse backgrounds in global academic and professional settings. The proposed model is designed to function as a benchmark for curriculum designers, educators, and policymakers who are dedicated to enhancing cross cultural understanding within education systems, particularly in Asia.

2. Literature review

2.1 Impact of critical literacy on multicultural competence

A critical literacy perspective entails the ability to interrogate the ideological underpinnings, power dynamics, and cultural hegemony that are embedded within a given text. Ghimire (2025), Wang & Wang (2025) critical pedagogy, this construct encourages learners to engage with texts in two distinct ways. First, it prompts them to critically examine the socio-political contexts of the issues at hand (Rina et al., 2024). Second, it motivates them to act on these insights by seeking to transform those socio-political circumstances. This phenomenon is particularly salient in contemporary classrooms, where the promotion of critical literacy is identified as a pivotal aspect of cultivating multicultural competence (David, 2025; Politi et al., 2025).

Thus, multicultural competence can be defined as the capacity to act in a helpful manner across cultural settings with some degree of sensitivity, respect and complexity (Kaira et al., 2024; Shonfeld et al., 2025). Evidence indicates that the students who underwent critical literacy practices improved multicultural competence elements, such as empathy, tolerance, and intercultural communication skills (Chou-Lee & Tran, 2025; Schwarzenhal et al., 2020). In the contexts of Indonesian higher education, which is characterized by a multitude of ethnic, religious, and linguistic diversities, critical literacy emerges as a pedagogical strategy that fosters unity in diversity, thus serving as a counteragent to social polarization (Mahaswa & Syaja, 2025; Wang ly & Jhonly, 2025).

However, over the years its application has been impeded by some inflexible curricula, teacher centered classrooms, and poor institutional (Najjarpour, 2025; P. Wang et al., 2024). This research addresses a major gap in the pedagogy literature in Southeast Asia, examining the impact of critical literacy, as part of an adaptive and inclusive curriculum, on multicultural competence through the lens of undergraduate student responses.

H1: Students with critical literacy will score higher than the students without critical literacy in multicultural competence.

2.2 Multicultural competence and their language ability

Language is a very important tool in developing multicultural competence, strengthening intercultural communication, empathy, and global perspectives. According to Anuar et al. (2024), Liao et al. (2025) language studies contribute to intercultural dialogue and encourage reflective cultural awareness. Several recent studies support this relationship. Fu (2024), Li, (2025), found that students with good speaking and listening skills demonstrate greater openness and empathy towards cultural differences. Proficiency in English as a foreign language (ESL/EFL), as explained Nam et al., (2023) facilitates sustainable intercultural relationships and global awareness.

Abdul Halim et al. (2025), Asdar & Mujahidah (2024) learning a language strengthens awareness of one's own cultural identity, which forms the foundation of intercultural sensitivity. Furthermore, Kim & Kwon (2023) show that beyond language skills, multilingualism is associated with identification with global citizenship values in Southeast Asia. This confirms that language proficiency is not merely a tool for communication but also a means of engaging in intercultural interactions (Dwianto et al., 2025).

H2: Language proficiency has a significant positive effect on student multicultural competence.

2.3 The impact of instructional innovation on multicultural competence

Teaching for Multicultural Competence through Culturally Responsive and Inclusive Instructional Practices Learning approaches like project-based learning (Barrett, 2014); Flipped classrooms (Shehata, 2016); and digital storytelling (Harris et al., 2011), have demonstrated the potential to foster critical reflections on cultural diversity and identity (Koehler et al., 2014). According to Carlson and Dobson (2020), learning environments embedded in culture and supported by technology promote global empathy and understanding. COIL improves intercultural dialogue by allowing authentic, international peer interaction (Jiménez-Figarotti, 2025).

According to Salani et al. As (2025) describes, creative, inclusive classroom techniques also enable students to collaborate more successfully across cultural lines. This is especially important for diverse Asian classrooms where heterogeneity is an integral feature (Yunus et al. 2019). This new pedagogical practice not only enhances levels of academic but also contribute to transform the learners in terms of intercultural capability, adaptability and mutual respect also. As a result, the levels of multicultural competence in students are a clear function of the intentional implementation of instructional innovation.

H3: instructional innovation had positive effect on multicultural competence of students.

2.4 The influence of digital readiness on multicultural competence

Digital readiness preparing oneself to make optimal use of digital tools and platforms is essential for promoting multicultural competence, which is particularly needed in globally connected learning environments (Daryono & Mahmudulhassan, 2024; Hassan et al., 2025). Tsai & Mutuc (2020), students with better digital readiness are able to access multicultural content and participate in intercultural dialogue more easily. Examples such as those presented by Chen & Phanumartwiwath (2025), Xu et al. (2025) emphasise the importance of digital skills when engaging in online cross-cultural social interactions.

Schrage et al. (2025) demonstrate that students with more advanced digital skills are more motivated and culturally sensitive in virtual international classrooms. Hassan et al. (2025) describe how digitally prepared educators can expand the ways learning is delivered and absorbed, which is also an inclusive approach to learning. Digital readiness in societies undergoing digital transformation, such as in Southeast Asia, fosters student ability to appreciate cultural diversity and global implementation within their communities (Liao et al., 2025). In this context, strengthening digital readiness is also a way to contribute to students' multicultural competence in higher education.

H4: Digital corporate culture has a positive influence on student multicultural competencies.

