



## Artificial Learning Environment and Learning Independence in Arabic Learning: Mediating Effect of Learning Creativity

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### ABSTRACT

**Purpose:** This study aimed to examine the influence of artificial learning environment, the learning independence, and learning creativity in the achievement of learning Arabic by students at the Darul Ukhuwah Islamic Boarding School, Malang. The research also aimed to examine the mediating effect of learning creativity in relationship between artificial learning environment, learning independence, and Arabic learning achievement. **Method:** This research involved 388 students studying at Darul Ukhuwah Islamic boarding school. Data was collected through the survey method via the Google form, which was distributed via WhatsApp groups and emails. Data were analyzed using SmartPLS 3.9 and SPSS programs.

**Result:** This study found that the artificial learning environment and the level of student learning independence significantly affected students' achievement in learning Arabic. This study also explained that students' learning creativity mediated the relationship between artificial learning environments and the level of student teaching independence with achievement in learning Arabic.

**Research implications:** This research explored how strategies should be implemented to maximize the role of the learning environment to increase learning achievement and creativity to improve student achievement in learning Arabic. Since it was limited to a quantitative approach, in-depth qualitative researches could expose better learning environments to improve student achievement.

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## Introduction

Students' learning achievements are determined by the teaching and learning environment and the activities that involves teachers, students, and schools. Any experience gained by students at school ultimately influences their learning achievements, both cognitively, affectively, and on their psychomotor skills (Biggs, 2012). Learning achievements show the level of success of students in achieving the learning objectives and goals that have been set in a study program (Mubarok, Dinangsit, & Lengkana, 2022). These achievement includes students' abilities in the form of mastery of knowledge, attitudes, and skills achieved in learning after they carry out learning activities (Kizlik, 2015). They also describe students' fundamental ability as a result of efforts from certain activities, and the results that can be measured.

The measuring tool of learners' achievement commonly used to measure the level of success of students is an assessment or what is known as a test (Kibble, 2017). The achievement in these tests reflects how students have academically excelled in each field of their specialization (Nicholls, 1978). Academic excellence is usually expressed as learning achievement in the form of grades, letters, and numbers. However, there are many other factors that can measure students' learning success. Learning success is also a reflection of the process of changes in students. Changes resulting from the learning process are reflected in various forms, such as knowledge, understanding, attitudes and behavior, skills, abilities, habits, and other aspects of learners (Gagne, 1984).

In the context of the current study, the factors influencing the success of learning and teaching of the Arabic language are significant to understand. Several key factors can influence the success of learning and teaching Arabic. Many internal and external factors influence success in the Arabic learning achievement. In general, the factors that influence Arabic learning processes and achievements can be classified into four, namely the material being studied (Tomlinson, 2012); the environment that surrounds students (Erdogdu, 2022); instrumental factors (Shi, Wang, & Ding, 2022); and the physical and psychological conditions of students (Al-Zoubi & Younes, 2015).

Several previous studies have confirmed that the learning environment with various types is one of the critical factors that influence student learning achievements, such as the socio-economic environment (Dudaite, 2016), environment-based teaching (Bartosh et al., 2009), and the educational environment in general (Ali et al., 2023). Likewise, learning independence is a significant predictor that influences student learning achievement (Setyaningsih et al., 2023) because students with an independent learning attitude will focus more on achieving their learning goals. Therefore student learning independence affects their learning achievement (Adams et al., 2012). However, research that uses creativity as a mediation factor that can increase the influence of the learning environment and student learning independence on their learning achievement still needs to be made available. Even according to our assumption, high creativity is predicted to increase student achievement significantly (Gajda, Karwowski, & Beghetto, 2017). In addition, research examining the influence of these factors in learning Arabic is also rare.

Keeping the research gaps in mind, this study aimed to examine how far environmental factors and conditions of students' learning independence affects their learning achievements in Arabic learning. This study also aimed to measure whether the level of

students' creativity mediated the relationship between environmental factors and student independence with their Arabic learning achievements.

## Literature Review

### • *Factors Affecting Arabic Learning Achievement*

Arabic is often considered a complex and challenging language to learn (Al-Busaidi, 2015; Bergman, 2009). There are many factors that affect the level of difficulty in learning this language. The factors influencing the success of learning and teaching Arabic are also critical to understanding this language and speak and write it effectively. Several key internal and external factors can influence the success of learning and teaching Arabic. The internal factors come from the intrinsic level hinting at the learner's psychological aspects, such as motivation or intention to learn (Ghenghesh, 2010), learning independence (Eriyanto, Roesminingsih, & Soeherman, 2021), and creativity (Gajda et al., 2017). At the same time, the external factors in the learning process come from outside the students, extrinsic to the environment (Erdogdu, 2022), which includes among other factors, the role of teachers and parents (Nunes et al., 2023).

