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Research Article

The Role of Multiple Intelligences in EFL learners' Lexical and Grammatical Achievement: A Personalized Learning Facilitator?

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ABSTRACT

One of the pivotal factors in language learning is the critical role of intelligence, which has been steadily undisputed. Therefore, the present study aimed to examine the relationship between MIs (Multiple Intelligences) and vocabulary and grammar exam scores. 191 intermediate EFL (English as a Foreign Language) learners participated in this study. All the participants were administered the McKenzie's MIs questionnaire and the 9th graders' English final exam. The findings of multiple regression analysis revealed a significant association between logical and linguistic intelligences with vocabulary and grammar exam scores. It was concluded that learners' intelligence typically plays a vital role in their pedagogical path and can facilitate a purposeful Personalized Learning (PL) to enhance the quality of language pedagogy. The findings of the current study might have valuable implications for EFL teachers and learners, and relevant educational stakeholders.

Introduction

Gignac (2018, p. 440) defined human intelligence as "Maximum capacity to achieve a novel goal successfully using perceptual-cognitive [processes]." However, presenting a unanimously accepted definition for intelligence in an all-compassing manner entails challenges (Gignac & Szodorai, 2024).

Traditionally, intelligence was largely considered as test scores, memorization, linguistic, and mathematical abilities (Ackerman, 2022). However, Gardner's theory of MIs altered this conceptualization in education and introduced a plural view about intelligence and different functions that it can have (Madhkhan et al., 2024). According to Gardner's classification, intelligence constitutes eight types, including kinesthetic, musical, verbal-linguistic, special-visual, logical-mathematical, intrapersonal, interpersonal, and naturalistic intelligences. Later, Gardner (1999) discussed the possibility of a ninth one, called existential intelligence (Khan et al., 2025). In this study, the learners' level of MIs was measured through the MI questionnaire, designed by Walter McKenzie in 1999.

Learners' performance in various exams depends on their potential in MIs, which can make a difference in learning outcomes when instruction is adaptive in terms of learners' achievements (Malaran & Pañares, 2025; Taj et al., 2025). Gardner's framework delineates distinct intelligence types that somehow notably enhance the ease with which individuals acquire linguistic structures, employ language teaching methodologies, effectively develop linguistic skills, and ultimately progress in proficiency in performance tests (Tiansoodeenona & Sitthitikul, 2024). Recognizing the most suitable methods is an essential challenge for teachers in terms of MIs. According to Akrami (2025) and Assingkily et al. (2025), utilizing a variety of methods in the field of teaching that are adapted to MIs can significantly enhance involvement in class activities and tasks. Therefore, teachers who employed various strategies observed that students were more motivated when learning was in accordance with their dominant intelligence type. As an example, learners who had dominant bodily-kinesthetic intelligence often reacted to physical activities properly, while those with visual-spatial intelligence basically preferred activities based on visualization. Nevertheless, applying these varied approaches can be challenging due to limited time and the demands of the top-down curriculum, which often highlights conventional mental abilities (Harapan et al., 2024).

Vocabulary learning is considered a basic aspect of foreign language learning, not only crucial for successful learning outcomes (Aghajani et al., 2024) but also for improving language proficiency (Biseko, 2025). Lexical knowledge is the pivotal factor for strengthening the four main language skills (Salehi, 2025). Vocabulary learning has become progressively central in L2 research and pedagogy (Zarei & Asadi Amani, 2018). On the other hand, Grammar is described as the set of rules governing how sentences are constructed, with words arranged in orderly ways, along with the meanings attached to these structures (Mart, 2013). By being better aware of grammatical functions, learners' language use will be better controlled (Shakir & Mahmood, 2021). Accordingly, as Azizpour and Alavinia (2021) asserted, grammar instruction has been a hot topic of discussion in language pedagogy and plays a pivotal role in EFL learners' development of macro skills.

The problem originates from the absence of personalized education in designing curriculum for language acquisition. Aaccording to existing studies, PL provides a wide range of educational benefits (Chiu et al., 2023; Yildiz, 2023). Therefore, in order to design and implement a personalization-based model, it is essential to incorporate learners' individual characteristics, including types of

intelligence, into the language education context to fill this gap. This is particularly significant in the context of Iran because when it comes to the role of MIs in EFL textbooks in the Iranian educational system, there is a much wider gap in research compared to other educational communities (Tajabadi et al., 2024). This study was an attempt to partially fill this gap. Therefore, this study attempted to examine the role of MIs in the 9th grade English learners' final exam performance, consisting of both lexical and grammatical questions. Lim et al. (2025) highlight the importance of the role of learners' individual differences for educators in personalizing instructions according to learners' characteristics. The purpose of this study was to investigate the predictive power of types of MI on vocabulary and grammar achievement. The main purpose of the study was answering the following questions:

1. Which type of multiple intelligences is a better predictor of students' vocabulary learning?
2. Which type of multiple intelligences is a better predictor of students' grammar learning?

