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Adapting to Diversity: Leveraging AI for ESL Learning Enhancement

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Abstract - Recent years have seen tremendous advancements in artificial intelligence, which is now pervasive in many aspects of society. Its ability to emulate human intelligence sets it apart. Artificial Intelligence is being explored more and more in the field of education as a possible aid to enhance language acquisition, particularly in the development of students' communication skills. Artificial Intelligence possesses the capability to deliver dynamic, adaptable, and personalized learning experiences that are suited to individual student needs and interests. The purpose of this research is to identify each student's preferred method of learning and adapt the language-learning process to meet their needs. This suggests that each student can focus on the areas in which they require the most assistance and work at their own pace while studying. The important part that social interactions, group projects, and cognitive development play. According to this viewpoint, less skilled students participate in cooperative learning activities with more skilled people, such as teachers or, in modern environments, computer programs. In addition, the enormous volumes of data that AI can analyse and draw conclusions from can be utilized to address the varied language and cultural backgrounds of students. It also shows how important it is to adapt lessons to meet the different needs of English language learners. Overall, these results show how important it is to change the way we teach to fit the needs of different groups of people and to use new technologies like AI to make learning more specific and help students do better in ESL classes.

Keywords: Artificial Intelligence, Language Acquisition, Communication Skills, Personalized Learning, Dynamic Learning Experiences

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1. INTRODUCTION

English language competency has become crucial for anyone looking to succeed in a variety of social, academic, and professional situations in today's linked glob(Sari 2023). Proficiency in English communication offers doors to worldwide cooperation, global employment chances, and educational options(Sari 2021). Artificial intelligence has advanced significantly in recent years and is now ingrained in many facets of society. It is distinguished by its capacity to mimic human intellect. AI is being investigated more and more in the field of education as a potential tool to help and improve language acquisition, especially in the growth of students' communication abilities. AI has the ability to provide dynamic, adaptive, and customized learning experiences that are tailored to the requirements and interests of specific students. In the field of English language teaching (ELT), artificial intelligence (AI) has become a game-changing tool with enormous potential for addressing learner diversity. Artificial Intelligence (AI) technologies comprise an extensive array of instruments and methodologies, including machine learning, natural language processing, and adaptive learning systems. These may be utilized to customize education and cater to the varied requirements of students(Anis 2023). Furthermore, promoting inclusion for kids with special needs is a crucial role that artificial intelligence can play. For example, text-to-speech and speech-to-text features provided by AI-driven systems can help visually impaired students access written materials and take part in interactive language activities(Anis 2023). The vast amounts of data that AI can analyze and generate insights from may also be used to address the diverse language and cultural backgrounds of learners. Teachers may assist students from different linguistic backgrounds by discovering common errors, linguistic patterns, and inter-language differences with the use of AI-powered language analysis tools(Anis 2023). AI can also support the development of cultural sensitivity and intercultural competence by offering engaging simulations, virtual encounters, and possibilities for cross-cultural conversation inside the ELT framework(Montanucci and Peconi 2023). By providing individualized, interactive, and communicative learning processes, information technology may be used to improve language acquisition for students(Shatri 2020). The language

abilities and subskills of language learners may gain from using ChatGPT, an AI-assisted language learning technology(Baskara 2023). It gives students writing inspiration, offers substitute phrases to help them write better, and advances their language learning goals(Su, Lin, and Lai 2023).

2. AIM &OBJECTIVES

Aim:

This study aims to determine the learning type of each student and modify the language learning process to suit their requirements. This implies that every student may concentrate on the subjects where they most need help and study at their own speed.

Objectives:

- To assess how to create personalized learning experiences for students
- To look at the role of artificial intelligence in ESL learning enhancement.
- To assess the challenges and opportunities while learning ESL
- To analysing individual learning patterns and preferences to tailor educational content accordingly

3. LITERATURE REVIEW

This study's theoretical framework is based on significant contributions to social constructivist learning theories(L S Vygotsky 1998). The significant role of social interactions and collaborative learning experiences and cognitive growth. In this perspective, less proficient learners engage in collaborative learning activities with more proficient individuals, including instructors or, in contemporary settings, computer programs. These interactions serve as cognitive scaffolding, supporting less proficient learners in the acquisition and development of their knowledge(Lev Semenovich Vygotsky and Cole 1978)(Vygotskiĭ 1997).