The learning environment is one of the main factors in the learning process. Students exposed to an environment that supports learning Arabic will have a greater chance of mastering it (Elkhafafi, 2005). An environment rich in Arabic, through daily conversation and media such as books, games and films, can help students develop their outcomes (Abdul Ghani et al., 2022). In addition, the teacher's role is also significant in the process of learning Arabic. Teachers who have in-depth knowledge of the teaching material and effective teaching methods are able to help students overcome barriers to learning this language. The teacher's creativity in conveying the fabric can make learning more exciting and fun (Nunes et al., 2023).

Even though Arabic is considered complex and challenging, it is possible to learn this language with the support of a good learning environment, the role of an effective teacher, and the independence of student learning. The difficulties in learning Arabic can be overcome and good Arabic language skills can be achieved. For this purpose, students need to have independent learning in order to be successful in learning this language (Eriyanto et al., 2021). Self-motivation, discipline, and the willingness to keep practicing are essential elements to build up independent learning in students to overcome difficulties in learning Arabic (Havidz & Mujakiah, 2023).

### • *Artificial Learning Environment*

An environment can be defined as everything that exists in the natural life of human beings with a specific meaning that influence on individuals. The environment most often refers to natural environment and biophysical environment that affects human behavior, growth, development, and life processes. At the same time, the learning environment or educational environment is everything that surrounds the ongoing process of education or everything around students that influences the behavior and development of students in the learning process. This learning environment includes the formal education, non-formal education, government agencies, and environment interest groups (Archie & McCrea, 1996).

Walgito (2010) states that the learning environment consists of place, environment, tools, time, and association. Such an environment that is calm, comfortable, and away from noise is conducive to learning, when students can concentrate and absorb lessons easily. A less conducive environment will disrupt the learning process, which makes it difficult for students to absorb lessons easily. The educational background includes the physical environment, social environment, intellectual environment, and other social, economic, social-political, and aesthetic values (Fraser, 2002).

The artificial learning environment in this study is a series of learning environments deliberately created, shaped, and modified by humans according to their needs to support the teaching and learning process (Nugrawiyati, 2015). Moreover, the artificial environment is intentionally created or designed beforehand by humans so that the school can use it for the learning process, both inside and outside of class hours, such as in the form of student assignments or in a particular time that has been prepared (Efendi, 2013). In a learning process, the artificial environment stimulates individuals, and vice versa; individuals also respond to the environment. In this process of interaction can occur changes in individual behavior (Land & Jonassen, 2012), which can be both positive and harmful.

- ***The Effect of Artificial Learning Environment on Arabic Learning Achievement***

Learning achievement is the result of a learning activity that has been done either individually or in groups. It cannot be separated from learning activities because learning is a process while learning achievement is an outcome of the learning process. Learning achievement is divided into five aspects: intellectual abilities, cognitive strategies, verbal information, attitudes, and skills. According to Bloom, learning achievements are divided into three aspects: cognitive, affective, and psychomotor (Forehand, 2010).

The artificial learning environment that students are exposed to in school can significantly influence the learning achievement. This environment includes technology integration, environmental engineering, and teacher creativity, ultimately influencing how students improve their studies. Teachers need to create an artificial learning environment that benefits their students and can improve learning achievement. Such ways can be explored that improves learners' proficiency in Arabic by utilizing an artificial learning environment. This fact could involve encouraging teacher creativity, increasing support from environmental engineering, and exploring the influence of technology on student success. With more research in this field, it is possible to understand how to make meaningful changes to the learning process, ultimately leading to better achievements for students regarding improved Arabic learning achievement.

If students' learning environment is comfortable and supports learning, it will undoubtedly expedite the learning process and vice versa; an unsupportive climate, however, hinders student learning activities. A supportive learning environment will create conducive learning activities so that students can concentrate on learning Arabic, and the learning achievements achieved by students can increase. However, unfortunately not all of these learning environments are available properly according to the expectations of teachers or parents. Therefore, teachers, parents, and the community must create their environment by engineering the background so that it is conducive to students' learning and teaching needs. Especially in learning Arabic, which is difficult and complex, the

engineering of the learning environment, both the place, the atmosphere, the tools, the time, and the association, needs to be created so that students are stimulated to learn Arabic well, enthusiastically, and comfortably. From this explanation, the researcher proposes a hypothesis:

*H1. A good artificial learning environment can improve students' Arabic learning achievement.*

- ***Learning Independence and its effect on Arabic Learning Achievement***

Learning independence is a learning activity carried out actively and is driven by the intention to master a specific competency to solve problems and is built with the provision of knowledge or competencies that have been possessed (Mulyono, 2017). Learning independence can also be interpreted as learning activities that are driven by their own will and choice and are accompanied by a sense of responsibility from the learner. Independent learning activities are marked by motives that encourage someone to learn and not by the physical appearance of learning activities. In liberated learning activities, the teacher's role is to foster students' intentions and interest in learning rather than forcing them to learn (Hasibuan, Saragih, & Amry, 2019).