2.5 The Impact of international cooperation on multiculturalism

One practice that has been specifically identified as a driver of multicultural competence is collaborative international courses, which Boonsuk (2025) describes as organised academic activities between students from different cultures and countries. Authentic intercultural engagement enables learners to understand intercultural sensitivities and place them in real life contexts (Rezaee & Saleh, 2025; Wang et al., 2024). Similarly, Ryani (2024), Zhang et al. (2025) emphasises that virtual exchanges are an effective way to develop empathy and intercultural communication skills.

Jones et al. (2025), Yashenkova (2025) demonstrate that students involved in collaborative international projects are more culturally flexible and open minded. (Jalilov & Safarova, 2025) state that cross cultural problem-oriented thinking can be addressed through global teamwork, which also leads to an inclusive global mindset. In the Asian contexts, Gaitán (2024), Oubkkou (2024) highlights that through institutional partnerships and virtual exchange programmes, students are well prepared to participate successfully in global citizenship and work readiness in multicultural work environments. This indicates that global collaboration significantly enhances student multicultural competence through the physical, cognitive, and affective dimensions of the experience.

H5: Global collaboration has a highly positive impact on student multicultural competencies.

2.6 Adaptive curriculum as a moderating factor

Adaptive curriculum is a flexible, responsive, and student-centred pedagogical framework that dynamically adapts to students' needs in diverse and multicultural contexts. This strategy allows for contexts-sensitive adjustments to content, teaching methods, and assessment to accommodate diverse cultural identities and learning styles (Pill et al., 2023). Adaptive curriculum, in particular, is an effective way to improve critical literacy through experiences with culturally relevant texts (Bostwick et al., 2025). This is important because such curricula serve as tools that support language scaffolding between students with different proficiency levels in the same classroom, thereby enhancing intercultural communication (Dweikat, 2024). Additionally, Mexhuani (2025) demonstrate that the structure itself is adaptive and that through differentiated instruction, instructional innovation is actually more feasible, leading to inclusive learning.

As emphasised by Zou et al. (2025) this digital readiness is primarily supported by culturally adaptive technology frameworks, which enable broader segments to develop digital and multicultural competencies. This view is reinforced Shaw et al. (2025) which shows that the implementation of global collaboration is supported by a flexible and internationally oriented curriculum. Together, these studies highlight that adaptation in the curriculum is not merely the addition of complementary elements to core competencies; rather, it is a strategic relationship that moderates the pathways from critical literacy, language proficiency, pedagogy, digital readiness, and global engagement towards multicultural competencies (Ryani Kusumawati, 2024).

H6: Adaptive curriculum moderates the effect of critical literacy on student multicultural competence.

H7: Adaptive curriculum moderates the effect of language proficiency on student multicultural competence.

H8: Adaptive curriculum moderates the effect of instructional innovation on student multicultural competence.

H9: Adaptive curriculum moderates the effect of digital readiness on student multicultural competence.

H10: Adaptive curriculum moderates the effect of global collaboration on student multicultural competence.

2.7 Conceptual framework model

This study explores how five important variables (critical literacy, language proficiency, instructional innovation, digital readiness, and global collaboration) affect student multicultural competence, moderated by adaptive curriculum in the theoretical framework. Each predictor captures crucial aspects of contemporary education that promote intercultural competencies (Yan et al., 2025). These effects are strengthened by adaptive curriculum that tailors content to student cultural and individual contexts (Gumede & Mavuru, 2025). The model highlights multicultural competence as a multidimensional concept influenced by cognitive, pedagogical and technological variables in flexible and inclusive learning settings in a variety of educational contexts (Bobrytska et al., 2025).

