



A Study of the Integration of Adaptive Learning With Artificial Intelligence

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Abstract

The massive strides in the world of technology has also led to its contribution in the field of education. Its latest entrant, artificial intelligence or AI, has taken learning to a customized experience for each student, and thereby, eliminating the varied challenges faced by the instructors and students alike. The culmination of designed adaptivity and algorithmic adaptivity results in a synergy wherein educators and learners can interact on a one-to-one basis. The engagement level of the student with the AI-enabled learning tools optimizes the teaching effect by making it efficient and effective. The personalized content delivery is tailor made for the student in terms of content and materials, providing the student with a dynamic learning experience. Whereas, the educator helps the learner to gain mastery over the concepts through intelligent tutoring systems. The use of data analytics and artificial intelligence (AI) has resulted in the creation of platforms that provide increased accessibility for adaptive learning. Through learning analytics, gamification-induced learning and microlearning, the teacher and the learner gain access to resources that result in optimal learning outcomes.

Keywords: adaptive learning, artificial intelligence, technology, learning tools, learners, educators

I. Introduction

The transformation and evolution of imparting education has changed at a phenomenal pace in the last few years. The implementation of technology to the utmost level with the latest tools has redefined the education field. E-learning platforms offer a multitude of positive outcomes that benefit everyone involved



with pedagogy and learning. Adaptive learning can be defined as “a pedagogical approach that utilizes advanced technologies, particularly machine learning algorithms, to tailor educational content, instructional strategies, and assessment methods to individual learners. It aims to adapt the learning process in real time, based on each learner’s performance, preferences, knowledge level, and learning style.” (Gligorea, et al., 2023). The effectiveness of this method lies in its tracking of the students’ progress meticulously and exhaustively in real-time. The learning process of the students is analysed through the following metrics –study style, learner performance, predilection and erudition level. A UNESCO report titled ‘Guidance for Generative AI in Education and Research’ stressed the need for utilizing AI in the educational sector to redefine the essential skills of the learner. (Miao & Holmes, 2023). Through incessant monitoring and assessment of the students’ data, which includes every aspect of their approach to learning and their progress, adaptive learning systems guide the students by offering personalized study material that is apposite and exercises that are efficacious.

Significantly, educators need to be very well aware and proficient in using AI technologies. Learners too should be provided proper and complete training in using AI tools to get the maximum benefits. The prime reason being, personalized learning platforms known as “adaptive learning systems” (ALSs) may be used to create lessons that are personalized to the learning styles and preferences of students as well as the order and level of task difficulty. (Pilakos, et al., 2019). Therefore, it is evident that each student interacts with AI tools in a unique manner though they use them in the same manner. The personalized interaction of AI tools with the learners is due to the adaptive learning systems that include a fundamental architecture known as a ‘closed loop’ that collects data from the learner and utilizes them to evaluate progress, suggest leaning activities, and deliver customized feedback.(Wang, et al., 2020). E-learning platforms utilize a broad spectrum of adaptive learning methods such as intelligent tutoring systems, learning analytics, and personalized learning paths. Personalized learning, where education is tailored to a student’s specific requirements and learning preferences, has been made possible and assisted by the development of adaptive e-learning systems.(Beldagli&Adiguzel, 2010). Additionally, the



blending of adaptive learning with artificial intelligence increases competency and adaptability which aids in a metamorphic and maximized learning environment for learners who are varied and have unique challenges.

Ultimately, the aim of integration of adaptive learning with artificial intelligence is to make learning easy for learners and is an exercise in helping them to grasp and fathom the learning content according to their ability and intellectual level. Adaptive learning uses to its advantage the data-driven algorithm and artificial intelligence to tailor the content and instruction according to the results of the analysis carried out continuously of a students progress. Furthermore, adaptive learning engages the students for longer periods because it provides a learning experience and environment that is interesting, exciting and motivating. The utilization of modern technology has boosted students' confidence and "abilities to access, acquire, manipulate, construct, create, and communicate information" in these times of digitalization and has resulted in students making rapid progress. (Green & Donovan, 2018). For the instructors, the data that is gathered and stored during e-learning provides them with inputs on the creation of learning content and its effectiveness to diverse learners.