Learning independence is not an innate trait inherent in individuals from birth but a trait whose development is influenced by many factors, such as the environment. The factors that influence learning independence are genes, parenting, school education systems, and living systems in society (Cahyana, Supatmi, & Rahmawati, 2019). The indicators of student learning independence are not expecting direction from others, self-confidence, original attitude or not just imitating others, and wanting to try it yourself. Learning independence is also marked by several indicators, such as; does not depend on others; being self-confident; disciplined behavior; having own initiative; being responsible; and having self-control (Subagiyo, 2019).

Learning independence is a condition in which a student has the drive or motivation to learn to compete and advance for his good. In addition, an independent student takes the initiative, is creative, and can make decisions to overcome problems encountered in learning Arabic. Independent students are also confident in their abilities and are responsible for the learning activities they undertake. Because of the characteristics of independent learning that exist in him, his learning achievement is assumed to increase. Conversely, for students who are less independent in education, it is considered that their learning achievement could be more optimal. From this explanation, the researcher suspects:

*H2. Learning independence has a positive effect on increasing students' Arabic learning.*

- ***Learning Creativity and Its Influence on Arabic learning achievement***

Creativity is often interpreted as the ability to think of new things, a power that reflects originality in thinking, and the ability to elaborate on an idea (Riccardi, 1998). It is an attitude or mental ability and a unique skill possessed by someone with which it can produce something unique, original, novelty, beautiful, efficient, on target, and effective (Davis, 2011). Learning creativity is the ability to learn to be able to find a way out of old ideas to new ideas and develop them into high-quality pictures. Among the indicators of learning creativity are the attitude of not depending on others, being able to experiment,

being quick and responsive in receiving lessons, taking time to learn, and having the courage to express opinions (Munandar, 2004).

Many factors cause the emergence of learning creativity in students, both internal and external factors (Rubenson & Runco, 1992). Internal factors are more influenced by the child's innate factors from birth, and external factors are other factors outside a person's self, such as environmental factors, upbringing, and so on. The environment in which individuals grow and develop can support the development of creativity. However, on the other hand, there are also environmental factors that hinder the development of individual creativity. The invention of a student can be used to deal with the learning problems they face by looking for various alternative solutions to improve their learning achievement (Selvi, 2007).

Arabic is a language that is difficult for students to learn. It requires students' seriousness to learn it. The results are also standard if students are unmotivated to study and rely only on the typical learning process. Therefore, creativity is needed to increase the maximum effects of learning Arabic. Learning creativity is becoming increasingly important in achieving positive results in improving Arabic learning achievement. Studies have shown how learning creativity can significantly influence student, school, and teacher learning achievement. Such studies show that encouraging learning creativity makes students more likely to achieve tremendous success in their studies. Schools and teachers need to recognize the value of learning creativity and take steps to promote it in the classroom so that Arabic learners can reach their full potential. From this explanation, the researcher assumes a hypothesis:

*H3. Learning creativity can improve students' Arabic learning achievement.*

- ***The Role of Creativity in Mediating the Relationship between Artificial Learning Environment, Learning Independence, and Student Achievement in Learning Arabic.***

The artificial learning environment is an innovative concept that uses technology to create engaging and interactive learning experiences (Winn, 2003) in offline and online environment (Aydoğdu, 2020). Students can learn independently in this environment through various resources such as live libraries, videos, mobile applications, and e-learning platforms, where the role of creativity becomes essential. Creative teachers can create exciting learning strategies and inspire students to learn Arabic more actively. They can use innovative methods such as educational games, collaborative projects, or interactive simulations to increase students' interest and motivation in learning Arabic.

Previous research revealed that creativity mediating relationship between student character improvement and environment (Halek & Utomo, 2021). Creativity also plays a vital role in mediating between independent learning and achievement in learning Arabic. Creativity is essential in learning Arabic because this language has unique and complex characteristics (ElJundi et al., 2019). Creativity allows students to discover new ways of understanding (Reid & Petocz, 2004) and using Arabic, increasing their communication ability. With creativity, students will experience a more exciting and meaningful learning experience to improve their learning achievement in Arabic.

In conclusion, creativity is essential in mediating the relationship between the artificial educational environment, independent learning, and Arabic learning achievement. Creative teachers can create exciting and relevant student learning experiences through technology and innovative ideas. With this creative approach, students are expected to develop a better interest and understanding of the Arabic language and achieve optimal learning achievement. From this explanation, two hypotheses are concluded as follows:

H4. Creativity mediates the relationship between the artificial learning environment and Arabic learning achievement.