Literature Review

Historically, intelligence has been regarded as one of the determining factors influencing L2 learning, and numerous scholars have consistently investigated its related issues (Wang & Liu, 2023). According to Shearer (2018), intelligence can be systematically divided into general and multiple aspects in education. In this vein, Zhang (2024) described the former as: "automatic optimization ability of the action or value function of a system with a certain degree of conservatism" (P. 186). In general, Xu (2025) categorized multiple dimensions of general intelligence into cognitive, emotional, and cultural. The latter MIs theory was initially proposed by Howard Gardner, which markedly altered every traditional conception of intelligence that existed. Primarily, he introduced eight distinct intelligences: verbal or linguistic, logical or mathematical, spatial or visual, musical or rhythmic, bodily or kinesthetic, interpersonal, intrapersonal, and naturalistic intelligences. Gardner (1999) discussed the possibility of a ninth one, called existential intelligence, a few years later (Khan et al., 2025). An explanation for MIs appears below (Berrington, 2004, as cited in Yavich & Rotnitsky, 2020):

- **Verbal/Linguistic Intelligence:** The ability to use language effectively, whether in writing, speaking, or lecturing. People with strong linguistic intelligence can both understand the implicit meaning of sentences and express their thoughts efficiently.
- **Logical-Mathematical Intelligence:** The specific ability in the domain of reasoning skills, solving problems, and understanding how to work with numbers. The ability to think logically, recognize patterns, and apply mathematical concepts is the basic skill of this intelligence.
- **Spatial/visual Intelligence:** Any kind of ability to manipulate objects and visualize shapes and spaces mentally. It can be beneficial for reading maps, drawing pictures, and designing or imagining how things fit together.
- **Musical/rhythmic Intelligence:** Rhythm, pitch, and sound are the elements to which they have potential in this intelligence. People with this intelligence can better recognize, create, and enjoy musical content compared to others.

- **Bodily/Kinesthetic Intelligence:** Utilizing one's body to express ideas or perform tasks skillfully. Athletes, surgeons, and dancers often show strength in this area.
- **Interpersonal Intelligence:** Interpersonal people are capable of understanding and interacting with others perfectly. They have strong skills in empathy, communication, and sensitivity to others' feelings.
- **Intrapersonal Intelligence:** Intrapersonal people possess a strong awareness of their own emotions, strengths, and motivations. Self-discovery, evolution, and personal growth are the key concepts of this intelligence.
- **Naturalistic Intelligence:** Various elements in nature can be noticed, such as plants, animals, or on a broader scale, ecosystems, which is the ability of these people. Individuals who possess this strength easily enjoy exploration in nature and have a strong awareness of the environment.
- **Existential Intelligence:** These people regularly think about fundamental questions about humans or the universe. They always question why, how, and what about the reasons for everything.

As Jensen and Calvert (2014) and Sener and Cokcaliskan (2018) noted, each learner possesses varying degrees of these multiple intelligences, exhibiting strengths in some areas and weaknesses in others. In addition, they claimed that these intelligences also influence learning styles. In this regard, visual learners, as an example, prefer instructions that are based on visual elements such as PowerPoint presentations or pictures. In contrast, verbal learners prefer more writing and discussion-based activities. However, some learners tend to participate in engagements collaboratively and enjoy working with a group, while others learn through studying independently. Wu and Ye (2021) believed that MIs significantly benefit learners and educators. For instance, employing musical rhythm can adjust the pace of speech as well as help to have natural pauses. This can enhance students' ability to express their ideas transparently. Additionally, repeated review of content is essential for long-term L2 learning. Using different teaching methods can make the process more engaging, less repetitive, and allow learners to discover their suitable learning strategies. Alternatively, Tsai (2016) noted that most further education systems merely focus on linguistic and logical or mathematical intelligences for teaching, instructional materials, and assessment. However, utilizing the MIs model in education supports personalized learning in teaching, helps the learning process to have optimum instruction, and allows students to demonstrate their skills and strengths in how they learn (Afini et al., 2023).

According to Purwanto (2023) and Walela (2024), combining MIs with varied teaching strategies and customized learning materials is essential. They believe that educators, as the primary decision-makers in the educational process, should take into account the different intelligences of their students when planning instruction. As an example, linguistic intelligence is an inherent talent in language use to appropriately meet objectives, or interpersonal intelligence entails the skill to read and notice others' emotions, motivations, and intentions, which supports effective interaction. Intrapersonal intelligence, on the other hand, deals with awareness, self-motivation, and the ability to set personal goals internally (Wilson, 2018). On the whole, studying the different aspects of MIs requires a broader perspective. The more it is examined, the more its covert, yet significant,

effects on language learning emerge. Typically, MIs researchers have examined it specifically, but the role of MIs through the lens of PL is the aim of this study to fill the areas of gaps in this field.