The swift progress of artificial intelligence has transformed multiple fields, including education, with significant consequences for methods of instruction and learning(Chen et al. 2020). Artificial intelligence (AI) technology has the enormous potential to revolutionise traditional teaching approaches in the educational setting by offering individualised learning experiences catered to each student's needs and preferences(Hwang et al. 2020) Researchers, educators, and politicians from all over the world have been paying close attention to AI's integration in education, which ranges from intelligent tutoring systems and language learning applications to adaptive learning platforms(Ilkka 2018)(Kim, Cha, and Kim 2019)(Huang and Tan 2023).

3.1. Demographic Diversity:

Personalised learning experiences are one of the key ways Artificial Intelligence (AI) helps handle student diversity in the classroom. Conventional ELT settings usually find it difficult to meet the unique needs, interests, and learning styles of each student, which results in one-size-fits-all tactics that might not effectively engage or support a varied student body. By evaluating learner data and applying adaptive algorithms, AI systems may identify trends, make inferences, and generate customised recommendations, which leads to the development of a distinct learning path for each student(Anis 2023).

The vast amounts of data that AI can analyse and generate insights from can also be used to address the diverse linguistic and cultural backgrounds of learners. Teachers can assist students from different linguistic backgrounds by discovering common errors, linguistic patterns, and inter-language differences with the use of AI-powered language analysis tools(Anis 2023).

3.2. AI Integration:

Effective AI integration in education involves the formation of task forces dedicated to AI, the promotion of AI literacy, the establishment of responsible AI guidelines, the support of professional growth, and AI research and development.

Speaking, writing, and reading abilities are being enhanced with the help of AI tools. It can offer innovative pedagogical approaches and assist students in creating objectives and overseeing their own education. It doesn't appear that AI techniques are frequently utilised to enhance listening abilities. AI tools can assist students in using their English outside of the classroom.

A66daptive assessments use artificial intelligence (AI) to evaluate students' performance, providing them with timely feedback and highlighting areas for improvement(Omar et al. 2024).

3.3. Personalized Learning Approaches:

While some adult learners are self-directed, the majority gain from continual direction and assistance from teachers; this is especially true in settings with lots of technology. The employment of leverage digital tools improves adult instructors' and learners' collaborative learning experiences. ChatGPT, a chatbot powered by artificial intelligence (AI), is generating a pointed debate in education and beyond. ChatGPT is an online tool that creates human-like written responses to any prompt imaginable.

While some educators consider ChatGPT as a vehicle for disseminating false information and biases built into AI systems, others see it as a way to

advance professional practice and education (Atlas 2023).

AI has the ability to automate administrative duties, giving teachers more time to design more engaging, data-driven lessons(Goodell and Kolodner 2022).

3.4. Opportunities and Challenges:

The way people learn languages has been significantly impacted by technological advancements in many facets of life. The swift incorporation of Artificial Intelligence (AI) across various domains has presented novel opportunities and challenges for language instruction.

Opportunities:

- AI has particularly made an impact on English teaching, providing creative approaches to language acquisition.
- AI-driven language learning systems are becoming more and more common, offering students individualised and engaging educational experiences large language model (LLM) is ChatGPT.
- Applied linguists might be acquainted with a related idea called corpora, which aids researchers, educators, and linguists in creating real-world guidance and materials like curriculum and dictionaries.

Challenges:

- Many of the largest K–12 school districts in the nation have prohibited ChatGPT due to worries that kids may use it to cheat or plagiarise essay submissions. ChatGPT was launched by OpenAI in late 2022(Jimenez 2023).
- The primary constraint with ChatGPT is its reliance on the quality of the training data Sometimes, comments could be irrelevant or absurd(Majumder 2022).
- Concerns over the security and privacy of personal data have been expressed on several occasions. There are no processes provided by OpenAI for users to determine whether ChatGPT retains their personal data or how to remove it.(Gal 2023).

4. HYPOTHESIS DEVELOPMENT

In supervised machine learning, a hypothesis is a function that most accurately characterises the target. The data and the limitations and biases we have applied to the data both influence the hypothesis that an algorithm might produce.

Hypothesis 1: The implementation of personalised learning methodologies is influenced by the diversity of demographics found among ESL learners.