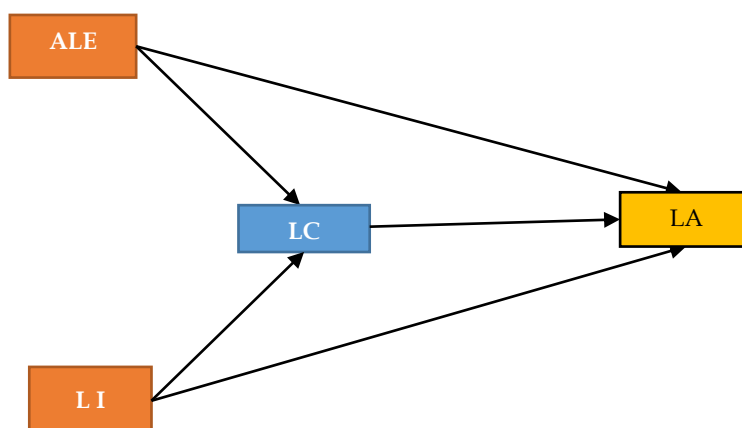
H5. Learning creativity moderates the relationship between learning independence and achievement in learning Arabic.

## Method

### • Research design

This study used a quantitative approach with a descriptive correlational research design that connects various variables to determine the relationship or effect between one variable and another (Seeram, 2019). This type was chosen because the researcher saw the suitability of the criteria for this type of research with the characteristics of the research being carried out. The variables measured in this study are the artificial learning environment (ALE), learning independence (LI), learning creativity (LC), and language achievement (LA) in Arabic. There are two types of measurements to be tested, namely first, measuring the direct relationship between the effect of artificial learning environment (ALE), learning independence (LI), and learning creativity (LC) on learning achievement (LA) and second, measuring whether learning creativity (LC) moderates the relationship between artificial learning environment (ALE) and learning independence (LI) with Arabic learning achievement (LA).

To make it easier for readers to understand the framework of this study, Figure 1 presents the research model:



**Figure 1.** Research model and hypotheses of Research.

Note: ALE: Artificial learning environment, LI: Learning independence, LC: Learning creativity, LA: Learning achievement



Figure 1 shows how the research model was structured and how the relationships between variables were determined. This relationship is manifest in the hypotheses derived:

H1-Artificial learning environment has a positive effect on improving students' Arabic learning achievement.

H2-Learning independence has a positive effect on increasing students' Arabic learning.

H3-Learning creativity has a positive effect on improving students' Arabic learning achievement.

H4-Creativity mediates the relationship between the artificial learning environment and Arabic learning achievement.

H5-Learning creativity mediates the relationship between learning independence and Arabic learning achievement.

#### • *Research Sample*

This research was conducted at Darul Ukhuwwah Islamic Boarding School Malang, which had a combined strength of 1217 students in its junior high school and senior high school. There were 611 junior high school students and 606 senior high school students. Not all students were involved as respondents in this study. The sample was determined by employing single-stage clustering random sampling (Simkus, 2022). The sample was selected based on class groups at the junior high school and senior high school levels. Utilizing the random sampling method, and a questionnaire through WhatsApp, email, and Telegram, a total of 400 students were sampled, with 200 students from junior and senior high schools. However, after checking the completeness of the questionnaire, it was found that only 388 data met the requirements for analysis. After being classified, it was found that the junior high school group had the sample of 197 students, while the senior high school group comprised 191 students.

#### • *Research Instruments*

Four variables to be tested in this study included: artificial learning environment, learning independence, learning creativity, and learning achievement. The indicators used to measure the learning environment consisted of two categories: social environment and non-social environment. The social environment consisted of the role of the teacher, the part of school friends, the role of associates, and the role of parents. At the same time, the non-social environment consisted of three points: the condition of the place to study, the completeness of learning facilities, and the availability of Arabic language learning resources (Walgito, 2010), which were then arranged into 7 question items.

Meanwhile, to measure learning independence, researchers used several leading indicators, namely having learning motivation, learning initiative, being able to make learning decisions, being confident, and being responsible, which were then arranged into 5 question items. Besides, to measure learning creativity, researchers used several indicators as follows: independence from others, being able to experiment, being quick and responsive in accepting lessons, taking time to learn, and daring to express opinions (Munandar, 2004), which were then broken down into 5 question items.



For measuring students' Arabic learning achievement, the researcher used an Arabic language assessment issued by the school listed in each student's report card, whose grades consisted of 10-100. In this case, when filling out the questionnaire, the students concerned were asked to include the value of the last report card they received. The above indicators were then measured on a 5-point Likert Scale ranging from strongly disagree to strongly agree.