In an empirical study investigating the role of multiple intelligences-based supplementary materials in EFL learning, Alishahi et al. (2025) carried out a research which had two stages. During the first stage, researchers created lesson-specific tasks for the Vision series textbook. In the second stage, experimental groups practiced these tasks alongside the standard textbook, whereas control groups studied only the textbook over four months. Each of the groups, consisting of 60 students, completed the Babel proficiency test and then the Payesh language achievement exam as pre- and post-intervention measures. The findings revealed that exposure to MI-based tasks positively influenced students' outcomes in learning a language.

Several studies have been conducted regarding MI and vocabulary learning. For example, Madhkhan (2024) investigated the effect of multiple intelligence-based activities on the vocabulary development of male and female Iranian EFL learners. Sixty students at Isfahan University of Technology, from both genders were selected and assigned to control and experimental groups. The OPT (Oxford Placement Test) and vocabulary pre-tests and post-tests were administered to assess learners' performance meticulously. Conventional tasks such as drills and reading aloud were conducted with the control group, while the experimental group engaged in multiple intelligence activities, including crossword puzzles, alphabetic coding, and map-based tasks. This kind of instruction lasted 12 weeks (2 hours per week). As a result, posttest data revealed that the experimental group significantly outperformed the control group, and males scored better than females in specific tasks. Findings suggest that intelligence-based activities can be enhanced to foster vocabulary learning.

In this vein, according to Jiang and Zhou (2020), the application of multiple intelligences-based tasks enriches instructional practices and significantly improves learners' vocabulary learning and word memorizing, respectively. Hajebi et al. (2018) explored the relationships among interpersonal intelligence, reading, and vocabulary learning. Their findings indicated that interpersonal intelligence did not predict vocabulary learning, while reading ability significantly influenced word knowledge. Another study conducted by Savojbolaghchilar et al. (2020) claimed that employing multiple intelligence-oriented thematic vocabulary instruction benefits EFL learners. Their results revealed that the experimental group, and particularly those with pronounced interpersonal intelligence, excelled in vocabulary learning tasks. Besides, Zarei and Afshar (2014) reported that learners' reading proficiency was shaped by their musical, interpersonal, mathematical, and bodily intelligences. Meanwhile, vocabulary knowledge appeared to be determined by a broader range of multiple intelligences, including musical, linguistic, visual-spatial, bodily, and naturalistic domains.

Javanmard (2012) investigated any possible associations between vocabulary test outcomes and MIs among Iranian EFL learners. Statistical analyses indicated no meaningful link between the type of intelligence and the learners' scores in vocabulary tests. Despite assumptions that linguistic intelligence would play the strongest role in vocabulary knowledge, the study showed that only musical

intelligence, coupled with kinesthetic intelligence, functioned as a predictor. A particularly unexpected outcome was that most types of intelligence were negatively related to vocabulary scores, suggesting an inverse relationship. The only exception was bodily-kinesthetic intelligence, which maintained a slight positive correlation. In a study by Razmjoo et al. (2009), the results showed a significant relationship between vocabulary learning and linguistic and natural intelligences.

Concerning grammar learning, Garavand et al. (2021) studied the potential relationship between intrapersonal intelligence and grammatical competence. A significant relationship was found between intrapersonal intelligence and grammar scores, suggesting the relevance of intrapersonal intelligence in grammar learning situations.

In a study conducted by Zarei and Mohseni (2012), MI analysis of 190 male and female students from Takestan Azad University, Karaj Azad University, and Imam Khomeini International University in Qazvin revealed that significant predictors of grammatical accuracy included intrapersonal and interpersonal intelligences. In another study, Saricaoğlu and Arikan (2009) found that L2 learners' MI identities were related to only some of the language skills. Grammar achievement correlated with bodily-kinesthetic, spatial, and intrapersonal intelligences, and writing was linked to musical intelligence.

Overall, most of the studies above have focused on the effects of MIs on learning vocabulary or grammar within other skills or sub-skills, and there is a gap in terms of the relationships that can exist between learners' MIs and improving grammar and vocabulary knowledge for their own sake. The present study aims to fill this gap.

Methodology

Participants

Ninth-grade students from a charter secondary school located in Qazvin were the participants of the present study. All the participants were male, aged 15 to 16, and participated with full consent in the data collection phase of this study. Based on the results of the placement test, the participants were selected when the academic year started. Then, the students with intermediate proficiency level were employed to reduce the potential impact of proficiency differences on the findings. Throughout the study, all the participants benefited from the same instructional materials and pedagogical approaches. Besides, an English final exam with identical questions was administered to all the students at the end of the academic year based on the contents of their English book.