II. Aims of the study

- To fathom the integration of adaptive learning with artificial intelligence in e-learning.
- To understand the functionality and benefits of integrated learning.
- To analyse the impact of integrated adaptive learning with artificial intelligence tools on student performance.
- To encourage educators to utilize integrated adaptive learning for learners for an exponential experience in grasping the content they learn.

III. Hypotheses of the Study

- □ The secondary school students of Baghdad may witness a rapid understanding of their subjects.



▪ □ The interest levels of the learners will be enhanced and holistic regarding the following sub samples;

- (a) Improved learning outcomes
- (b) Better engagement
- (c) Minimal reliance on educators

IV. Sample and Methodology

The sample consists of 180 secondary school students from 18 schools in Baghdad. The methodology utilized is the normative survey method. [1] (Best & Kahn, 2007). The details of the sample selected for the study are shown in Appendix-I.

V. Study Tool

The Kolb Learning Style Inventory 4.0 (2011) was utilized. It assesses six variables, four primary scores that measure an individual's relative emphasis on the four learning orientations – Concrete Experience (CE), Reflective Observation (RO), Abstract Conceptualization (AC), and Active Experimentation (AE) and two combination scores measure an individual's preference for abstractness over concreteness (AC-CE) and action over reflection (AE-RO). The KLSI 4.0 maintains the high scale reliability of the KLSI 3.1 with an average Scale reliability (Cronbach Alpha) = .81 (4.0) vs .80 (3.1).

Statistical Techniques

- Ipsative scales
- Significance of difference between the means
- Standard statistical methods like standard deviation and arithmetic mean median



VI. Methodology

Eighteen schools were approached and they permitted to carry out the survey. The researcher chose grade VII to IX students of the secondary level for the present research. The researcher picked 180 students. Integration of adaptive learning with artificial intelligence data collection sheets were handed out to the selected sample of students. The learners were instructed on the manner the sheets were supposed to be filled with their responses. The score of every learner was encoded and statistical calculations were carried out. Mean, standard deviation, percentiles and test of significant difference between means were calculated.

VII. Research Limitations

The research is strictly limited to finding out the impact of the integration of adaptive learning with artificial intelligence on the secondary school students of the city of Baghdad.

VIII. Data Interpretation and Analysis

Number of students and the reliability coefficient to measure the alacrity of secondary school students in learning through integrated learning with artificial intelligence.

The entire sample was categorized into five parts by the researcher for the reliability of the KLSI 4.0. The categories were headed as follows: N, CE, RO, AC and AE. The KLSI 4.0 maintains the high scale reliability of the KLSI 3.1 with an average Scale reliability (Cronbach Alpha) = .81 (4.0). Table 1 shows the alpha coefficients for the normative group and sub-groups.

Table 3. Internal Consistency Alphas for the Scale Scores of the KLSI 4.0

N CE RO AC AE



TOTAL 180	.83	.83	.83	.76
NORM				
GROUP				
Class VII60	.82.83	.85	.77	
Class VIII60	.88	.85	.81	.73
Class IX 60	.84	.88	.86	.71

The score obtained by the ipsative scales (S1–I S1–N_YV) signifies that the keenness regarding the inclination of students is almost even.

Therefore, the frequency of students distributed in the categories was uniform. The table highlights the presence of students in all grades selected.

Effect of adaptive learning with artificial Intelligence when compared to traditional methods.

To examine the variance of teaching methods on the students, the mean and the standard deviation of scores were calculated. To investigate whether the two variables differed significantly in their scores, the KLSI 4.0 test was conducted. Below are the tabulated values. Table 2.

Results showing significance of difference between means of scores with regard to integrated learning with artificial intelligence of secondary school students.