#### • Data Analysis

The data in this study were analyzed using SPSS 20 and SEM with the SmartPLS 3.9 program. The SPSS program was employed to analyze data descriptively to determine the mean, standard deviation, and percentage. Meanwhile, the SmartPLS program was used to examine both directly and indirectly complex variable relationships. The analysis procedure with SmartPLS was carried out in two stages. The first stage tested the validity and reliability of the data by looking at three important things, namely the discriminant validity, loading factor value and the AVE value. Data was valid from discriminant validity if the loading factor value was  $> 0.7$  and the AVE value was  $> 0.5$ . As for the reliability test, the researcher looked at it from the Cronbach Alpha value and the Composite Reliability value, that is, if the importance of the two aspects were  $> 0.7$ . In the second stage, after the data was declared valid and reliable, the researcher conducted a path analysis test to find out the direct and indirect relationship of the variables measured by carrying out the bootstrapping process with the category that the independent variable was said to affect the dependent variable if the t-count value was more significant from the t-table value and the p-value  $< 0.05$ .

### Results

The data was first classified based on gender, level, grades and majors. Table 1 presents the demographics of the respondents. Descriptively, the statistics show that in terms of gender, there are 183 male and 205 female students. In terms of level, there are 197 students in Junior High School and 191 in Senior High School. The grades of students involved in this study were 65 students in class VIII, 130 students in class IX, 96 students in class X, 76 students in class XI, and 21 students in class XII. Meanwhile, from the major side, there were 108 students majoring in social sciences, 116 in natural sciences, and 164 in religious studies.

**Table 1**

*Descriptive statistics of respondent demographic status*

	Dimensions	Frequency	Percent
Gender	Man	183	47.2%
	Woman	205	52.8%
Level	Junior High School	197	50.8%
	Senior High School	191	49.2%
Grade	VIII	65	16.8%
	IX	130	33.5%
	X	96	24.7%
	XI	76	19.6%
	XII	21	5.4%
Major	Social sciences	108	27.8%
	Religious studies	164	42.3%
	Natural Sciences	116	29.9%

Table 2 presents the data processed from the questionnaire. It describes the descriptive statistics on each variable, showing the number of respondents, the minimum and maximum cumulative values, the mean, and the standard deviation.

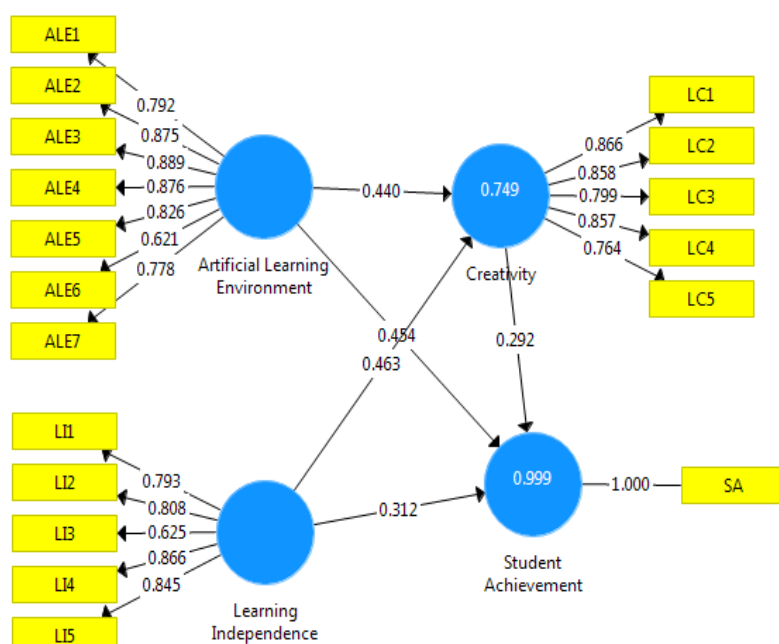
**Table 2**

*Descriptive Statistics of respondents' perception, mean and standard deviation*

Dimensions	N	Minimum	Maximum	Mean	Std. Deviation
Artificial learning Environment (ALE)	388	8	35	26.02	5.471
Learning independence (LI)	388	9	25	18.59	3.583
Learning creativity (LC)	388	9	25	19.41	3.547
Student achievement (SA)	388	41	100	79.02	11.849
Valid N (listwise)=	388				

It is evident from Table 1 that the minimum cumulative value for Artificial learning environment variable is 8, and the maximum is 35. Meanwhile, the mean value for the ALE variable is 26.02, with a standard deviation of 5.471. The minimum value for LI and LC variables is 9 each, and maximum 25 each, with a mean of 18.59 and 19.41 and standard deviation at 3.583 and 3.547 respectively. The SA variable's minimum value is seen at 41 and maximum at 100, with a mean of 79.02 and a standard deviation of 11.849.