Instruments and materials

In this study, the data collection tools included a placement test, the school's final exam, and an inventory of measuring MIs. The Oxford Quick Placement Test (OQPT) was administered to ensure a homogeneous sample. This is a valid and reliable instrument, designed to measure learners' grammatical and lexical level (Geranpayeh, 2003). The OQPT has a maximum of 60 points, and learners, based on their score on the test, are categorized as follows: beginner (1-17), elementary (18-27), lower-intermediate (28-36), upper-intermediate (37-47), advanced (48-55), and very advanced (56-60). Only those within the 28-47 range were considered intermediate for this research. Meanwhile, previous studies have confirmed the OQPT's reliability and construct validity (e.g., Aalaei et

al., 2025; Abbasi Dogolsara et al., 2022; Rashidi & Mirsalari, 2017). For this study, reliability was recalculated using the KR-21 formula, producing a coefficient of 0.71, which meets the threshold for acceptable reliability (George & Mallery, 2019; Harrison et al., 2021).

The next instrument was McKenzie's MI inventory, which was utilized to specify the learners' level in each type of intelligence. To this end, the Persian version of this inventory was given to the participants. They had 30 minutes to answer 90 questions. Each question was a simple, short statement explaining a specific ability, behavior, or priority. Hajhashemi and Wong (2010) examined the reliability of the Persian version of the questionnaire and reported its reliability (0.90), which indicates a high index. Besides, many researchers have used this questionnaire to measure the learners' MI practically (e.g., Razmjoo et al., 2009). Nonetheless, the reliability of the test was rechecked by using Cronbach's Alpha, and it turned out to be .87.

The English final exam was the last instrument that was designed by Qazvin Education Office experts based on the 'Prospect 3' book. This exam is developed every year and mostly needs 70 minutes to answer. The template of the questions is mostly based on grammatical points and lexical items, and the validity of the test was entrusted to the Ministry of Education experts. The reliability of the test has been checked by its experts as well. It is worth noting that in designing the final exam questions, experts annually follow a predetermined structure consistent with the coursebook objectives.

In this study, the main resource was the coursebook 'Prospect 3', which was designed for ninth-graders. This textbook consists of six lessons that address all the four language skills, along with sub-skills. The first lesson focuses on personality matters, and its grammar in this section revolves around describing and inquiring about personalities, particularly using the verb 'to be.' The second lesson introduces the topic of travel, with relevant grammar points, including the present continuous tense and expressions of possession. The third lesson describes festivals and ceremonies, while the grammar focuses on the simple present tense with main verbs and possessive adjectives. In lesson four, the topic is services, and the grammar emphasizes constructing sentences using WH-questions and frequency adverbs. The fifth lesson deals with media. The grammatical focus in the two final lessons is on the simple past tense (regular verbs in lesson five and irregular for lesson six), past forms of 'to be,' and object pronouns. The final lesson centers on health and injuries. All the lessons consist of relevant lexical items in the domain of the lesson topic. Students are provided with two books: a student book, consisting of 133 pages, and a workbook, which contains 97 pages.

Procedure

Initially, 230 ninth-graders were recruited through convenience sampling on the basis of availability. All the participants were taught by the same instructor, under the same conditions and teaching methodology. They were provided with detailed explanations regarding the research procedures. Their English proficiency level was measured through the OQPT within 30 minutes. Only those at an intermediate level whose scores were between 28 and 47 out of 60 were included, while advanced learners and beginners were excluded. The participants subsequently completed the Persian Multiple Intelligences Inventory to identify dominant intelligence domains. The official final exam

from the Qazvin Education Office, which focused on grammar and vocabulary from the Prospect 3 curriculum, served as the primary measure of performance. The final exam was administered in the classroom, whereas the MI inventory was completed online via links provided in the Shad application.

Data Analysis and Research Design

The study adopted a descriptive correlational design for both research questions. A standard multiple regression analysis was used to determine the extent to which the independent variables predicted the dependent variable. The collected data were analyzed using SPSS version 26 to address the research questions.

Results and Discussion

Results

The first research question was intended to find out which types of MI were predictors of vocabulary achievement. To this end, a multiple regression analysis procedure was utilized. To make sure that the results of the McKenzie's MI inventory are reliable, Cronbach's Alpha was checked. Results confirmed the reliability of the test (r = .87). Table 1 shows the summary of descriptive statistics. From among the intelligence types, the highest mean score is found in interpersonal intelligence (74.35) and bodily intelligence (70.41). These two types of intelligence appear to be the most developed among the participants. In contrast, the lowest mean score is in linguistic intelligence (58.62), followed by naturalist intelligence (64.36).

