

The Role of Artificial Intelligence Technologies in Addressing Individual Differences among Basic Education Students in Libya

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Abstract

This study aims to identify the role of artificial intelligence technologies in improving the consideration of individual differences among students in the basic education stage in Libya. This is achieved through examining teachers' perspectives on the reality of individual differences and the possibility of benefiting from artificial intelligence technologies in the educational process within schools. The study adopted the descriptive-analytical approach and used a questionnaire as the main tool for data collection from a sample of 46 male and female teachers from the basic education stage in several Libyan cities.

The results revealed clear individual differences among students in terms of comprehension, understanding, response speed, and academic achievement. The findings also indicated that class overcrowding, weak parental follow-up, and limited class time are among the most significant factors influencing these differences. In addition, the results showed a positive attitude toward the use of artificial intelligence technologies in education, as participants confirmed the possibility of benefiting from these technologies in providing more flexible learning that meets the diverse needs of students.

On the other hand, the study revealed several challenges facing the implementation of artificial intelligence in Libyan schools, including weak technological infrastructure, a lack of devices, and the need to train teachers on the effective use of artificial intelligence tools.

The study findings also indicate that employing artificial intelligence technologies in basic education can contribute to improving the consideration of individual differences among students, provided that appropriate infrastructure is available and teachers are adequately trained to use these technologies effectively.

Keywords: Artificial Intelligence, Individual Differences, Basic Education, ChatGPT, Adaptive Learning, Education in Libya.

Introduction

The education sector has witnessed remarkable development in recent years as a result of technological advancement and the emergence of artificial intelligence technologies. These technologies have become widely used in various educational fields to improve the quality of the educational process and develop teaching and learning methods. They have contributed to creating more interactive learning environments capable of meeting students' diverse needs and addressing variations in their educational levels (Adeshola & Adepoju, 2024; Harry & Sayudin, 2023; Javaid et al., 2023; Wang et al., 2023).

Individual differences among students have become one of the most important educational issues facing teachers in the teaching and learning process and within classrooms. Students differ in their intellectual abilities, speed of understanding, academic achievement, learning

styles, and motivation toward learning. The importance of this issue increases in the basic education stage, as it is the stage in which students' fundamental skills are developed and their basic knowledge expands. This requires the use of teaching methods that take these differences into account and contribute to improving learning outcomes for all students (Demir, 2021; Myftiu, 2015).

Due to the continued reliance on traditional teaching methods, many teachers face difficulties in dealing with individual differences among students within the same classroom, especially with large class sizes and limited educational resources. This has led to noticeable differences in students' academic achievement, which negatively affects the quality of education and its outcomes (Myftiu, 2015).

From this perspective, artificial intelligence technologies have become important in education, as they can be used to provide personalized educational content that meets the needs of each student individually, in addition to offering different activities according to learners' levels. This helps support adaptive learning and achieve the principle of personalized education (Farhood et al., 2025; Oyebola Olusola Ayeni et al., 2024).

In Libya, basic education faces many challenges related to infrastructure, limited use of modern technology, and insufficient teacher training in digital technologies. Therefore, it has become necessary to study the possibility of benefiting from artificial intelligence technologies to improve the educational process and address individual differences among students (Sana Shrif, 2025).

This study aims to identify the role of artificial intelligence technologies in addressing individual differences among basic education students in Libya by examining teachers' perspectives on the main causes of these differences and the possibility of employing artificial intelligence tools to reduce their effects and improve the quality of education.

Literature Review

Several previous studies have examined the role of artificial intelligence and adaptive learning in improving the educational process. In 2015, researcher J. Myftiu studied individual differences and students' learning styles and highlighted the impact of individual differences and various learning styles on the educational process. The researcher concluded that students differ in their ways of understanding and comprehension, which requires the use of diverse teaching methods that take these differences into account. The study also confirmed that ignoring individual differences may lead to poor academic achievement among students (Myftiu, 2015).

Similarly, S. Wang and his colleagues conducted a study in 2023 comparing adaptive learning systems with teacher-led instruction. The study aimed to compare the effectiveness of adaptive learning systems and traditional teaching methods. The results showed that adaptive learning systems achieved remarkable outcomes in improving students' understanding and enhancing their academic achievement, particularly among low-performing students. This highlights the importance of using modern intelligent technologies to address individual differences (Wang et al., 2023).

In addition, H. Farhood and his colleagues presented a study in 2025 on artificial intelligence-based personalized learning. The study aimed to review the role of artificial intelligence in supporting personalized learning. The findings indicated that artificial intelligence tools help provide educational content that matches students' different levels, contribute to improving academic performance, and increase interaction within the learning environment. Furthermore, they play an important role in addressing individual differences among students (Farhood et al., 2025).