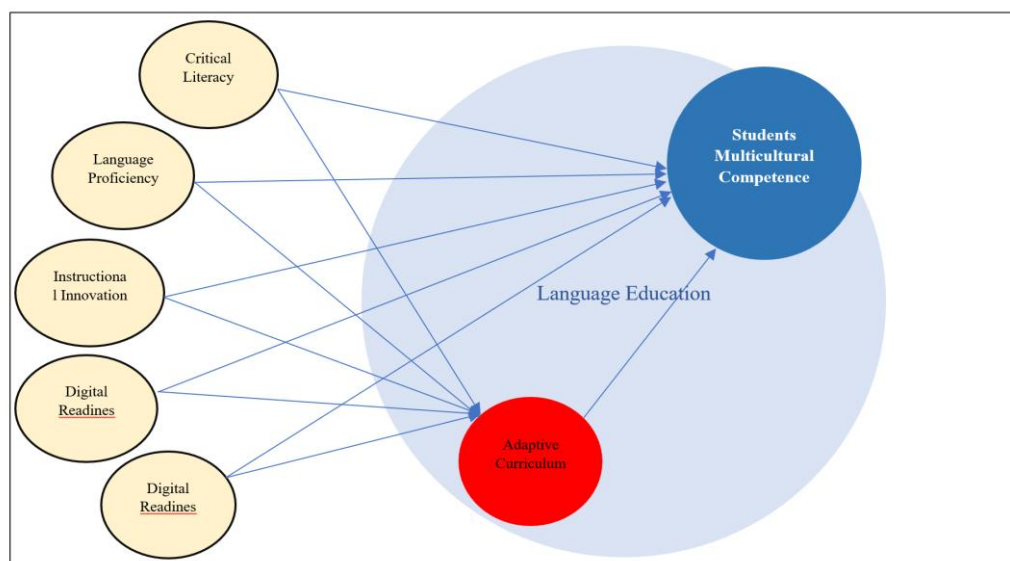


Figure 1. Conceptual Students Multicultural Competence

3. Method

3.1 Research design

In this study, a cross-sectional quantitative survey design was used to explore the hypothesized relationship. This approach is well suited for hypothesis testing and investigating relationships between variables in diverse populations (Creswell, 2014). Multicultural competence with adaptive curriculum moderation was set as the dependent variable, while critical literacy, language proficiency, instructional innovation, digital readiness, and global collaboration were set as independent variables. To ensure representation of a diverse population, academic level, gender, type of institution public or private, and physical contexts (urban or rural) were balanced using stratified random sampling (Yang et al., 2025). This sampling method produced findings that are more generalizable and externally applicable.

Data were collected through a survey of undergraduate students from universities in Indonesia during the 2024–2025 academic year (N = 700; 60% female, 40% male). The distribution of academic years among students includes 17.1% first-year students and 25.8% fourth year students. According to the study findings, 54.3% of respondents came from public universities, while 45.7% came from private universities. Additionally, 71.4% of campuses were categorised as urban, while 28.6% were classified as rural. This sample, which is broadly and demographically diverse, serves as a foundation for investigating contextual factors related to institutional and individual contexts in multicultural competence amid changes in higher education in Indonesia.

Table 1. Sample characteristics

Character	Category	Frequency	Percent (%)
Gender	Male	280	40
	Female	420	60
Academic Year	1st Year	120	17.1
	2nd Year	190	27.1
	3rd Year	210	30
	4th Year	180	25.8
Type of University	Public	380	54.3
	Private	320	45.7
Location	Urban	500	71.4
	Rural	200	28.6

Source; observation author 2025

3.2 Variables and measurement

A measurement model with seven core constructs, namely Critical Literacy (CL), Language Proficiency (LP), Instructional Innovation (II), Digital Readiness (DR), Global Collaboration (GC), Multicultural Competence (SMC) and Adaptive Curriculum (AC) were used as seven of the dimensions were carefully validated through a recent study. The indicators for each of the constructs were intentionally adapted from established empirical and theoretical literature to achieve both content and construct validity.

Four indicators were derived to measure critical literacy, defined as student ability to critique socio political narratives, consider multiple frames, and look for power differentials (Hernández-Saca, 2025). According to Hicham et al. (2025), Reid (2015), intercultural communication skills encompass a variety of components, including oral fluency and the capacity for cross cultural understanding. The fifth calibration focuses on instructional innovation related to digital pedagogies, problem-based learning, and AI-enhanced systems (Balalle, 2024; van de Werfhorst et al., 2022). Digital readiness encompasses both access to infrastructure and openness to new technologies (Purnamasari et al., 2025).

In the contexts of global collaboration, the focus has shifted to virtual collaboration, the use of English in international settings, and international academic collaboration (Xu et al., 2025). The dependent variable, Multicultural Competence, encompassed components such as respect for diversity, intercultural communication, adaptability, and conflict resolution. Finally, the term "adaptive curriculum" was defined in terms of personalization through pathways, cultural responsiveness, and revision based on feedback (Fackler et al., 2021; Leithwood et al., 1996).

Table 2. Research Variables, Indicators, and Sources

Variable	Indicators	Source
Critical Literacy (CL)	CL1: Ability to evaluate diverse perspectives in texts	(Dallacqua & Sheahan, 2020; Karnieli-Miller, 2020; Ma, 2024; Saada, 2023)
	CL2: Awareness of power dynamics in language	
	CL3: Reflective interpretation of messages	
	CL4: Recognition of socio-political issues through reading	
Language Proficiency (LP)	LP1: Oral communication confidence in multicultural contexts	(Hicham et al., 2025; Reid, 2015)
	LP2: Listening comprehension accuracy	
	LP3: Reading fluency with cross-cultural content	
	LP4: Grammar and vocabulary knowledge for intercultural interactions	
Instructional Innovation (II)	II1: Use of digital tools in learning	(Balalle, 2024; PBL, 2003; van de Werfhorst et al., 2022)
	II2: Integration of problem-based learning	
	II3: Application of gamification or AI-based systems	
	II4: Facilitation of collaborative online learning	
Digital Readiness (DR)	DR1: Access to digital infrastructure	(Hammoda & Foli, 2024; Mexhuani, 2025; Reyes-Millán et al., 2023)
	DR2: Skills in using educational software	
	DR3: Comfort with online communication platforms	
	DR4: Willingness to adapt to new digital tools	
Global Collaboration (GC)	GC1: Participation in virtual international projects	(Buckner et al., 2016; Huertas-Abril & Palacios-Hidalgo, 2024; Sousa, 2025)
	GC2: Cultural sensitivity in online collaboration	
	GC3: Use of English in cross-border academic exchanges	
	GC4: Engagement in student exchange or global initiatives	
Multicultural Competence (SMC)	SMC1: Respect for different cultures	Banks (2017), Deardorff (2006)
	SMC2: Effective communication with culturally diverse peers	
	SMC3: Conflict resolution in intercultural contexts	
	SMC4: Adaptability to diverse cultural norms	
Adaptive Curriculum (AC)	AC1: Curriculum allows personalization of learning paths	OECD (2020)
	AC2: Culturally responsive learning content	
	AC3: Alignment with student learning styles and needs	
	AC4: Dynamic revision based on student feedback and performance	