With the help of artificial intelligence, educators may create individualized learning programs that provide students greater autonomy over their education and set realistic yet difficult goals According to connectivism, networks and connections are crucial to learning. Artificial intelligence may be used to build individualized learning networks where students can interact with experts and peers, access pertinent information, and get feedback from a variety of sources (Siemens 2004).With the use of artificial intelligence and customized learning, it is possible to create learning environments that are tailored to the unique requirements of each learner by gathering and analysing data on student performance(Siemens 2004). The range of demographics among ESL students has an impact on how individualized learning approaches are used. Moreover, the diversity of students' learning requirements and interests is another goal of personalized learning. With this method, students create their own educational route, including learning objectives, activities, and assessments, taking charge of their own education.

Hypothesis 2: AI integration has both positive and negative effects on ESL education; it improves personalised learning but also presents difficulties related to technology and culture.

Investigating AI integration in English language instruction is important for a number of reasons. First of all, artificial intelligence (AI) offers a novel strategy that may tailor educational experiences to accommodate different learning tempos and styles (Bergdahl and Nouri 2021) The efficiency of AI in enabling customized learning experiences and meeting individual learning demands was noted in survey answers from educators. Thanks to interactive AI technologies, students have indicated greater interest and involvement in their English language studies. Several research works have investigated the application of AI in language learning, with a focus on English language acquisition(Vadivel et al. 2022). The results demonstrate the beneficial effects of AI integration on language proficiency, with learners demonstrating substantial gains in vocabulary, grammar, understanding, and fluency(An et al. 2021). The study's conclusions highlight how integrating AI may significantly improve English language instruction(Hammad Al-Rashidi et al. 2023). Because AI apps are personalized, learners of various demographics can benefit from individualized learning experiences that raise their language proficiency levels. AI integration with a cultural perspective. According to emerging trends, AI-powered solutions are developing to take into account cultural quirks in addition to linguistic ones.

AI implementation in language education faces challenges like unstable internet connectivity and technological access, particularly in underprivileged areas. Despite its potential, ethical concerns, data privacy concerns, and the need for ongoing human-AI collaboration remain, necessitating further exploration(Vadivel et al. 2023). Educators need

adequate training and professional development to integrate AI effectively into their teaching practices. However, challenges in technology access and internet connectivity, especially in underserved areas or resource-constrained institutions, hinder seamless AI implementation, and educators struggle to adapt teaching methods.

Hypothesis 3: AI integration maximises customised instruction for better learning outcomes by acting as a mediator between personalised learning approaches and their efficacy in ESL education.

Artificial intelligence algorithms have the capability to detect weak points and suggest relevant resources, tasks, or measures to bridge those gaps. Students are able to overcome obstacles and enhance their learning results with the help of this focused support. Differentiated instruction is further facilitated by AI-powered personalized learning. DeepL, which is renowned for its AI-driven translation capabilities; ELSA, which functions as an English language speech facilitation tool; and AI for vocabulary and grammar instruction. ChatGPT is one notable advancement in this area. ChatGPT is a sophisticated language model that uses deep learning techniques to understand and produce human-like speech, enabling smooth user conversations(Lock 2022). ChatGPT has proven to be a powerful tool for raising students' academic performance and motivation in educational settings and ESL instruction by utilizing AI-assisted training programs(Srinivasa, Kurni, and Saritha 2022).The creative use of tools like ChatGPT and the dynamic interaction of Generative Artificial Intelligence (GAI), Computer-Assisted Language Learning (CALL), and these technologies to improve the English as a Second Language (ESL) learning process. Research has examined the connection between ChatGPT and ESL instruction empirically, providing insight into the tool's efficacy. For example, incorporating ChatGPT into language learning sessions boosted participants' excitement and involvement, according to a study done with English language learners.

5. METHODOLOGY

5.1. Research Design

Quantitative research methods were used in this investigation. This design helps explore the learning type of each student and modify the language learning process to suit their requirements. Quantitative research design helps collect numeric data while analysing the numerical patterns, trends, and relationships among variables.

5.2. Sampling Technique

Sample size:

In this study, the sample size was made up of 300 of people to find the transformative role of AI in English language education and its potential to address the diverse needs of language learners. By understanding the current state of research and exploring the opportunities and challenges presented by AI in language learning, educators and policymakers can make informed decisions to harness the benefits of AI technology and maximize its impact on developing effective communication skills among English language learners.