Despite the large number of studies that have examined the role of artificial intelligence and adaptive learning in improving the educational process, most of these studies were conducted in educational environments outside Libya. In addition, they mainly focused on higher

education and advanced educational systems. These studies did not address the reality of basic education in Libya, particularly with regard to teachers' perspectives on the possibility of using artificial intelligence tools to address individual differences among students.

Accordingly, this study seeks to fill this gap by examining the reality of basic education in Libya and analyzing teachers' perspectives on this issue.

Significance of the Study

The primary objective of this study is to improve the educational process, promote the principle of equal educational opportunities, and effectively address the issue of individual differences. It also aims to support teachers and decision-makers through the use of technology in education in Libya.

Objectives of the Study

The objectives of this study are to identify the forms of individual differences among students in the basic education stage in Libya and to examine their impact on the educational process and students' academic achievement. The study also aims to analyze the challenges faced by teachers in addressing these differences and to clarify the role of artificial intelligence in supporting the educational process through providing more flexible and adaptive learning approaches that meet the diverse needs of students, as well as developing practical recommendations for improving educational performance.

Theoretical Framework

This framework includes a set of educational theories related to individual differences and learning, such as Gardner's Theory of Multiple Intelligences, Piaget's Constructivist Theory, Maslow's Hierarchy of Needs, and Vygotsky's Sociocultural Theory of Development. These theories emphasize that students differ in their abilities, learning styles, and educational needs, which requires the use of diverse and flexible teaching methods that take these differences into consideration (Demir, 2021; Myftiu, 2015).

From this perspective, artificial intelligence technologies can contribute to the application of these educational principles (Salama, 2025) by providing adaptive learning environments and personalized educational content that matches students' varying levels and needs. This can help improve academic performance and enhance equity in educational outcomes (Farhood et al., 2025; Oyebola Olusola Ayeni et al., 2024; Shemshack & Spector, 2020; Wang et al., 2023).

Methodology

This study adopts the descriptive-analytical approach to investigate the role of artificial intelligence technologies in addressing individual differences among students in the basic education stage. This approach aims to describe the phenomenon and analyze teachers' perspectives regarding the causes of individual differences and the possibility of using artificial intelligence tools and technologies to improve the educational process and address differences among students' levels.

The study population consists of male and female teachers in the basic education stage from a number of Libyan schools. A purposive sample of participants was selected due to their direct connection to the study topic and their experience in dealing with individual differences among students.

Data Collection Tool

Data were collected through an electronic questionnaire designed using Google Forms. The questionnaire included a set of questions related to individual differences, the causes of these differences, and the role of artificial intelligence technologies in reducing their effects within the educational environment.

Data Analysis

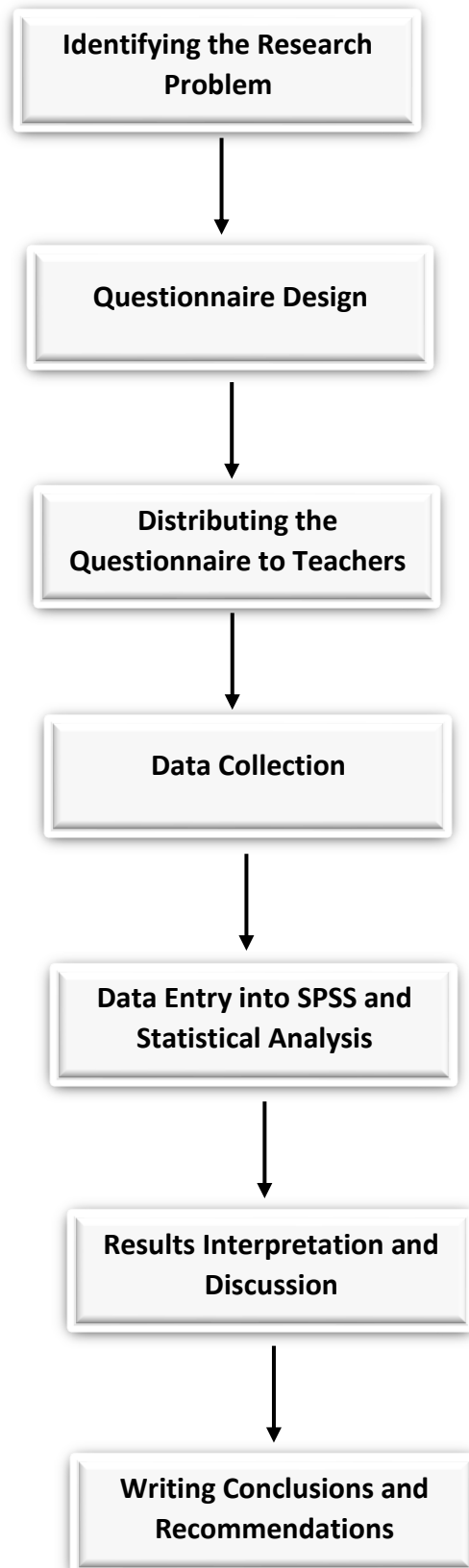
Descriptive statistical methods were used to analyze the collected data, including:

- Percentages
- Means

- Standard Deviations

In addition, both Excel and SPSS software were used to organize and statistically analyze the data.