Table 1
Descriptive Statistics for Vocabulary Scores and MIs

	Mean	Std. Deviation	N
Vocabulary Scores	6.209	.9280	191
Naturalist	64.369	12.5130	191
Musical	68.270	14.1139	191
Logical	66.484	11.4231	191
Existential	67.974	11.8748	191
Intrapersonal	65.466	14.3346	191
Bodily	70.414	13.3383	191
Linguistic	58.626	14.4074	191
Interpersonal	74.351	11.7031	191
Visual	68.421	12.5252	191

Table 2 presents the Pearson correlation coefficients, which show the relationship between vocabulary scores and each intelligence type. Based on the Table, the highest correlations with vocabulary scores belong to logical and linguistic intelligences, respectively. While some intelligence types (naturalist, musical, intrapersonal) show very small, negligible correlations with vocabulary exam scores. The table also confirms that there is no evidence of multicollinearity.

Table 2
Correlations of Vocabulary Scores and MIs

		Vocabulary Scores	Naturalist	Musical	Logical	Existential	Intrapersonal	Bodily	Linguistic	Interpersonal	Visual
Pearson Correlation	Vocabulary	1.000	.032	-.012	.327	.164	.009	-.112	.206	.140	.157
	Naturalist		1.000	.585	.432	.658	.360	.456	.445	.418	.477
	Musical			1.000	.270	.538	.332	.412	.414	.417	.468
	Logical				1.000	.490	.416	.186	.477	.480	.486
	Existential					1.000	.399	.379	.414	.555	.520
	Intraperson						1.000	.393	.464	.416	.346
	Bodily							1.000	.284	.368	.380
	Linguistic								1.000	.322	.497
	Interperson									1.000	.432

		Vocabulary Scores	Naturalist	Musical	Logical	Existential	Intrapersonal	Bodily	Linguistic	Interpersonal	Visual
	Visual										1.000
Sig. (1-tailed)	Vocabulary	.	.332	.437	.000	.012	.453	.061	.002	.027	.015
	Naturalist		.	.000	.000	.000	.000	.000	.000	.000	.000
	Musical			.	.000	.000	.000	.000	.000	.000	.000
	Logical				.	.000	.000	.005	.000	.000	.000
	Existential					.	.000	.000	.000	.000	.000
	Intraperson						.	.000	.000	.000	.000
	Bodily							.	.000	.000	.000
	Linguistic								.	.000	.000
	Interperson									.	.000
	Visual										.
N	Vocabulary	191	191	191	191	191	191	191	191	191	191

As it is shown in Table 3, the nine types of intelligence as predictors account for 18.6% of the variation in students' vocabulary scores. The adjusted R-square (14%) is slightly lower, as expected, showing that the model still explains a meaningful portion of the vocabulary performance even after the adjustment.

Table 3
Model Summary[b] for Vocabulary Scores and MIs

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.431[a]	.186	.145	.8579	.186	4.588	9	181	.000

a. Predictors: (Constant), Visual, Intrapersonal, Bodily, Interpersonal, Musical, Linguistic, Logical, Naturalist, Existential
b. Dependent Variable: Vocabulary Scores

It can be seen that the ANOVA table indicates that the model is statistically significant, meaning that the nine intelligences collectively play a significant role in predicting vocabulary performance. Thus, at least one of the predictors has a meaningful relationship with vocabulary scores.

Table 4
ANOVA[a] for Vocabulary Scores and MIs

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	30.396	9	3.377	4.588	.000[b]
	Residual	133.227	181	.736		
	Total	163.623	190			

a. Dependent Variable: Vocabulary Score
b. Predictors: (Constant), Visual, Intrapersonal, Bodily, Interpersonal, Musical, Linguistic, Logical, Naturalist, Existential

To determine how much each of the nine predictors contributed to differences in vocabulary knowledge, the standardized coefficients and the significance of each predictor's t-value were examined. A summary of these results is shown in Table 5. Of the nine predictors, only logical and linguistic intelligences, with 30% and 17%, respectively,

significantly predict vocabulary performance, suggesting that vocabulary learning correlates more with analytical ability and language-based intelligence than with non-linguistic intelligences. In other words, about .30 and .17 of a standard deviation change in one's vocabulary score occurs for every one standard deviation change in one's logical and linguistic intelligences, respectively.