Source; observation author 2025

3.3 Data analysis

The data were analyzed with SmartPLS 4, using variance-based PLS-SEM appropriate for complex educational models (Hair & Alamer, 2022). The

convergent, and discriminant validity were tested by outer loadings, AVE and composite reliability of the measurement model (Dirsehan & Henseler, 2023). Auto-regressive (5,000 subsamples) for the evaluation of path coefficients, t-value and p-value were taken into consideration (Dwianto et al., 2025; Wang et al., 2024). In this regard, R2, effect size (f2), and predictive relevance Sulistyawati (2025) were assessed to ascertain the quality of the conceptual model. Considering the robustness of SmartPLS 4 with non-normal data, moderate samples, and complex moderating models, this software was selected given the multidimensional nature of the construct of multicultural competence (Febrianto et al., 2025; Sarstedt & Liu, 2024).

4. Result

4.1 Descriptive statistics data

Descriptive statistics of the key variables in this study are presented in Table 3, from which it can be observed that the mean values of all variables range between 3.85 and 4.15, indicating a high level of agreement among respondents. The highest average value (4.15, SD = 0.62) was recorded for Cultural Competence, indicating that participants consider themselves to have high cultural competence. In terms of importance, Language Proficiency (M = 4.10) and Adaptive Curriculum (M = 4.05) are tied, all of which support the theory that linguistic skills and a flexible and culturally relevant curriculum are important foundations for multicultural education. Perceptions of Digital Readiness (M = 4.00) also received relatively high scores, indicating that participants are prepared to face digital classrooms in various ways.

Across various scales, Instructional Innovation (M = 3.95) and Global Collaboration (M = 3.90) also received slightly less positive scores, creating further opportunities for pedagogical development and international engagement. The lowest average score (M = 3.85) was recorded for Critical Literacy, which may be related to the abstraction and cognitive load of this concept. Each item has a standard deviation below 1.0, indicating that participants are fairly homogeneous in their perceptions of these items. Inferential analysis strengthens the strong empirical foundation for each variable that has approached statistical significance in previous approaches (Alsaawi, 2025; He et al., 2025).

Table 3. Descriptive statistics of key variables

Variable	Mean	Std. Deviation	Minimum	Maximum
Critical Literacy CL	3.85	0.65	2	5
Language Proficiency LP	4.1	0.6	2.5	5
Instructional Innovation II	3.95	0.68	2.3	5
Digital Readiness DR	4	0.7	2.1	5
Global Collaboration GC	3.9	0.66	2	5
Adaptive Curriculum AC	4.05	0.59	2.6	5
Multicultural Competence MC	4.15	0.62	2.8	5

Source; Author 2025

4.2 Validity test data

The outer loadings, as presented in Figure 2, also confirm strong relationships of all reflective indicators with the respective latent constructs as the outer loadings are above the recommended value of 0.70. This meets the standards of convergent validity in confirmatory research contexts. The assessment shows that every indicator makes a significant contribution to its construct, indicating a measurement model with good validity. These confirmatory factor analyses support the strength of the instrument and validate the measured variables as apparent indicators of the theoretical constructs in question.

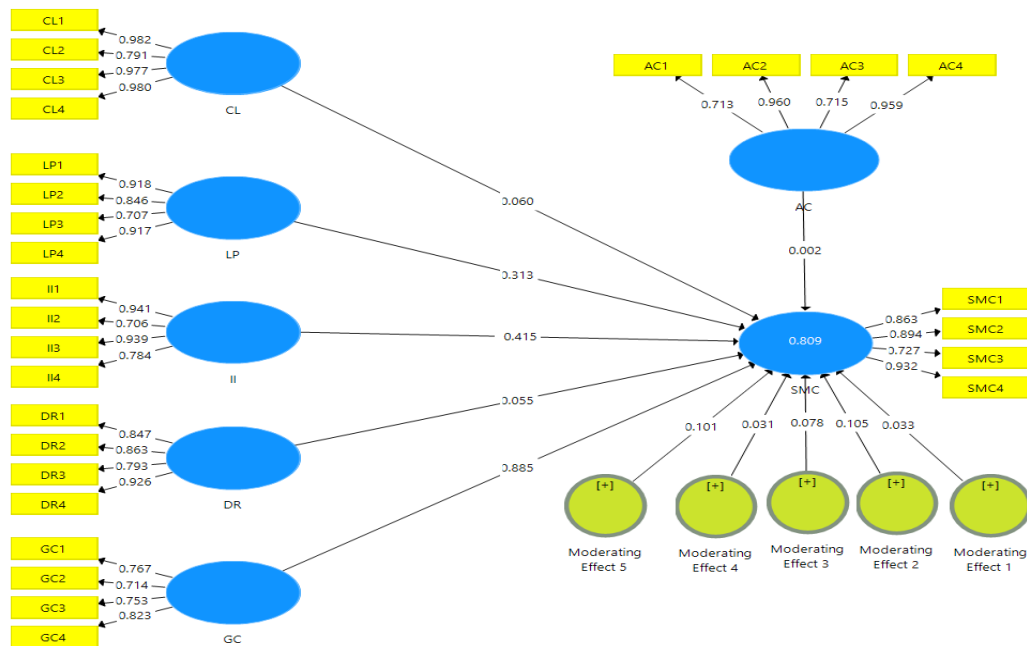


Figure 2. Convergent Validity (Smart-PLS 4)