Figure (1): Study Implementation and Data Analysis Process



Ethical Considerations

The confidentiality of participants' data was maintained throughout the study. The information collected through the questionnaire was used solely for scientific research purposes, and all necessary measures were taken to ensure that no personal information of the participants was disclosed.

Results

Based on the questionnaire conducted among teachers in the basic education stage, the following results were obtained:

1.Results Related to Individual Differences

The findings revealed a high level of agreement among participants regarding the existence of clear individual differences among basic education students. Most teachers confirmed that students differ in terms of comprehension, understanding, and academic achievement within the same classroom.

2. Results Related to the Causes of Individual Differences

The results indicated that class overcrowding, weak parental follow-up, and limited class time significantly affect teachers' ability to address individual differences among students.

3.Results Related to the Role of Artificial Intelligence

The findings showed that the majority of participants believe that artificial intelligence technologies can help provide explanations that match each student's level. These technologies can also be used to design various activities and exercises according to students' needs and educational levels.

4.Results Related to Challenges

The results demonstrated that limited internet availability in schools, a lack of technological devices, and the need for teacher training on artificial intelligence tools are among the most significant challenges facing the implementation of these technologies in basic education.

Questionnaire Results Tables

First: Participants' Demographic Information

Table (1): Distribution of Participants by Gender

Gender	Frequency	Percentage
Female	34	73.9%
Male	12	26.1%

The results showed that females represented the highest percentage of participants, accounting for 73.9%, while males represented 26.1% of the participants.

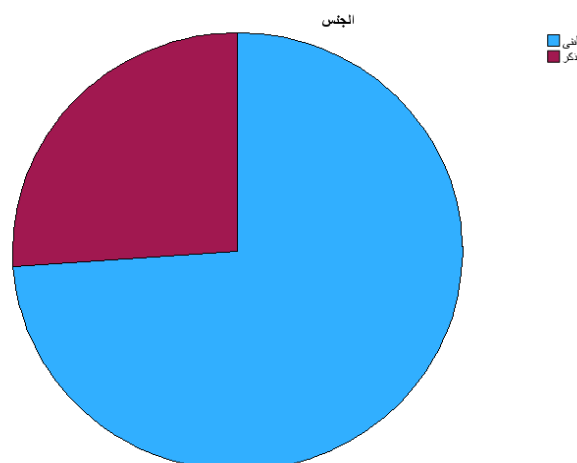


Figure (2): Distribution of Participants by Gender

Table (2): Educational Qualification

Educational Qualification	Frequency	Percentage
Bachelor's Degree	20	43.5%
Licentiate Degree	16	34.8%
Diploma	10	21.7%

The results indicated that the majority of participants held a Bachelor's Degree, representing 43.5% of the sample, followed by those holding a Licentiate Degree at 34.8%.

Table (3): Years of Experience

Years of Experience	Frequency	Percentage
More than 10 Years	24	53.3%
Less than 10 Years	21	46.7%

Note: One participant did not provide information regarding years of experience.

The sample showed that the majority of participants had more than ten years of teaching experience, reflecting a good level of experience in dealing with students and addressing individual differences.

Table (4): Results of Questionnaire Item Analysis According to Mean, Standard Deviation, and Response Level

Questionnaire Items	Mean	Standard Deviation	Response Level
There are clear individual differences among students.	3.31	0.701	Very High
Students differ in their speed of understanding and comprehension	3.59	0.498	Very High
There are variations in students' academic achievement levels.	3.35	0.566	Very High
Some students require additional instruction more than others	3.43	0.544	Very High
Traditional teaching methods do not accommodate all learning levels.	2.38	0.996	Moderate
Class overcrowding affects the consideration of individual differences among students.	3.31	0.633	Very High
Weak parental follow-up contributes to the low performance of some students.	3.37	0.572	Very High
Differences in intellectual abilities affect academic achievement.	3.17	0.608	High
Relying on a single teaching method does not suit the learning levels of all students.	3.22	0.593	High
Limited class time makes it difficult for teachers to follow up with every student.	2.91	1.083	High
Artificial intelligence technologies can help provide explanations that match each student's learning level.	2.96	0.788	High
Artificial intelligence can support low-achieving students by simplifying educational concepts.	3.02	0.783	High
Artificial intelligence can be used to design exercises tailored to students' different learning levels.	2.96	0.815	High
Artificial intelligence can help teachers identify students' weaknesses.	2.47	0.869	Moderate
ChatGPT helps diversify teaching and explanation methods.	2.87	0.815	High
Artificial intelligence can contribute to reducing individual differences among students.	2.25	0.918	Moderate
Limited internet availability represents a barrier to the use of artificial intelligence in schools.	3.14	0.702	High
The lack of technological devices in schools limits the use of artificial intelligence.	3.26	0.684	Very High
Teachers need training to use artificial intelligence tools effectively	3.24	0.57	High
Excessive reliance on artificial intelligence may reduce the role of the teacher.	2.91	1.145	High
The use of artificial intelligence should be carried out under the supervision of the teacher.	3.11	0.706	High