- **Data Validity and Reliability**



**Figure 2.** Outer loading value after calculating process by SmartPLS program

The validity and reliability of the data was tested by looking at the factor loading value and the AVE value of each variable. Figure 2 shows that most of the factor loading values

for each variable are  $> 0.7$ , namely ALE value is 0.6 and LI value is 3. In case of discrepancy, the researchers are usually advised to delete or replace an item with another one. However, another solution to overcome this problem is looking at the AVE value of each variable. If the AVE value is more significant than 0.5, the value is acceptable (Shrestha, 2021). The results of the AVE value for each variable can be seen in Table 3:

**Table 3**

*Validity and reliability test result.*

Dimension	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
Artificial Learning Environment (ALE)	0.912	0.921	0.931	0.660
Learning Creativity (LC)	0.886	0.889	0.917	0.689
Learning Independence (LI)	0.849	0.871	0.893	0.627
Student Achievement (SA)	1.000	1.000	1.000	1.000

Table 3 shows the results of the validity and reliability test of the research data as seen from the AVE, Cronbach's Alpha, rho-A, and Composite Reliability values. AVE value is accepted if  $> 0.5$ . As for Cronbach's Alpha, rho\_A, and Composite Reliability values are accepted if  $> 0.7$ . Judging from this measurement standard, we find that all AVE values for each variable tested are  $> 0.5$ , so it can be concluded that all indicator items for each variable have fulfilled the measurement validity requirements.

As for the data reliability test, it can be seen that all data reliability test results on Cronbach's Alpha, rho\_A, and Composite Reliability show results  $> 0.7$ , so it can be concluded that all indicators on all tested variables have fulfilled the measurement validity requirements.

### • Hypothesis Testing

The second step taken by the researcher was to test the research hypothesis. Based on the results of hypothesis testing obtained with the SmartPLS 3.9 program and after bootstrapping, it produced values as listed in Table 4.

**Table 4**

*Path Coefficients*

Dimensions	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics	P Values
Artificial Learning Environment -> Learning Creativity	0.440	0.441	0.063	7.041	0.000
Artificial Learning Environment -> Student Achievement	0.454	0.455	0.007	67.055	0.000
Learning Creativity -> Student Achievement	0.292	0.291	0.007	44.920	0.000
Learning Independence -> Learning Creativity	0.463	0.461	0.054	8.516	0.000
Learning Independence -> Student Achievement	0.312	0.313	0.009	35.040	0.000

Table 4 presents the results of the research hypothesis test with path coefficients. The data shows that all research hypotheses are accepted. The first hypothesis analyzes the effect of the Artificial learning environment on learning creativity showing a positive and significant influence with a P-value of 0.000 and a T-statistic of  $7.041 > 1.9$  in a positive direction with an original sample value of 0.440, which means that the better the development of the artificial learning environment, the greater is the influence in improving students' creativity in learning Arabic.

The second hypothesis measures the effect of the artificial learning environment on student achievement showing positive and significant results with a p-value of 0.000 and a T-count of  $67.055 > 1.9$  and a positive direction with an original sample value of 0.454, which means that the better the management of the artificial learning environment, the greater is the effect on the Arabic learning achievement of students.

The third hypothesis measures the effect of learning creativity on student achievement with significant results with a p-value of 0.000 and t-count of  $44.920 > 1.9$ . The results of this study are in a positive direction with an original sample value of 0.292, which means that the higher the level of student learning creativity, the greater is the influence on student achievement in Arabic.

The fourth hypothesis tests the direct effect of learning independence on student achievement with positive and significant results with a p-value of 0.000 and a t-count of  $8.516 > 1.9$ . The direction of the relationship shows the buoyant sector with an original sample value of 0.463, suggesting that the higher the level of students' learning independence in learning Arabic, the greater is the students' Arabic learning achievement.

The fifth hypothesis analyzes the effect of learning independence on student achievement with positive and significant results with a p-value of 0.000 and a t-statistic value of  $35.040 > 1.9$ . It leads to a positive relationship with an original sample value of 0.312. This value means that the higher the level of student learning independence, the higher the effect on increasing student achievement in learning Arabic.

From the results of the hypothesis testing, the learning independence variable has the most significant influence on increasing student learning creativity, with an original sample value of 0.463. At the same time, the variable with the most negligible effect on improving student learning achievement is the learning creativity variable, with an original sample value of 0.292.