Data Collection:

This research used a structured questionnaire as its main data collection method. The questionnaire's questions evaluate the effect of utilizing AI-ML technology on educational instruction and learning results. This paper aims to present an overview of the current level of AI-ML integration in education and emphasize its potential advantages, difficulties, and consequences for different stakeholders through a thorough examination of the body of available literature

Data procedure:

Data Collection took place through both online and offline means depending on accessibility and preferences of participants. Interview students in-depth to learn about their perspectives on the advantages, difficulties, and experiences with utilizing AI tools. And interviewing teachers to learn more about their experiences integrating AI, as well as any requirements for professional development and results that they have seen in their students.

Data analysis:

We employed structural equation modelling (SEM), a rigorous statistical tool, to explore the complex interactions among several elements. It allows researchers to examine the interplay between different components within a theoretical framework by allowing them to study direct and indirect effects. SEM employs a number of statistical techniques, including component analysis and regression analysis, to assess how well the suggested model fits the data. By identifying intricate patterns and correlations, this analytical method enables us to validate and adjust our research hypotheses and improve our comprehension of the phenomena we are studying. SEM analysis is essential to our work because it illuminates the intricate relationships and potential consequences for businesses and organizations between digital innovation, organizational growth, perceived confidence, and strategy management.

6. TOOLS AND TECHNIQUES OF THIS STUDY

Tools:

The statistical package SPSS and the program AMOS are used in this study.

Techniques: We used a rigorous statistical approach called structural equation modelling (SEM) to investigate the intricate relationships between various components. By allowing them to investigate

both direct and indirect impacts, it enables researchers to look at how various elements interact within a theoretical framework. Component analysis and regression analysis are two statistical methods used by SEM to evaluate how well the proposed model fits the data. This analytical approach helps us better understand the things we are examining and validate and modify our research hypotheses by spotting complex patterns and relationships. SEM analysis is crucial to our work because it highlights the complex connections and possible outcomes between possibilities and obstacles, AI integration, personalized methods, and demographic diversity.

7. CONCEPTUAL FRAMEWORK

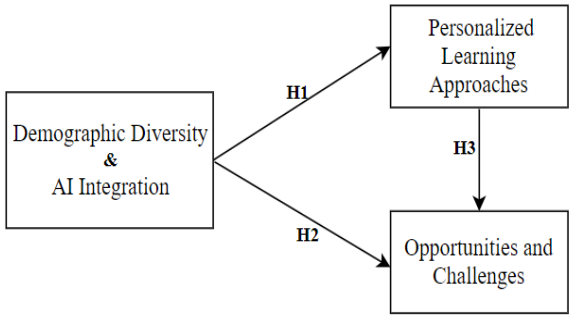

Figure 1 Conceptual Framework

8. RESULTS AND DISCUSSION

Results:

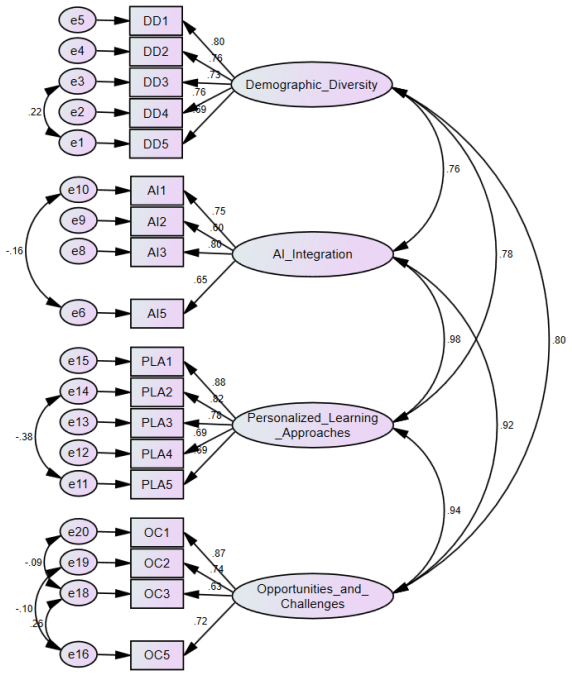

Table 1 Regression Weights: (Group number 1 - Default model)