The results indicated that the mean scores of most questionnaire items ranged between high and very high levels, reflecting teachers' awareness of the existence of individual differences among students and the potential benefits of using artificial intelligence tools to improve the educational process in the basic education stage.

Note: The mean scores were interpreted according to a four-point Likert scale, where a mean score ranging from 1.00 to 1.75 indicates a low level, from 1.76 to 2.50 indicates a moderate level, from 2.51 to 3.25 indicates a high level, and from 3.26 to 4.00 indicates a very high level.

Discussion

The study findings revealed a high level of agreement among the participants regarding the existence of clear individual differences among students in the basic education stage. Participating teachers confirmed variations in students' speed of understanding, comprehension, and academic achievement within the same classroom. These differences were attributed to variations in intellectual abilities, educational backgrounds, and social conditions among students. This finding is consistent with the study conducted by Demir (2021), which showed that differences in students' learning styles directly affect academic achievement and performance (Demir, 2021).

The results also showed that class overcrowding, weak parental follow-up, and limited class time are among the most significant factors that hinder teachers' ability to address individual differences among students. This finding is in line with the study by Myftiu (2015), which emphasized that traditional educational environments may not be sufficient to meet the needs of all learners within the classroom (Myftiu, 2015).

The study further revealed a positive attitude toward the use of artificial intelligence technologies in the educational process. Most participants believed that these technologies could help provide explanations tailored to each student's level and support the development of diverse educational activities that match students' varying abilities. In addition, artificial intelligence can assist teachers in preparing exercises and identifying students' weaknesses. This finding is consistent with the study conducted by Lo (2023), which confirmed that artificial intelligence tools, particularly ChatGPT, can contribute to enhancing personalized learning and providing more flexible educational content that adapts to learners' needs (Lo, 2023).

These findings are also supported by the study conducted by Ayeni et al. (2024), which demonstrated that artificial intelligence technologies promote personalized learning and help reduce educational gaps among students by providing diverse teaching methods that adapt to different student abilities (Oyebola Olusola Ayeni et al., 2024).

On the other hand, the results revealed several challenges that may hinder the implementation of artificial intelligence technologies in Libyan basic education schools. The most significant challenges include limited internet availability, a lack of technological devices, and the need for teacher training on the effective use of artificial intelligence tools. These findings reflect the existence of technological and infrastructural barriers that may limit the effective utilization of these technologies within the Libyan educational environment.

Overall, the findings indicate that the use of artificial intelligence technologies in education can contribute to improving the educational process and addressing individual differences among students. However, the successful implementation of these technologies requires the availability of an appropriate technological environment and adequate support for teachers.

Conclusion

This study aimed to investigate the role of artificial intelligence technologies in addressing individual differences among students in the basic education stage in Libya from the perspective of teachers. The study adopted the descriptive-analytical approach and employed a questionnaire administered to a sample of basic education teachers in Libya.

The findings revealed the existence of individual differences among students in terms of understanding, comprehension, and academic achievement when traditional teaching methods

are used. The study also showed that weak parental follow-up, limited class time, and class overcrowding may affect students' academic achievement and teachers' ability to address these differences.

In addition, the results confirmed a positive attitude toward the use of artificial intelligence technologies in the educational process. Participants believed that these technologies can support more flexible and adaptive learning that responds to the diverse needs of students.

Based on these findings, it can be concluded that artificial intelligence technologies offer promising opportunities to support the educational process and address individual differences among students. However, the successful implementation of these technologies requires the provision of an appropriate educational environment that supports their effective use within Libyan schools.

Future Work

Future studies may be conducted on a broader scale by including larger samples from different schools across Libyan cities. In addition, future research may investigate the practical implementation of artificial intelligence applications in classrooms and examine their direct impact on students' academic achievement.

It is also possible to develop intelligent educational systems specifically designed for basic education students in Libya. Such systems could analyze students' performance levels and provide educational content tailored to their individual needs. Furthermore, future research may explore the role of artificial intelligence in supporting students with learning difficulties and enhancing their engagement within digital learning environments.

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