- **Indirect Effect**

Two more hypotheses were tested to assess the indirect effect of the artificial learning environment on student achievement through learning creativity and the indirect impact of learning independence on student achievement through learning creativity. The results of the analysis are recorded in Table 5.

**Table 5**

*The indirect effect of Artificial learning environment and learning independence on student achievement through student creativity.*

Dimensions	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ( O/STDEV )	P Values
Artificial Learning Environment -> Learning Creativity -> Student Achievement	0.129	0.128	0.017	7.361	0.000
Learning Independence -> Learning Creativity -> Student Achievement	0.135	0.134	0.017	7.991	0.000

Table 5 shows the indirect effect of the artificial learning environment and learning independence on student achievement through student creativity. The analysis results show that learning creativity mediates the relationship between the active learning environment and student achievement with a p-value of 0.000 and a t-statistic value of 7.361 > 1.9 in a positive direction with an original sample value of 0.129. The data in Table 5 also shows an indirect effect of learning independence on student achievement through student creativity, with a p-value of 0.000 and a t-statistic value of 7.991. The results of this study indicate that learning creativity mediates the relationship between learning independence and student achievement, which means that if the teacher wants to improve student learning achievement in Arabic, it is necessary to increase student learning independence as well. If the effect of learning independence is to be increased, the teacher must also increase students' creativity in learning Arabic.

- **R-Square Value**

R-Square is a value that indicates how much the independent (exogenous) variable affects the dependent (endogenous) variable. The magnitude of the influence is measured by a number ranging from 0 to 1, which indicates the importance of the combination of independent variables that jointly affect the value of the dependent variable. There are three categories in assessing R-square: strong, moderate, and weak. R-square value of 0.75 - 1 is included in the strong category, the R-square value of 0.5 - 0.74 is included in the moderate category, and the R-square value of 0.25 - 0.49 is included in the weak influence category (Hair, Ringle, & Sarstedt, 2011).

Table 6 depicts the influence of the artificial learning environment and learning independence variables on learning creativity of 0.749, which means that the impact of these two variables on learning creativity is 74.9%, and the other 25.1% is influenced by other factors outside the factors studied. This influence is included in the strong category. Table 6 also shows the magnitude of the influence of the artificial learning environment, learning independence, and learning creativity on student achievement of 99.9%. The other 1% is influenced by other factors outside the studied variables, and this influence is included in the robust category.

**Table 6***R-Square value.*

Dimension	R Square	R Square Adjusted
Artificial Learning Environment ->Learning Independence-> Learning Creativity	0,749	0,748
Artificial Learning Environment ->Learning Independence-> Learning Creativity ->Student Achievement	0,999	0,999

### Discussion

This study aimed to determine whether the artificial learning environment, independent learning, and learning creativity affected students' Arabic learning achievement. Research also attempted to discover whether creativity mediated the relationship between the artificial learning environment and independent education with Arabic learning achievement. In general, the data exposure and analysis, as described in the previous sub-chapter, this research revealed that the artificial learning environment, learning independence, and learning creativity had a positive and significant effect on improving students' Arabic learning achievement. On top of that, if teachers or managers of Arabic language education in an institution wanted to enhance students' academic learning achievement, they must pay attention to these three factors in Arabic education and learning.

In this study, the learning environment was proven to effectively improve students' Arabic learning achievement, thus underlining the importance of learning environment engineering in learning Arabic. This study thus confirms several previous studies which also demonstrated the positive influence of the learning environment on student achievement in general (Vekli & Çalik, 2023) and its influence in specific areas such as non-cognitive achievements (Ali et al., 2023), student learning achievements (Setyaningsih et al., 2023), and literacy development (Rance, Dowell, & Tomlin, 2023). This fact again confirms the importance of paying attention to learning environmental factors in learning Arabic at or at Islamic boarding schools. The learning environment must be designed intentionally to drive students to learn more actively.

This study also confirms that a good learning environment can stimulate students' learning creativity in learning Arabic. As happened in the research on Islamic boarding schools, the teacher continuously records new vocabulary on a small board placed in front of the class, and some of it is hung on trees near the classroom and dormitory. This factor encourages students to record them in their books and sometimes use them to construct sentences in their dairy story writing assignments. The influence of the learning environment and creativity also reinforces several previous studies, which confirms that the creative learning environment fosters student creativity (Fan & Cai, 2022) and the school environment improves student language creativity (Sacher, 2022).