Table 5

Coefficientsa for Vocabulary Scores and MIs

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	5.060	.497		10.174	.000		
	Naturalist	-.010	.007	-.141	-1.407	.161	.445	2.247
	Musical	-.006	.006	-.096	-1.058	.292	.549	1.822
	Logical	.024	.007	.300	3.327	.001	.554	1.806
	Existential	.012	.008	.155	1.514	.132	.430	2.326
	Intrapersonal	-.010	.005	-.156	-1.873	.063	.645	1.550
	Bodily	-.010	.006	-.147	-1.795	.074	.670	1.492
	Linguistic	.011	.006	.178	2.039	.043	.590	1.694
	Interpersonal	.004	.007	.053	.598	.550	.578	1.729
	Visual	.003	.007	.042	.464	.643	.558	1.792

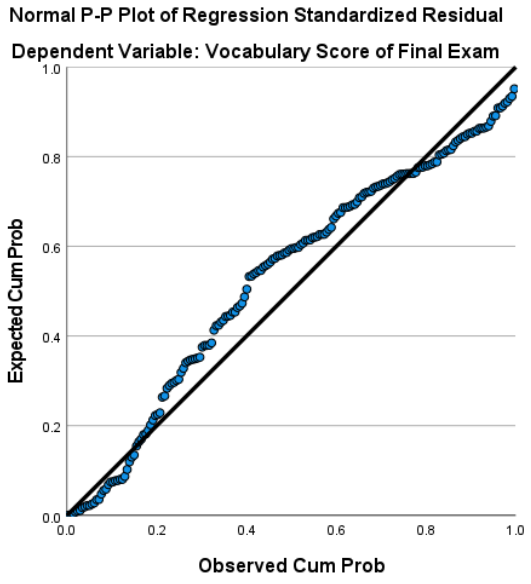
a. Dependent Variable: Vocabulary Scores

Identifying multivariate outliers is essential to avoid possible influences on the model (Kline, 2019; Leys et al., 2018). According to Olive (2008), by utilizing the Mahalanobis Distance (MD) and Cook's Distance (Cook's D), outliers can be detected. Further examination of the data showed that the maximum MD is 33.08, which exceeds the Chi-square critical value of 27.88 for nine predictors. However, because the Cook's D remains below the threshold of 1, no influential cases would distort the results of the analysis.

As can be observed in Figure 1, the deviation of points from the diagonal is minimal. In addition, the distribution is generally normal, showing only minor bends in the middle that are still acceptable.

Figure 1

The Normal P-P Plot for the Regression Model Predicting Vocabulary Scores



The second research question examined which types of MI could predict students' grammar knowledge. To address this question, another standard multiple regression analysis was carried out. Table 6 presents the descriptive statistics for the grammar test

scores and the nine types of MI. The MI variables show moderate to high mean scores, indicating that students generally perceive themselves as possessing these intelligences to varying degrees. From among the MI categories, Interpersonal (74.35) and bodily (70.41) show the highest means, suggesting that these intelligences are more strongly represented in the sample. In contrast, linguistic intelligence shows the lowest mean (58.62), indicating a comparatively weaker performance in this domain.

Table 6

Descriptive Statistics for Grammar Scores and MIs

	Mean	Std. Deviation	N
Grammar Score of Final Exam	7.458	1.8139	191
Naturalist	64.369	12.5130	191
Musical	68.270	14.1139	191
Logical	66.484	11.4231	191
Existential	67.974	11.8748	191
Intrapersonal	65.466	14.3346	191
Bodily	70.414	13.3383	191
Linguistic	58.626	14.4074	191
Interpersonal	74.351	11.7031	191
Visual	68.421	12.5252	191

According to Table 7, which shows the correlation coefficients between grammar scores and the nine types of MI. The results show that grammar performance is positively correlated with several MI types, particularly logical and linguistic intelligences. These correlations indicate that students with stronger abilities in these areas tend to achieve higher grammar scores. Overall, the findings point to a stronger connection between grammar learning and cognitively oriented intelligences, particularly logical and linguistic domains. Meanwhile, there is no threat of multicollinearity because there is no strong correlation index among the predictor variables to cause concern in this regard.

Table 7

Correlations of Grammar Scores and MIs

		Grammar Scores	Naturalist	Musical	Logical	Existential	Intrapersonal	Bodily	Linguistic	Interpersonal	Visual
Pearson Correlation	Grammar	1.000	.059	.024	.413	.140	.009	-.151	.247	.168	.175
	Naturalist		1.000	.585	.432	.658	.360	.456	.445	.418	.477
	Musical			1.000	.270	.538	.332	.412	.414	.417	.468
	Logical				1.000	.490	.416	.186	.477	.480	.486
	Existential					1.000	.399	.379	.414	.555	.520
	Intraperson						1.000	.393	.464	.416	.346
	Bodily							1.000	.284	.368	.380
	Linguistic								1.000	.322	.497
	Interperson									1.000	.432
	Visual										1.000
Sig. (1-tailed)	Grammar	.	.209	.371	.000	.026	.453	.019	.000	.010	.008
	Naturalist		.	.000	.000	.000	.000	.000	.000	.000	.000
	Musical			.	.000	.000	.000	.000	.000	.000	.000
	Logical				.	.000	.000	.005	.000	.000	.000
	Existential					.	.000	.000	.000	.000	.000
	Intraperson						.	.000	.000	.000	.000
	Bodily							.	.000	.000	.000
	Linguistic								.	.000	.000
	Interperson									.	.000
	Visual										.
N	Grammar	191	191	191	191	191	191	191	191	191	191

Table 8 tells us that the model, as a whole, explains 26.7% of the variance in grammar scores, and the adjusted R-square 23%.

