

Examining University Students and Teachers' Behavioral Intention to Upgrade Blended Learning Using an Extended TAM Model

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Abstract

With the changing face of the learning paradigms in education industry due to the impact of global pandemic, various new revolutions are observed. This study reveals the intentions of students and academicians towards improvement in e-learning system. The technology acceptance model is used to identify the acceptability and improvements expected by them. Certain factors are identified in the model along with categorizing them under various hypothesis parameters. A survey was conducted for collecting opinions from various respondents. The survey was communicated in various universities across Middle East Region. More than 20 universities participated for answering the questions.

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1. Introduction

The development and growth of any nation depends entirely upon the system of education followed by the country. There has been a significant change in the teaching methodology and systems during the past five decades. Unlike the older age, large number of improvements have been observed and identified with various techniques integrated with the learning methodology. The researchers for improvement in teaching and learning methods have proposed various models.

The old strategy for teaching and learning at last level requires an upgradation and improvement since long. The mindset of the student towards that school and colleges was expecting a reformation. Many surveys are done with the view in mind for working towards the improvement in the education system. [1] Proposed that the improvement is required with the help of various modern approaches. The implementation and integration of these modern technical ideas should be done with the help of technology. The elements of education system, which are expected to be improved, are categorized as:

A. Classroom Teaching

It can be formulated as the most traditional methodology of learning.

Since years, it has been adapted as one of the most significant techniques of imparting education to the generation. [2] Reflected in his study that the classroom studies is indeed one of the only solutions which is supposed to be the most interactive and effective means of communicating knowledge.

B. Mobile Learning

Yet another class of learning is becoming very popular these days. Especially with the young generation, the use of mobile learning or self-based learning is becoming an important part of the young minds. [3] Quoted that a large number of students requires the ideology for learning with the help of mobile systems as one of their favorite methods.

C. Learning Management System

Use of various learning management system with different features is becoming very popular amongst students as well as the teachers. Large number of organizations and companies release their licensed as well as open source LMS systems for teaching and learning. The training of the students as well as the staff is indeed one of the important factors about the use of LMS system. [4] Refer to a study in which the use of LMS in higher education is becoming an integral part in the Middle East. The educational institutes have the interest in using this technology.

D. Virtual Classrooms

Many universities have introduced this new methodology of learning in which the teacher is present on one side of the computer and the students connects from various parts of the world. This semi-online mode of working enables the student to access the information and learn various subjects with minimal efforts [5]. Both the teacher and the learner can work simultaneously based on the technology, which is integrated by providing a platform to interact.

E. Blended Learning

The modern means of learning and teaching is coming up with the ideology of blended learning. Various teaching methodologies are mixed together, including the use of gadgets, LMS systems, virtual tutoring, and mobile learning as a part of this type of methodology [6].

F. Smart Classroom

To draw the attention of the students and make learning more acceptable with the use of technical gadgets and smart devices, smart classrooms are introduced at various levels of learning. Organizations are developing their own smart classroom devices and software has to create interactivity and interest of the students [7]. Smart boards and smart panels are

providing good resources for learning and making the students in tracked easily with least human interaction required.

2. Problem identification

2.1 COVID-19 Impact on Education

In the previous introduction section, it has been identified that there is a requirement for improving the conditions and possibilities of improvising blended learning towards the traditional mode of learning. In reference to the global pandemic COVID-19, it further becomes very important and alarming situation that the blended learning should be integrated inside the curriculum for better understanding of the student as well as the staff. Large number of challenges have been posed out and seen in this type of blended learning paradigms. However, it is very difficult, yet not impossible to integrate special techniques that will be responsible for providing value-added services and improving the quality of education, even from home. The practical mode of teaching and learning is minimized because of the global conditions of lockdown and humanity should be well prepared for such conditions in the near future.

There is an acute requirement in which the traditional mode of learning needs revision. Author in this reference [8] proposed the ideology for learned to predict. In this research study the

prediction-based systems are more important and are supposed to rise with the need of the hour. However, with the use of computational paces strategies and tactics it further becomes simpler and accurate to derive results about learning and evaluation of students. [9] Further provided case studies about new interactive methods of learning that are more helpful, as compared to the previous mode of working. With the help of sophisticated and newly designed tools like Shodan [10], it becomes further very simple to teach the identical use cases with the help of smart techniques and sensor-based devices comprising of Internet of things-oriented facility.