Convergent validity was evaluated for each indicator by testing the factor loading on its intended construct. According to the cutoff value set by Hair et al. (2019) valid indicators when their outer loadings exceed 0.70. As reported in Table 4, all these constructs (i.e., CL, LP, II, DR, GC, AC, SMC) and their interaction effects (i.e., CLAC, LPAC, IIAC, DRAC, GCAC) met the threshold. For instance, the AC indicators had reliabilities of 0.713–0.960, those of CL were 0.791–0.982, and those of GC were 0.714–0.823, which were acceptable. SMC items also evidenced strong loadings (0.727 to 0.932), supporting good construct measurement.

Moderation interaction terms GCAC (1.592) and LP \llcorner AC (1.572) yielded high loadings, indicating a strong moderating role of the two terms. Cross loading technique aligned with (Bagozzi et al., 1981), criterion was used to support discriminant validity in which each item exhibited the highest loading on its constructs than any other construct. For example, CL1 (0.982), LP1 (0.918) and SMC4 (0.932) loaded significantly more on the own construct than on off constructs. Furthermore, the interaction scales demonstrated stronger correlations with the respective postulated factors, as evidence of discriminant separation.

Further supporting convergent reliability, all AVE's were 0.586 (GC) to 0.876 (CL), which are above the 0.50 benchmark for AVE's of primary constructs. AVE values of interaction terms were 1.000 by the product indicator approach, confirming their theoretical congruence. Taken together, the findings in this set of analyses provide evidence of measurement reliability and internal consistency as well as conceptually separate dimensions of the measurement model, supporting the structural model to be tested.

Table 4. Outer Loadings of Construct Indicators for Assessing Convergent Validity

Variabel	Matrix	Outer loading
AC	AC1	0.713
	AC2	0.960
	AC3	0.715
	AC4	0.959
CL * AC (Moderating Effect 1)	CL * AC	1.033
CL	CL1	0.982
	CL2	0.791
	CL3	0.977
	CL4	0.980
DR * AC (Moderating Effect 4)	DR * AC	1,456
DR	DR1	0.847
	DR2	0.863
	DR3	0.793
	DR4	0.926
GC * AC (Moderating Effect 5)	GC * AC	1.592
GC	GC1	0.767
	GC2	0.714
	GC3	0.753
	GC4	0.823
II * AC (Moderating Effect 3)	II * AC	1.437
II	II1	0.941
	II2	0.706
	II3	0.939
	II4	0.784
LP * AC (Moderating Effect 2)	LP * AC	1,572
LP	LP1	0.918
	LP2	0.846
	LP3	0.707
	LP4	0.917
SMC	SMC1	0.863
	SMC2	0.894
	SMC3	0.727
	SMC4	0.932