PATH			Un std. Estimate	S.E.	Std. Estimate	C.R.	P
DD5	<---	Demographic Diversity	1.000		.687		
DD4	<---	Demographic Diversity	1.098	.104	.757	10.545	***
DD3	<---	Demographic Diversity	1.141	.098	.731	11.696	***
DD2	<---	Demographic Diversity	1.187	.112	.760	10.582	***
DD1	<---	Demographic Diversity	1.201	.109	.796	10.994	***
AI5	<---	AI Integration	1.000		.653		
AI3	<---	AI Integration	1.363	.125	.800	10.876	***
AI2	<---	AI Integration	.827	.096	.605	8.601	***
AI1	<---	AI Integration	1.192	.123	.753	9.654	***
PLA5	<---	Personalized Learning Approaches	1.000		.686		
PLA4	<---	Personalized Learning Approaches	1.017	.100	.687	10.177	***
PLA3	<---	Personalized Learning Approaches	1.149	.101	.779	11.429	***
PLA2	<---	Personalized Learning Approaches	1.095	.106	.820	10.331	***
PLA1	<---	Personalized Learning Approaches	1.634	.128	.880	12.739	***
OC5	<---	Opportunities and Challenges	1.000		.716		
OC3	<---	Opportunities and Challenges	.869	.081	.626	10.736	***
OC2	<---	Opportunities and Challenges	1.000	.093	.743	10.754	***
OC1	<---	Opportunities and Challenges	1.316	.101	.867	12.973	***

Table 2 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.955
Bartlett's Test of Sphericity	Approx. Chi-Square	2814.125
	df	153
	Sig.	.000

Using KMO and Bartlett's tests to evaluate the appropriateness for factor analysis. The KMO value obtained was 0.955, indicating a high level of sampling adequacy. Additionally, the Bartlett's test yielded a highly significant result (P = 0.00), providing further support for the factor analysis.

Table 3 Post CFA, Cronbach alpha, factor loadings

Factors and items	Cronbach alpha values	Post CFA factor loadings	AVE	CR
Demographic Diversity	0.869		0.7462	0.47493834
DD5		.687		
DD4		.757		
DD3		.731		
DD2		.760		
DD1		.796		
AI Integration	0.783		0.70275	0.33925796
AI5		.653		
AI3		.800		
AI2		.605		
AI1		.753		

Personalized Learning Approaches	0.869		0.7704	0.49087643
PLA5		.686		
PLA4		.687		
PLA3		.779		
PLA2		.820		
PLA1		.880		
Opportunities and Challenges	0.832		0.738	0.36153281
OC5		.716		
OC3		.626		
OC2		.743		
OC1		.867		

Discriminant validity:

Discriminant validity is not a specific test performed in SPSS or any other statistical software but a concept within the context of validating measurement instruments and assessing the relationships between variables. Discriminant validity is crucial to ensure that different constructs or variables in a study are truly distinct and not measuring the same underlying concept. Researchers use various techniques such as confirmatory factor analysis (CFA) or correlation analysis to demonstrate that the measures intended to assess different constructs are, indeed, different and not highly correlated. Discriminant validity helps ensure that the measurement instruments accurately represent the unique concepts they are meant to measure, preventing construct overlap or redundancy and allowing for more robust and accurate data analysis and interpretation.

Table 4 Discriminant Validity Test

	Demographic Diversity	Personalized Learning Approaches	AI Integration	Opportunities and Challenges
Demographic Diversity	0.86383			
Personalized Learning Approaches	.683**	0.87772		
AI Integration	.628**	.841**	0.838302	
Opportunities and Challenges	.675**	.810**	.768**	0.85907

The discriminant validity matrix, which evaluates how well separate constructs or variables in a research model really measure distinct ideas as opposed to overlapping ones, is shown in the accompanying table. The correlation coefficient between any two particular constructions is shown in each table column, and the square root of the Average Variance Extracted (AVE) for each construct is shown in the diagonal elements. When the square root of the AVE for each construct is higher than the correlation coefficients with other constructs, discriminant validity is verified. The square root of the AVE for "Demographic Diversity, Personalized Learning Approaches, AI Integration, Opportunities and Challenges" is represented by the diagonal components (italicised values) in this table. The correlation coefficients between the related constructions are the off-diagonal elements. The diagonal elements' constant higher values than the correlation coefficients support discriminant validity because they show that the constructs measure different phenomena in the context of "Demographic Diversity, Personalized Learning Approaches, AI Integration, Opportunities and Challenges".