Due to the changes coming in the educational sector because of global pandemic and different mode of learning, this study emphasizes primarily on the acceptance of users towards latest methodology of teaching. The intention of staff members and faculty to impart education with the help of modern tools and techniques is evaluated based on the responses. The conviction of the staff member to work towards e-learning system and improved blended learning is recorded in the form of various questions. Around 1080 staff members across the Middle East region, especially in Saudi Arabia, answered these questions. They provided their feedback towards the questions given. Based on the provided information, in this study,

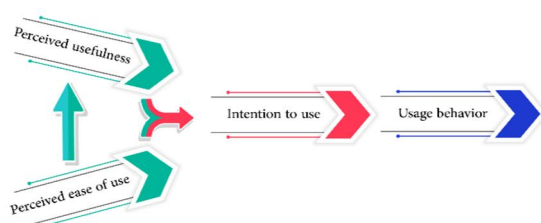
we try to identify the reliability and dependability of factors with the help of Cronbach alpha values. During the evaluation of the responses given by various faculty members, the rating scale have been mapped. The mapping led to the foundation of identification for the scale from a fuzzy value to a numeric value. These values are inserted into IBM SPSS tool for the statistical analysis.

Similar type of procedure has been adapted for inputs from the students of various universities. With the help of these inputs, approximately 740 responses were gathered with the help of Google forms from the students. These responses are again categorized based on the inputs. The weights that were given from the fuzzy scale to the numeric scale well noted down. These values are inserted inside the SPSS tool. The value of Cronbach alpha for measuring the reliability of various factors was calculated. Several factors were identified with the help of which derivations can be made. The factors that were notified towards various intentions for using the improved and enhanced learning methodologies are identified. The categories contain certain questions for which reliability is measured in terms of statistical analysis. Various results have been identified and noted down in this study.

3. Using the tam model for the measuring of intentions

The most important task was to categories the factors that were accountable for identification of intentions. The sections that were categorized, comprises of three individual subsections for both the staff and student category. A total of six subsections were evaluated. Google form, comprises of 16 and 18 questions respectively towards staff intentions and student intentions. The further subsections were grouped in the categories to identify the correlation between the given inputs from various respondents.

Fig.1. TAM Model for user acceptance



The technology acceptance model that was prescribed by Davis in 1989 is used in this study to identify the intentions of user (teacher or student). The current model of e-learning is having certain issues towards acceptance. The survey that is conducted in this study is used to identify certain factors which belongs to perceived usefulness category in the Technology Acceptance Model (TAM). The intentions to use upgraded technology by different types of users can be evaluated with the help of this model. The research, makes use of various

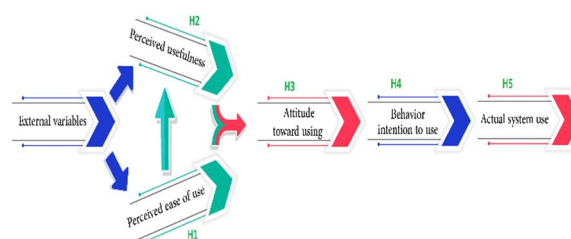
factors categorized into different sections. Each section contributes towards various factors such as user acceptability, intentions to use, perceived usefulness, perceived ease of use etc. the hypothesis that are considered to be a part of this model are prescribed as in table below.

Table.1 the hypothesis that are considered to be a part of this model

H1: H5	Hypothesis
H1	Perceived ease of use will have significant impact on teachers and students with the new system.
H2	Perceived usefulness will have a significant impact on intentions to use the updated model by students and teachers.
H3	Attitude to use the new model have a positive impact by students and teachers.
H4	User behavior to the new model have a significant impact based on the inputs.
H5	Adaptability of the new model will have a positive effect on students and teachers.

These hypotheses, comprises of observations based on which the model predicts whether the expected new design of e-learning systems will be adapted by students and teachers from universities in Middle East region.

Fig. 2. Hypothesis Factors Mapping



Following table 2 gives description about the method used for finding the

information from various respondents and categorize them in various factors to give a complete overview about the hypothesis suggested in the Technology Acceptance Model. The questions that are asked in the survey are categorized and based on the parameter is required to find out user intentions towards the acceptability of upgraded model of e-learning. The study is supposed to identify intentions of the user, along with support of the hypothesis given in Table 1 above.