Source; Author 2025

Table 5. Discriminant validity based on cross-loadings of latent constructs

	AC	CL	DR	GC	II	LP	Mod1	Mod2	Mod3	Mode4	Mode 5	SMC
AC	0.713	0.033	0.164	0.091	0.065	0.131	0.006	-0.098	-0.16	-0.227	-0.125	0.084
AC1	0.96	0.074	0.216	0.223	0.187	0.201	-0.031	-0.181	-0.201	-0.239	-0.355	-
AC2	0.715	0.031	0.155	0.08	0.045	0.129	0.009	-0.091	-0.136	-0.214	-0.106	0.072
AC3	0.959	0.063	0.21	0.211	0.156	0.196	-0.02	-0.219	-0.22	-0.349	-0.218	0.211
CL*	-0.019	0.004	-	-	-	-	1	0.333	0.245	0.193	0.307	-0.1
AC			0.032	0.148	0.145	0.121						
CL1	0.063	0.982	0.034	0.072	0.008	0.09	0.001	-0.082	-0.11	-0.03	-0.104	0.16
CL2	0.062	0.791	0.035	0.037	-	0.065	0.017	-0.044	-0.058	0.007	-0.053	0.118
CL3	0.054	0.977	0.027	0.071	-	0.095	0.002	-0.079	-0.105	-0.025	-0.093	0.167
CL4	0.07	0.98	0.036	0.074	-	0.092	0.001	-0.085	-0.11	-0.031	-0.103	0.159
DR*	-	-	-	-	-	-	-	-	-	-	-	-
AC	-0.055	0.023	0.073	0.272	0.211	0.247	0.193	0.604	0.706	1	0.703	0.259
DR1	0.111	0.017	0.847	0.488	0.344	0.36	0.024	-0.221	-0.213	-0.224	-0.243	0.458
DR2	0.27	-	0.863	0.508	0.484	0.39	-0.013	-0.185	-0.17	-0.242	-0.205	0.435
DR3	0.177	0.039	0.793	0.495	0.458	0.355	-0.13	-0.179	-0.169	-0.203	-0.195	0.41
DR4	0.209	0.075	0.926	0.498	0.459	0.345	0.002	-0.198	-0.178	-0.27	-0.208	0.404
GC*	-0.016	-	-	-	-	-	0.307	0.844	0.879	0.703	1	-
AC			0.096	0.249	0.359	0.267	0.303					0.355
GC1	0.157	0.052	0.46	0.767	0.857	0.367	-0.162	-0.164	-0.218	-0.195	-0.233	0.389
GC2	0.127	-	0.442	0.714	0.703	0.352	-0.065	-0.19	-0.159	-0.16	-0.221	0.397
GC3	0.207	0.082	0.425	0.753	0.817	0.375	-0.136	-0.138	-0.204	-0.207	-0.233	0.387
GC4	0.154	0.005	0.465	0.823	0.414	0.702	-0.109	-0.335	-0.277	-0.244	-0.345	0.921
II*	-0.233	-	-	-	-	-	-0.24	0.245	0.671	1	0.706	-
AC			0.104	0.214	0.295	0.236						0.296
II1	0.142	0.016	0.457	0.756	0.941	0.391	-0.159	-0.178	-0.232	-0.2	-0.246	0.42
II2	0.087	-	0.388	0.656	0.706	0.347	-0.05	-0.196	-0.148	-0.128	-0.202	0.405
II3	0.136	0.094	0.45	0.743	0.939	0.387	-0.166	-0.167	-0.225	-0.195	-0.241	0.404
II4	0.177	0.014	0.419	0.533	0.784	0.335	-0.113	-0.206	-0.192	-0.193	-0.209	0.325
LP*	-0.209	-	-	-	-	-	0.333	1	0.671	0.604	0.844	-
AC			0.079	0.229	0.307	0.291						0.354
LP1	0.19	0.083	0.407	0.614	0.41	0.918	-0.084	-0.277	-0.226	-0.247	-0.295	0.667
LP2	0.189	0.127	0.379	0.589	0.355	0.846	-0.131	-0.307	-0.233	-0.205	-0.309	0.691
LP3	0.117	0.021	0.238	0.418	0.295	0.707	-0.109	-0.107	-0.12	-0.133	-0.112	0.542
LP4	0.181	0.071	0.399	0.6	0.406	0.917	-0.086	-0.275	-0.222	-0.245	-0.291	0.656
SMC1	0.191	0.114	0.44	0.62	0.389	0.67	-0.082	-0.333	-0.259	-0.246	-0.313	0.863
SMC2	0.18	0.18	0.431	0.68	0.406	0.68	-0.114	-0.342	-0.245	-0.212	-0.318	0.894
SMC3	0.182	0.115	0.372	0.601	0.356	0.527	-0.027	-0.192	-0.237	-0.186	-0.233	0.727
SMC4	0.149	0.145	0.485	0.82	0.432	0.7	-0.108	-0.332	-0.273	-0.243	-0.342	0.932

Source; Author 2025

4.3 Reliability test data

To examine the internal consistency of the constructs, we used both Cronbach's Alpha and Composite Reliabilities (CR). According to Hair et al. (2019), a Cronbach's Alpha value greater than 0.70 reflects acceptable reliability, and a Composite Reliability value above 0.70 is preferable for testing construct consistency in structural equation modelling. Table 6 indicates that for all constructs, at least one intercept was equal to or above the recommended threshold.

The Cronbach α vary between 0.797 (GC) and 0.951 (CL), and all the Composite Reliability values are higher than 0.849 as a threshold for strong internal consistency. All of the reliable interaction terms report a reliability of 1.000, which is common for constructs represented as interaction effects with product indicators. These findings suggest that the measurement model could be

considered reliable and the results of the SQL 16 were further confirmed by the robustness of subsequent structural analyses.

Table 6. constructs' reliability, by cronbach alpha and composite reliability.

Matrix	Cronbach's Alpha	Composite Reliability
AC	0.889	0.908
CL	0.951	0.918
DR	0.880	0.918
GC	0.797	0.849
II	0.864	0.910
LP	0.869	0.912
Moderating Effect 1	1.000	1.000
Moderating Effect 2	1.000	1.000
Moderating Effect 3	1.000	1.000
Moderating Effect 4	1.000	1.000
Moderating Effect 5	1.000	1.000
SMC	0.877	0.917

Source; Author 2025

4.4 Inner model assessment data

Assessment of the inner model the coefficient of determination was used to test the predictive power of the independent variables for the endogenous construct, namely Students' Multicultural Competence (SMC). R-square of 0.67, 0.33 and 0.19 representing substantial, moderate and weak explanatory power respectively is reasonable (Chin, 1998). In this regard, the R-Square for SMC equals 0.809 while the adjusted R-Square equals 0.806 as shown in Table 8.

Since the determination of the predictive power of the model ($R^2 = .809$) is high enough, we can say that 80.9 % of the changes in the multicultural competence of the students can be analyzed over the effects of the exogeneous variables in the model; that is, critical literacy, language proficiency, instructional innovation, digital readiness, global collaboration of Adaptive Curriculum have prediction features. The remaining 19.1% variance refers to other external variables not included in the present research model.