Table 5 Model Fit Summary

Variable	Value
Chi-square value(χ^2)	239.622
Degrees of freedom (df)	123
CMIN/DF	1.948
P value	0.000
GFI	0.900
RFI	0.900
NFI	0.917
IFI	0.958
CFI	0.957
RMR	0.047
RMSEA	0.062

The quality of fit was acceptable representation of the sample data ($\chi 2$ = 239.622), NFI (Normed Fit Index) =0.917; IFI (Incremental fit index) = 0.958, GFI (Goodness of Fit) = 0.900, RFI (Relative Fit Index) = 0.900 and CFI (Comparative Fit Index) =0.957 which is much larger than the 0.90. Similarly, RMR (Root Mean Square Residuals) =0.047 and RMSEA (Root mean square error of approximation) = 0.062 values is lower the 0.080 critical value. Results indicated a good fit for the model presented including RMSEA of 0.062, RMR of 0.047, GFI of 0.900, and CFI of 0.957.

H1: The variety of demographics among ESL learners affects how personalized learning approaches are implemented.

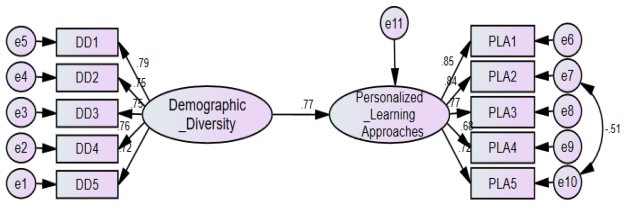

Table 6 Regression Weights: (Group number 1 - Default model)

PATH			Un std. Estimate	S.E.	Std. Estimate	C.R.	P
Personalized Learning Approaches	<---	Demographic_Diversity	1.179	.116	.774	10.138	***
DD5	<---	Demographic_Diversity	1.000		.717		
DD4	<---	Demographic_Diversity	1.059	.094	.761	11.229	***
DD3	<---	Demographic_Diversity	1.127	.101	.753	11.111	***
DD2	<---	Demographic_Diversity	1.127	.101	.753	11.113	***
DD1	<---	Demographic_Diversity	1.138	.098	.787	11.591	***
PLA1	<---	Personalized__Learning__Approaches	1.000		.853		
PLA1	<---	Personalized__Learning__Approaches	1.000		.853		
PLA2	<---	Personalized__Learning__Approaches	.707	.044	.839	15.924	***
PLA3	<---	Personalized__Learning__Approaches	.720	.049	.774	14.651	***
PLA4	<---	Personalized__Learning__Approaches	.635	.052	.680	12.147	***
PLA5	<---	Personalized__Learning__Approaches	.658	.053	.715	12.468	***

Table depicts a hypothetical structural equation model that show cases the interdependence between Two variables, namely the Demographic Diversity and Personalized Learning Approaches. In the present model, the independent variable is the Demographic Diversity, whereas the dependent variable is Personalized Learning Approaches. The findings of the investigation indicate a positive and statistically significant relationship between Demographic Diversity and Personalized Learning Approaches (β=.774, P<.05).

The standardized coefficient of 0.774, a positive association between Demographic Diversity and Personalized Learning Approaches, as shown in the route connecting these two variables. The correlation coefficient values (C.R. values) show large magnitudes, suggesting that the observed associations are statistically significant. The fit indices indicate that the model has a good fit, since the factors exhibit statistical significance with p-values over 0.05. The total model fit was evaluated by using seven distinct fit indices, which together demonstrated a statistically significant positive association between Demographic Diversity and Personalized Learning Approaches.

Table 7 Model Fit Summary

Variable	Value
Chi-square value(χ^2)	72.339
Degrees of freedom (df)	33
CMIN/DF	2.192
P value	0.000
GFI	0.941
RFI	0.930
NFI	0.949
IFI	0.971
CFI	0.971
RMR	0.052
RMSEA	0.069

The quality of fit was acceptable representation of the sample data (χ^2 = 72.339), NFI (Normed Fit Index) =0.949; IFI (Incremental fit index) = 0.971, GFI (Goodness of Fit) = 0.941, RFI (Relative Fit Index) = 0.930 and CFI (Comparative Fit Index) =0.971 which is much larger than the 0.90. Similarly, RMR (Root Mean Square Residuals) =0.052 and RMSEA (Root mean square error of approximation) = 0.069 values is lower the 0.080 critical value**.** Results indicated a good fit for the model presented including RMSEA of 0.69, RMR of 0.052, GFI of 0.941, and CFI of 0.971.