Table 8

Model Summary[b] for Grammar Scores and MIs

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.516[a]	.267	.230	1.5916	.267	7.312	9	181	.000

a. Predictors: (Constant), Visual, Intrapersonal, Bodily, Interpersonal, Musical, Linguistic, Logical, Naturalist, Existential

b. Dependent Variable: Grammar Score

Table 9 reports the ANOVA results for the regression model, which shows the significance of the model. As a result, there is at least one predictor that has an association with grammar scores.

Table 9

ANOVA[a] for Grammar Scores and MIs

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	166.686	9	18.521	7.312	.000[b]
	Residual	458.479	181	2.533		
	Total	625.165	190			

a. Dependent Variable: Grammar Score

b. Predictors: (Constant), Visual, Intrapersonal, Bodily, Interpersonal, Musical, Linguistic, Logical, Naturalist, Existential

Table 10 presents the Beta coefficient and significance level of the observed t-value for each of the intelligence types that contributed to the regression model. From among them, logical and linguistic intelligences make significant positive contributions to grammar scores. Meanwhile, bodily and intrapersonal intelligences are negatively related. Logical intelligence has the strongest association, as indicated by its highest coefficient (B = .41). Other intelligences, such as musical, naturalist, existential, interpersonal, and visual, do not significantly predict grammar performance. It is noteworthy that, despite the MD being higher than the critical value, the Cook's D of 0.06 was far below the limit point of 1, confirming that no influential outliers adversely affected the model.

Table 10

Coefficients[a] of Grammar Scores and MIs

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	4.760	.923		5.159	.000		
	Naturalist	-.014	.014	-.095	-.998	.319	.445	2.247
	Musical	-.004	.011	-.028	-.326	.745	.549	1.822
	Logical	.066	.014	.418	4.891	.000	.554	1.806
	Existential	.004	.015	.023	.241	.809	.430	2.326
	Intrapersonal	-.023	.010	-.185	-2.339	.020	.645	1.550
	Bodily	-.028	.011	-.206	-2.655	.009	.670	1.492
	Linguistic	.025	.010	.196	2.372	.019	.590	1.694
	Interpersonal	.013	.013	.084	1.005	.316	.578	1.729
	Visual	.004	.012	.027	.313	.755	.558	1.792

a. Dependent Variable: Grammar Score

Meanwhile, the P–P plot was used to assess the normality of residuals in the regression model. The points fell mostly near the diagonal line, showing that the residuals were close to a normal distribution. Overall, the normality assumption for the grammar regression model was satisfied.

Discussion

The results of the study showed a significant relationship between MIs and the vocabulary and grammar test scores. From a theoretical perspective, Gardner (1999) categorized learners according to individual differences in his theory of MIs. He asserted that intellectual features can explain why some learners perform more successfully in certain skills or domains of knowledge than in others. This view aligns with Information Processing Theory (Atkinson & Shiffrin, 1968), which posits that all learners are distinct in the way they process and internalize information. In addition, Individual Differences Theory (Dörnyei, 2006) further confirms the role of learner differences in shaping learning processes.

Several studies, in line with our study, have confirmed that MIs correlate with vocabulary learning (Ćirić Ognjenović, 2024; Fardad, 2015; Javanmard, 2012; Madhkhan et al., 2024; Ramzjoo et al., 2009; Skourdi et al., 2012; Zarei & Afshar, 2014). The purpose of this study was to examine MIs through the lens of PL based on L2 pedagogy implications. In Zarei and Afshar's (2014) study, the most prominent predictors of vocabulary knowledge were kinesthetic, musical, linguistic, naturalistic, and visual intelligences. From among these, musical intelligence contributed the most to vocabulary performance. This can be due to the feature of encoding information by learners who possess higher musical intelligence and can memorize vocabulary more efficiently when they find patterns through bridging what they have learned and the things that they learn (Thompson et al., 2025). In the current study, however, linguistic and logical intelligences were the primary contributors to vocabulary scores. A main difference between the two studies lies in the participants: Zarei and Afshar's research involved university students of both genders, whereas our study had different participants.