This research also fosters the effect of learning independence on student creativity and achievement. Learning Independence (LI) has been essential for improving student achievement and creativity in second language learning. It helps teachers to foster student engagement with the language by emphasizing open-ended tasks which promotes

creativity. Moreover, LI leads to improved academic achievement and a better understanding of the Arabic language as a second language. Previous studies have explored the effect of Learning independence on student creativity (Treffinger, 1980), highlighting the importance of sufficient teacher involvement in encouraging independent learning among students in school contexts. The school environment can provide an ideal platform for students to collaborate when they become more autonomous-driven learners, allowing them to develop their abilities to make judgments independently. Learning independence has been found to positively impact student creativity and achievement in Arabic as a second language. Previous studies have shown that when teachers give students the freedom to learn independently, they develop higher levels of creativity than those who do not (Cahyana et al., 2019). This fact is particularly actual for those studying Arabic because it involves mastering unique skills and concepts requiring a high level of self-directed learning.

In this study, students' creativity in learning mediates the relationship between the artificial learning environment and learning independence and student achievement. This fact means the influence of the two independent variables, namely artificial learning environment and learning independence, will be more assertive on students' Arabic learning achievement. Although in this study, partially, the two variables have had a significant direct effect, when coupled with learning creativity, the influence of the two variables is even more effective. Therefore, if the teacher wants to maximize the role of the two studied variables, namely artificial learning environment and learning independence, Arabic teachers must also increase students teaching creativity. This study supports previous research, which also confirms that learning creativity is an essential factor that predicts student learning success (Nofrialdi, 2022). Therefore, it is not surprising that many researchers emphasize the need for creative learning in language learning (Heath & Wolf, 2005), because with that creativity, students can further explore their abilities to achieve more remarkable achievements than they get from learning in the classroom alone.

### Conclusion, Recommendations and Limitations

To conclude this research, it is evident that the academic learning environment, learning independence, and learning creativity affect the increase in student learning achievement in Arabic subjects. In addition, this study also found the importance of creativity in improving student achievement in learning Arabic. Learning creativity can mediate the relationship between the learning environment, learning independence, and students' achievement in learning Arabic. Although environmental engineering and individual learning independence can directly improve student learning achievement, learning achievement will be even more significant if students have learning creativity. Therefore, in addition to seeking to enhance the learning environment and increase student learning independence, teachers and managers of educational institutions must also encourage students to be creative in learning Arabic so that their learning achievements are higher. Learning a new language can be overwhelming, but the environment we learn in and how independent and creative we are can play an essential role in student achievement. It has been observed that students thrive when they are allowed to solve problems independently, have access to new resources and sometimes collaborate with peers.



This study found the importance of artificial learning environment, independent learning, and learning creativity in learning Arabic because all three are essential predictors in increasing students' learning achievement. This study recommends that schools, language institutions, and Arabic teachers should pay more attention to environmental factors to improve student achievement. Attention to the learning environment can be done by creating an artificial learning environment. An artificial learning environment is an environment that is deliberately made, designed, or built by humans to achieve learning goals that can benefit the achievement of educational goals. An artificial learning environment can be an offline or an online environment. In an offline environment, for example, the teacher creates a classroom atmosphere that encourages students to speak Arabic or makes a particular room equipped with Arabic-language facilities. Meanwhile, Arabic learning media can be developed for online environments, such as Arabic games, game-based vocabulary enrichment, and other computer or gadget-based programs.

This study also recommends the importance of teachers increasing students' learning independence and student creativity because, with it, students will get a good outcomes and achievement. Students need to have learning independence to be successful in mastering this language. Self-motivation, discipline, and the willingness to keep practicing are essential for students to overcome difficulties in learning Arabic. Even though Arabic is considered complex and challenging, it is possible to learn well. With the support of an excellent artificial learning environment, and the independence of student learning, difficulties in learning Arabic can be overcome, and good Arabic language skills can be achieved.

This study has limitations in the methodology and the use of the sample. In the methodological limitations, the study solely relies on a quantitative approach, utilizing survey data collected through Google Forms. This limitation raises concerns about the depth of understanding and the potential for gathering rich insights from the participants. For further research, a more comprehensive research design could have incorporated qualitative methods such as interviews or observations to gain a deeper understanding of the participants' experiences. Researchers can explore qualitatively about teachers' strategies for maximizing the role of the environment in learning Arabic and the forms of artificial environment they have experienced. Another area for improvement of this study is the distribution of research respondents, which was only carried out in one institution, so it does not provide a broader general picture of the research objectives.

It is suggested to future researchers to deepen further the qualitative study of the forms of artificial learning environments and strategies for maximizing the role of this artificial environment because preparing an artificial learning environment alone is not enough. An approach must accompany it to optimize the function of the artificial environment so that the effect on increasing student learning achievement is also maximized. Experimental research can also be carried out by designing specific domains, such as language games, that allow students to enjoy them more now, considering that students are now accustomed to using electronic devices such as cell phones, computers, and gadgets. Furthermore, further researchers can provide research on contextual factors that may influence Arabic learning, such as cultural background, learning preferences, or socioeconomic status.

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