H2: Integrating AI into ESL education impacts both opportunities and challenges, enhancing personalized learning while introducing technical and cultural hurdles.

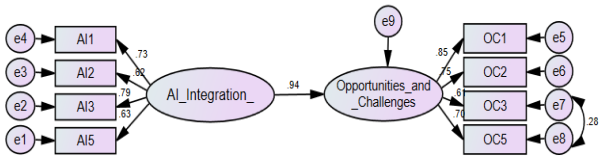

Table 8 Regression Weights: (Group number 1 - Default model)

PATH			Un std. Estimate	S.E.	Std. Estimate	C.R.	P
Opportunities and challenges	<---	AI Integration	1.257	.107	.940	11.712	***
AI5	<---	AI Integration	.836	.088	.635	9.462	***
AI3	<---	AI Integration	1.163	.098	.794	11.813	***
AI2	<---	AI Integration	.729	.079	.620	9.235	***
AI1	<---	AI Integration	1.000		.734		
OC1	<---	Opportunities and challenges	1.000		.853		
OC2	<---	Opportunities and challenges	.778	.060	.748	13.069	***
OC3	<---	Opportunities and challenges	.659	.066	.614	10.059	***
OC5	<---	Opportunities and challenges	.760	.063	.704	12.021	***

Table depicts a hypothetical structural equation model that show cases the interdependence between Two variables, namely the AI Integration, Opportunities and challenges. In the present model, the independent variable is the AI Integration, whereas the dependent variable is Opportunities and challenges. The findings of the investigation indicate a positive and statistically significant relationship between AI Integration, Opportunities and challenges (β=.940, P<.05).

The standardized coefficient of 0.940, a positive association between AI Integration, Opportunities and challenges, as shown in the route connecting these two variables. The correlation coefficient values (C.R. values) show large magnitudes, suggesting that the observed associations are statistically significant. The fit indices indicate that the model has a good fit, since the factors exhibit statistical significance with p-values over 0.05. The total model fit was evaluated by using seven distinct fit indices, which together demonstrated a statistically significant positive association between AI Integration, Opportunities and challenges.

Table 9 Model Fit Summary

Variable	Value
Chi-square value(χ^2)	38.652
Degrees of freedom (df)	18
CMIN/DF	2.147
P value	0.003
GFI	0.964
RFI	0.935
NFI	0.958
IFI	0.977
CFI	0.977
RMR	0.034
RMSEA	0.068

The quality of fit was acceptable representation of the sample data (χ^2 = 38.652), NFI (Normed Fit Index) =0.958; IFI (Incremental fit index) = 0.977, GFI (Goodness of Fit) = 0.964, RFI (Relative Fit Index) = 0.935 and CFI (Comparative Fit Index) =0.977 which is much larger than the 0.90. Similarly, RMR (Root Mean Square Residuals) =0.034 and RMSEA (Root mean square error of approximation) = 0.068 values is lower the 0.080 critical value**.** Results indicated a good fit for the model presented including RMSEA of 0.068, RMR of 0.034, GFI of 0.964, and CFI of .977.

H3: AI integration serves as a mediator between personalized learning approaches and their effectiveness in ESL education, optimizing tailored instruction for improved learning outcomes.

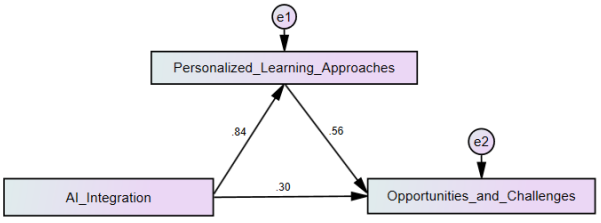

Table 10 Regression Weights: (Group number 1 - Default model)