According to Javanmard (2012), of the MIs, only musical and bodily intelligences showed a positive relationship with vocabulary test scores. Musical intelligence was discussed earlier, but unlike this study, our study showed an inverse relationship with bodily intelligence. One possible reason for the difference between Javanmard's findings and those of the present study is that his research represents one of the earliest investigations of multiple intelligences in the Iranian context, conducted at a time when the concept was relatively novel. Naturally, learners' vocabulary learning in those years was influenced by teaching methods, learning strategies, and environmental factors affecting cognitive abilities, which differ from the conditions experienced by today's learners. Moreover, all the participants in that study were English language teaching students, who likely possessed a higher level of vocabulary knowledge. In a related study, Panahi (2012) found that spatial intelligence notably contributed to improving vocabulary performance remarkably. Other studies, such as Skourdi et al. (2012) and Sogutlu (2018), corroborate our findings by reporting a positive relationship between linguistic intelligence and logical intelligence and vocabulary outcomes, respectively. These

results can be relevant to what has been previously stated, that learners with verbal intelligence can write, lecture, and understand the meaning of sentences better. Moreover, logical intelligence facilitates the challenges of problem-solving, reasoning skills, and recognizing patterns.

With regard to grammar, Sogutlu (2018) explored the relationship between grammar outcome and multiple intelligences, finding no statistically significant negative association between grammar scores and the bodily and interpersonal intelligences. It is worth noting that the analysis only focused on these two types of intelligence, disregarding the potential influence of other types of intelligence. The study included only 64 participants, all of whom were female EFL learners, which may limit the generalizability of the results. In another study, Zarei and Mohseni (2012) reported interpersonal and intrapersonal intelligences as the best predictors of grammar knowledge based on their findings. In contrast, the present study found that logical and linguistic intelligences had the most significant contribution to grammar performance. One possible justification for the difference from Zarei and Mohseni's findings is that their study focused on university students and included both genders, which may have influenced the results. Shayeghi and Hosseinioun (2015) observed a significant positive relationship between both linguistic and interpersonal intelligences and grammatical knowledge. Nevertheless, the findings of this study may have been affected by its fairly small sample size.

Ćirić Ognjenović (2024) argued that musical, existential, logical, linguistic, and spatial intelligences are positively correlated with grammar outcomes. Except for musical and spatial intelligences, other findings are similar to those of our study. It is worth noting that in this study, all major skills were examined, and vocabulary and grammar were inseparably examined within those skills. Additionally, this study was carried out in another context with Serbian males and females from different grades at school, who had varied language proficiency. The number of participants was approximately half that of our study. As a result, it is reasonable that, in the present study, linguistic and logical intelligences had the greatest influence on both vocabulary and grammar test scores, as these two intelligences are closely related (Kanwal et al., 2020).

Conclusion and Implications

Considering types of MI, the multiple regression analysis results showed that logical intelligence had the strongest association with vocabulary test scores, followed by linguistic intelligence. Meanwhile, in terms of grammar scores, logical and linguistic intelligences had a statistically significant predictive role. It may be concluded that learners' individual characteristics differentially contribute to L2 learning. As Wang (2024) asserted, by providing localized materials, many pedagogical stakeholders, including teachers, students, parents, curriculum designers, and virtual content and application creators will be capable of facilitating the process of language learning. In this vein, learners' potential capabilities, talents, and strengths will be developed. Furthermore, this study confirms the admission criteria of language students in university, similar to Barkaoui et al. (2025), making purposeful decisions in selecting majors (Sylaska & Mayer, 2024), and selectivity, particularly in higher education programs (Kopecny & Hillmert, 2025). Families and universities should be more

selective in admitting English language majors more deliberately by considering learners' potential. More precise and systematic guidance for students in all fields of study can foster their academic growth and help to accelerate their achievement in the leaning process.

As discussed earlier, this study was conducted to investigate the relationship between MIs and lexical and grammatical achievements. As findings showed, language learning is associated with the MIs. Our results emphasize that the meticulous selection of language teaching methods and relevant learning materials plays a significant role in improving the quality of language learning. Moreover, it may also be concluded from our findings that the process of implementing PL can be facilitated with purposeful direction in L2 pedagogy. Similar to Dumont and Ready (2023) and Amiri et al. (2024), raising awareness among students and relevant educational stakeholders about individual learner characteristics can boost learning achievements, support equity in education, and reduce unnecessary expenditures of time and resources.

It may also be inferred that utilizing structured and analytical approaches in all stages of desining instructional materials and selecting teaching methods can help certain learners achieve better outcomes in lexical and grammatical learning. Meanwhile, instructional practices should be aligned with this approach. In essence, the findings demonstrate that PL in L2 teaching instructions improves learning effectiveness. Furthermore, the results highlight the importance of considering individual learner differences. These findings may be beneficial for all of the educational stakeholders.

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