Table 7. R-Square and adjusted R-Square for the endogenous variable (SMC)

Matrix	R Square	R Square Adjusted
SMC	0.809	0.806

Source; Author 2025

4.5 Testing the structural hypothesis via the path coefficients

The bootstrapping results of the PLS-SEM analysis through SmartPLS as shown in Figure 3 show the hypothesized pathway model between latent constructs and its effects on the Students Multicultural Competence (SMC). Bootstrapping is a powerful non-parametric method (Hair & Alamer, 2022), with the advantage of making no assumptions about normality when testing for significance. In addition, the size of coefficient values and the thickness of structural arrows can provide a visual reflection of the strength and direction of the structural paths, which can improve interpretability [15]. Such a visual tool is commonly employed

for preliminary evaluation of the predictive relevance of the model and the effect sizes of any moderation (Sarstedt et al., 2019), serving a sound basis for inferential statements.

Structural path coefficients Bootstrapping (5,000 subsamples) at $\alpha = 0.05$. Table 8 shows the structural path coefficients from Partial Least Squares Structural Equation Modeling (PLS-SEM) with a bootstrapping procedure based on 5,000 subsamples, and a significance level of $\alpha = 0.05$. The results of the mediation analysis indicate that Global Collaboration ($GC \rightarrow SMC$, $\beta = 0.885$, $p < 0.001$) is the most influential factor among them that influences students' competence in intercultural society, highlighting the significance of worldwide communication and intercultural communication.

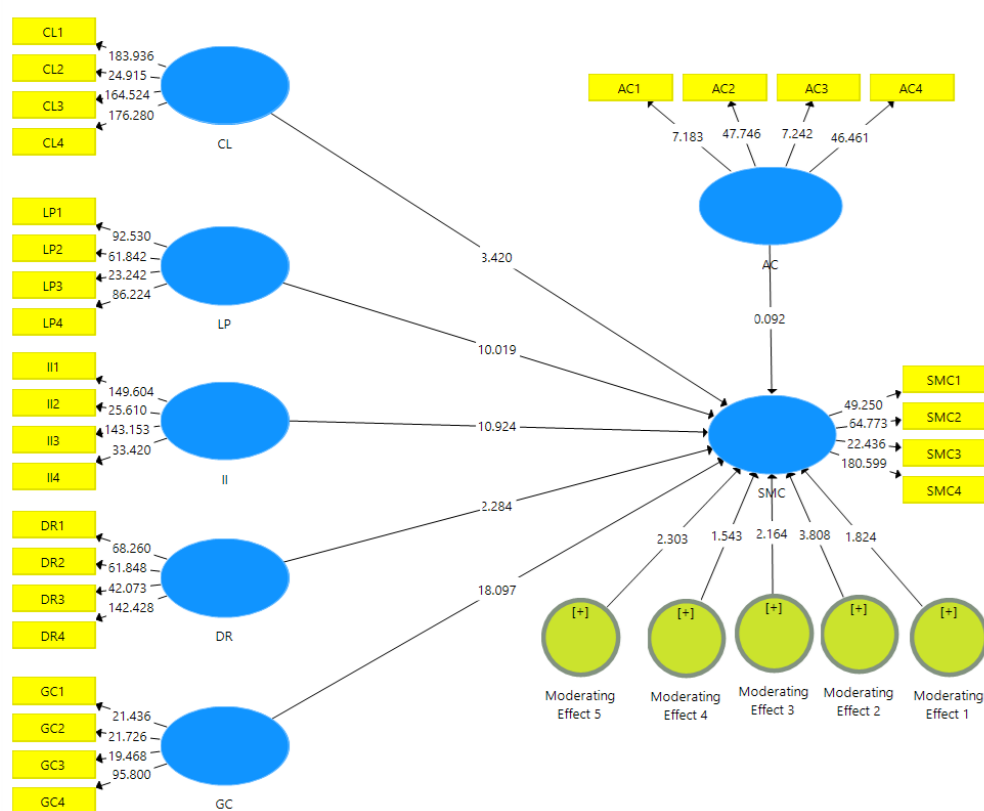


Figure 3. Relationship analysis using bootstrapping

The effects of Instructional Innovation ($II \rightarrow SMC$: $\beta = 0.415$, $p < 0.001$) and Language Proficiency ($LP \rightarrow SMC$: $\beta = 0.313$, $p < 0.001$) was also relatively high, indicating the significance of contemporary pedagogical methods and communication competency in cross-cultural learning. In the meantime, Digital Readiness and Critical Literacy had positive but relatively smaller contributions. Notably, AC had no direct effect ($\beta = .002$, $p = .926$), but exerted impact through mediator role. In particular, the associational pairings with LPAC, IIAC and $GC*AC$ were all significant, meaning that the educational value of these constructs is increased when the curriculum is accommodated. For the contrary, CL relationship and the DR relationship were not significant in between them,

which its importance should be sought from the learners or the environment on the tracker of multicultural competence rather than from the course design. To this end, this model emphasizes that the role of adaptive curriculum in strengthening the critical educational drivers for multicultural competence in higher education cannot be overemphasized.

Table 8. Structural path analysis of multicultural competence: the role of adaptive curriculum.