Path			Unstandardized Estimate	S.E.	Standardized estimates	C.R.	P
Personalized_Learning_Approaches	<---	AI Integration	.954	.039	.841	24.544	***
Opportunities_and_Challenges	<---	AI Integration	.341	.076	.297	4.499	***
Opportunities_and_Challenges	<---	Personalized_Learning_Approaches	.566	.067	.560	8.468	***

The table provide a thorough knowledge of the mediating model including Personalized Learning Approaches, AI Integration, and Opportunities and Challenges. The use of AI Integration has a considerable direct influence on Opportunities and Challenges, with an unstandardized estimate of 0.341 ($p < 0.001$). This direct association shows that firms that use AI Integration are more likely to acquire high-quality applicants, independent of other circumstances. The relationship between AI Integration and Personalized Learning Approaches shows a significant unstandardized estimate of 0.954 ($p < 0.001$), suggesting that as organizations integrate more AI Integration and Personalized Learning Approaches increase. AI Integration has a strong indirect influence on Opportunities and Challenges via Personalized Learning Approaches, Finally, a significant unstandardized estimate of 0.566 ($p < 0.001$) indicates that Personalized Learning Approaches has a direct impact on recruiting high-quality applicants. As a result, the mediating model illustrates that, although the use of AI Integration directly improves Opportunities and Challenges, it also indirectly contributes to this outcome by positively influencing Personalized Learning Approaches.

Table 11 Standardized Indirect Effects (Group number 1 - Default model)

	AI Integration	Personalized_Learning_Approaches
Personalized_Learning_Approaches	.000	.000
Opportunities_and_Challenges	.471	.000

The standardized indirect effects table provides to the understanding of the mediating model that includes AI Integration, Personalized Learning approaches, and Opportunities and Challenges. First, AI Integration has an indirect influence on Opportunities and Challenges via Personalized Learning approaches, with a standardized indirect effect of 0.471 ($p < 0.001$). This number demonstrates how the influence of AI Integration on Opportunities and Challenges is mediated by changes in Personalized Learning approaches. Notably, the standardized indirect impact of Personalized Learning approaches on Opportunities and Challenges is also apparent, implying that Personalized Learning approaches has a direct influence on recruiting Opportunities and Challenges applicants. However, the standardized indirect effect of AI Integration directly on Personalized Learning approaches is negligible, implying that, while AI Integration may indirectly influence Opportunities and Challenges through Personalized Learning approaches, their direct impact on Personalized Learning approaches levels may be minimal. As a result, our results highlight the critical role of Personalized Learning approaches as a mediator in the link between AI Integration and Opportunities and Challenges.

Discussion:

The proposed hypotheses provide from the structural equation models help us understand how complicated ESL education is, especially when it comes to combining AI technology with individual learning methods. First, the data show that there is a strong positive link between population variety and the use of personalized learning techniques. This shows that it is important to adapt teaching methods to fit the needs of students from different backgrounds in order to teach effectively. Adding AI to ESL classes also comes with both possibilities and problems. The research shows that it can improve individual learning in a big way, but there are also technical and cultural problems that need to be solved. The interaction study also shows how AI integration, individual learning methods, and their effects on educational results are all connected in complex ways. Adding AI directly affects possibilities and challenges, but it also affects these things in a roundabout way by changing how personalized learning is done. This shows how important individual learning techniques are as a way to use AI to make sure that students get the best possible teaching for their needs in ESL classes. Overall, these results show how important it is to think about different racial and cultural groups, use AI technology, and adjust learning methods in order to successfully meet the many needs of ESL students.

9. CONCLUSION

The study aims at how ethnic variety, AI integration, individual learning methods, and their effects on ESL education all work together. First, the results show that there is a strong positive link between population variety and individual learning techniques. This means that it is important to adapt teaching methods to the needs of a wide range of students in order for them to learn effectively. Similarly, using AI in English as a second language (ESL) classes has a lot of potential, as shown by the fact that it helps with individual learning and dealing with technical and culture issues. In addition, combining AI with personalized learning methods makes them more successful. This means that AI has a direct effect on educational results, but personalized teaching methods make that effect even stronger. In particular, the study shows how important individual learning is as a link between AI integration and educational results. It also shows how important it is to adapt lessons to meet the different needs of English language learners. Overall, these results

show how important it is to change the way we teach to fit the needs of different groups of people and to use new technologies like AI to make learning more specific and help students do better in ESL classes.

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