Grade	Sample Size	Mean	Standard Deviation	Correlations
Class VII	60	0.71	1.13	0.22**
Class VIII	60	0.47	0.17	0.16**
Class IX	60	0.29	1.13	0.39*

** p < .01, *p < .05



By their differences in means along with the standard deviation, it can be concluded that students experienced a massive difference in their learning capabilities through the integration of adaptive learning with artificial intelligence.

Table 3.

Results showing significance of difference between means of scores of secondary school students regarding their learning flexibility index, age, subjects, experience and integrated development.

Variable	VII	VIII	IX	1	2	3
Learning Flexibility						
Index with AI tools	0.71	0.17	-0.09			
Age	3.73	1.13	-0.05**			
Subjects	3.28	0.86	-0.06**	0.22**	0.06**	
0.09**						
Experience	10.72	4.50	-0.05**	-0.02	0.21**	0.10**
Integrated						
Development	0.29	18.23	0.25**	-0.04**	-0.16**	-
0.07**						

** $p < .01$, * $p < .05$

1 –Assimilating learning style



2–Accommodating learning style

3 –External accommodative orientation

The variables among the aforementioned parameters proves that there is a significant difference in the learning process of secondary school students upon integration of adaptive learning with artificial intelligence tools.

IX. Findings

- Each group of the sample of the secondary school students is immensely benefitted with the integration of adaptive learning with artificial intelligence.
- Significant improvements were found in all the learning parameters of secondary school students.
- Positive changes were found in the manner students approached their learning – with heightened enthusiasm and keenness.
- The use of artificial intelligence made learning easier and the engagement levels soared.

X. Conclusion

Traditional and conventional methods are causing disinterest in students. The integration of adaptive learning with artificial intelligence has brought about a profound transformation in the way learning is approached. The use of data analytics to assess the strengths, weaknesses and the natural learning patterns of the students has made learning a new experience with a better student engagement. Also, the real-time decoding of the students' difficulties and providing a customized learning methodology allows the students to analyse, reflect and ponder on the content they learn. By keeping the teacher interaction with the student limited, students are free to engage with their problems without any hesitation. Ultimately, the soaring student performance is a testimony to the usefulness and practicality of the integration of adaptive learning with artificial intelligence.



XI. Recommendations

The current study can be considered as a healthy contribution towards research on the integration of adaptive learning with artificial intelligence in Iraq. However, the results should be treated with caution as the respondents represent a specific age group in a single city. Further research in the long term benefits of implementing the integration of adaptive learning with artificial intelligence should be examined, which could help in getting a deeper understanding of its significance.

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Appendix I.

Name of the

Student:.....

Name of the School

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The following statements are related to the integration of adaptive learning with artificial intelligence. The responses should be true and accurate. Tick (✓) the degree of your agreement or disagreement with the statements provided in the columns.

Sl. No.	Statement	Strongly agree	Agree	Not decided	Disagree	Strongly disagree
1.	Learning a difficult subject, has become easier with integrated learning.					
2.	When learning new content, I try to understand it in my own way.					
3.	I find integrated learning exciting and motivating.					
4.	I think lesser reliance on the teacher makes me more confident.					
5.	I believe that my approach to education has become more positive.					
6.	I used to find it difficult to follow pedagogies of certain teachers.					
7.	I grasp the subject without repetitive learning.					



8.	Customized instructions are very helpful.					
9.	Integrated learning has helped me in becoming analytical.					
10.	The real-time progress tracking helps me to work quickly on my weaknesses.					
11.	Integrated learning has changed my attitude towards learning.					
12.	I get better insights on my subjects.					
13.	I learn and also understand its significance.					

14.	My concentration levels have improved.					
15.	I approach a subject differently than what my teachers used to prescribe because their methodology was difficult.					
16.	I find conventional and traditional pedagogies boring and difficult.					
17.	I believe technology is a better teacher than humans.					
18.	I get curious to learn more with the use of technology					
19.	I get to know more knowledge than before.					
20.	Teachers have become more engaged with us.					