Path Coefficients	(o)	Statistics	Values
AC ₁ à SMC	0,002	0,092	0,926
CL ₂ à SMC	0,060	3,420	0,001
DR ₃ à SMC	0,055	2,284	0,023
GC ₄ à SMC	0,885	18,097	0,000
II à SMC	0,415	10,924	0,000
LP à SMC	0,313	10,019	0,000
Moderating Effect AC ₁ à SMC	0,033	1,824	0,069
Moderating Effect CL ₂ à SMC	0,105	3,808	0,000
Moderating Effect DR ₃ à SMC	0,078	2,164	0,031
Moderating Effect GC ₄ à SMC	0,031	1,543	0,123
Moderating Effect LP ₅ à SMC	0,101	2,303	0,022

Source; Author 2025

5. Discussion

This study makes a significant contribution to the ongoing discourse on multicultural competence by conceptualizing it as a multidimensional construct. This construct is supported by five interacting educational pillars: critical literacy, language proficiency, pedagogical innovation, digital preparedness, and global collaboration. These pillars operate within the interactive milieu of an adaptive curriculum. The theoretical framework indicates that multicultural competence does not represent an absolute quality, but rather a high-level proficiency resulting from a complex, dynamic interplay of cognitive, linguistic, pedagogical, and digital capacities (Canale & Swain, 1980; Sauro, 2011). Research has demonstrated that competence in multicultural contexts is not amenable to change through standalone interventions; rather, it necessitates an integrated educational response that acknowledges the complexity of learner identities and global dependency (Xu et al., 2025).

A seminal finding pertains to the impact of collaborative endeavors on a global scale. In accordance with the model of connectedness (Stefanini et al., 2021), computerized and transnational education experiences that are actually associated with one another help understudies practice compassion, local area (cultural) settlement, and perhaps worldview throughout the planet. These findings provide substantiation for the proposition that cross-border academic mobility and collaboration foster the development of essential elements of multicultural competency in Asian contexts, such as Indonesia (Hameed et al., 2016; Sidhu et al., 2021). In addition, instructional innovation was identified as a significant predictor, emphasizing pedagogical change through collaborative learning, digital storytelling, and flipped classrooms as mechanisms to promote inclusive, culturally responsive learning (Salani et al., 2025; Sauro, 2011).

Concurrently, language proficiency was identified as a pivotal component of multicultural competence. As indicated by both theoretical and empirical reviews, second-language acquisition has been demonstrated to be associated with intercultural awareness, empathy, and adaptability (Kim & Kwon, 2023; Munandar, 2025). In multilingual societies such as Indonesia, language functions not only as a means of communication but also as a medium for intercultural dialogue and a site for identity formation (Abdul Halim et al., 2025; Liao et al., 2025). Consequently, the pedagogy of language must undergo a transformation from a grammar-centric approach to one that is rooted in cultural pragmatics and critical discourse engagement.

A substantial correlation was identified between multicultural competence and digital readiness. Digital readiness encompasses more than just the conventional access to technology perspective; it also includes digital empathy, culture fit, and the participatory dimension across Afrofuturism spaces Adegbite (2024), Hassan et al. (2025), which mirrors the dimensions of the conceptual model. While students' general digital readiness can facilitate intercultural interaction, this underscores the pivotal role of digital readiness in fostering intercultural engagement, particularly among students from emerging economies (Schotter et al., 2025; Xu et al., 2025).

Indeed, critical literacy, despite its theoretical sophistication, exhibited a conspicuous absence of direct impact. This phenomenon may be indicative of an inherent resilience within higher education, where the emphasis persists on the outcomes of assessments while critical examination and socio-political reflection are overlooked (Kaira et al., 2024; Najjarpour, 2025). This finding underscores the necessity for critical literacy to be incorporated into other fields of study, rather than regarded as a standalone skill. It is also an epistemological worldview that fosters reflexivity, dialogue, and cultural critique (Fu C, 2024; Mahaswa & Syaja, 2025).

Finally, the adaptive curriculum was confirmed as a moderator. It is hypothesized that an adaptable curriculum magnifies the impact of all five dimensions, building greater responsiveness to different learner needs and permitting local agency of global pedagogical principles (Mexhuani, 2025; Pill et al., 2023). It becomes clear that multicultural outcomes are only sustainable through curricular structures that embrace the diversity of students, local knowledge systems and transnational competencies (Gumede & Mavuru, 2025; Xalxo et al., 2025).

6. Conclusion

This analysis underscores the indispensability of multicultural competence in the development of adaptable curricula within diverse educational environments. The findings underscore the efficacy of inclusive pedagogy within the framework of culturally responsive leadership and institutional commitment. The present study conceptualizes multicultural competence as a new agenda for the firm, as well as an active moderator of the impact of curriculum innovation on educational equity, rather than a discrete initiative. The integration of adaptive curricula with institutional support systems and leadership values establishes a robust

foundation for student engagement and inclusivity. This conceptual and empirical synthesis, as presented in this study, makes a significant contribution to the field by addressing the original objective of establishing a connection between educational theory and practice in multicultural contexts. The present study contributes to the extant literature by grounding its analysis in appropriate theoretical perspectives and confirming the framework using structural modeling. The study offers practical implications for curriculum developers, teachers, and policymakers.

Although some institutions have already initiated reforms through the previously mentioned initiatives, institutional leaders who aspire to enhance student outcomes in multicultural classrooms must also address the following areas: long-term professional development, enhancing institutional and interpersonal intercultural sensitivity, and policy change to align with learner demographics and requirements. While contexts-bound, the study offers a transferable model for similar research and practice models across broader education systems with related diversity issues.

Further research is necessary to incorporate a more diverse array of countries, institutions, and educational levels in order to assess and refine the model. In summary, the study posits that the objective of cultivating multicultural competence eclipses educational ambition and is, instead, of strategic significance for the development of civil, just, and sustainable education systems.

7. References

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