Table 2. description about the method used for finding the information from various respondents

Subject	Computer science, e-learning
Specific area	Blended learning, future, e-learning
Type of data	Tables
Method of collecting data	The data is collected using online Google forms
Data format	Raw data, analyzed data, and finally filtered
Parameters for data collection	Data was collected from 1080 participants during the month of March and April 2021 for Staff Domain Data was collected from 740 participants during the month of March and April 2021 for Students Domain
Description of data collected	Data is collected from various respondents in Saudi Arabia via email and what's app messages
Data source	Around 20 universities participated for providing the inputs
Related information	Author's name: Rund Fareed Mahafdah

3.1 Value of the Data

- The data which is collected is important because it evaluates the basic awareness for improvement in the e-learning systems. This data is focused on information from the users of different backgrounds from academic's domain. The main focus is the identification of expertise in using the technology.
- The data can be very useful for global e-learning forums, and corporate companies producing learning management systems and software. It can be also useful for the researchers were trying to publish their studies in the field of e-learning.
- The information collected is also important for authorities who evaluate the competency level of education imparted by a university or organization. This information is helpful to identify the miniatures changes and the intentions of the user towards the technology being used currently.
- This data can also be used for training and educational purposes to impart deliberate information about e-learning and other activities.

3.2 Factors towards Staff Intentions

1) E-learning system acceptability:

The use of traditional classroom teaching methods by the staff member and teachers is still going on. There is a

requirement for upgrade of the technique of teaching. ELS factor which is used in the analysis represents the acceptability of a teacher to adapt e-learning in his teaching methodology. Five sub questions in this category were measured for the total observation set with the help of SPSS tool. The compatibility of a teacher is most important to teach with the help of modern techniques of e-learning systems. There are various tools that can be integrated to overcome the traditional tasks which teaching methodology used to comprise of. But there is a requirement for upgrade in the learning methods adapted so far.

2) Blended learning integration with e-learning

Blended learning may be utilized to better educate students by utilizing sophisticated contemporary approaches such as a software-driven approach and sophisticated modern methodologies. As a result, the usage of blended learning is becoming increasingly popular and promising in today's e-learning systems. For the purposes of calculating the acceptability of staff member intents to utilize blended learning in the current educational system, the BL factor must be used. The value for blended learning integration was determined with the aid of the SPSS tool based on four questions that were asked to the respondents.

3) Integration of artificial intelligence

Although conventional teaching techniques are available in many MOOC courses, they should be revised to ensure that they are more accessible to students. The general model of teaching that is implemented with the help of an e-learning system consists of fundamental components such as lectures, examinations, assessments, and grading, among others. The e-learning system, on the other hand, is capable of integrating a wide range of additional features. When artificial intelligence is included, the system may be made smarter and more active when compared to the standard e-learning environment, which is a significant improvement. It is possible to compute the dependability statistics for the factor AIELS with the aid of four fundamental questions that were posed to all of the respondents. In order to have a better knowledge of staff intentions toward using artificial intelligence in e-learning, the outputs were analyzed for dependability value with the aid of the SPSS program. It should be mentioned that Internet of Things (IoT) devices are an essential component of artificial intelligence. The factor calculation includes questions pertaining to the usage of Internet of Things devices to supplement the traditional e-learning mechanism with the artificial intelligence capabilities of the Internet of Things.

3.3 Factors towards Student Intentions

1) Student interest with e-learning systems

The affinity of a student to make use of e-learning systems for proper learning is described with the help of the factor ELSS. It comprises of five questions that the student were supposed to answer.

2) Student's perception towards artificial intelligence in e-learning

The second factor that comprises of the use of artificial intelligence in the e-learning systems was provided to the students. A total of five questions were composed of material pertaining to the application of artificial intelligence in e-learning. The students' awareness of the approach was noted, and their interest in employing it was assessed through the use of the IBM SPSS tool, which calculated the reliability value of the technique.

3) Affinity towards traditional learning/classroom teaching

The third factor tends to manage plate and identify the intention of a student to use computer aided learning over traditional classroom studies. This factor was more important due to the fact that the global phase shift towards learning is going on. The mindset of the student towards the adaptability of such e-learning systems was measured with the help of this factor and evaluated towards the reliability using SPSS.

Following are the tables for questions used for the evaluation of the various factors in the study by for staff respondents.

Table 3. The three factors that are projected

Factor	Question
ELS	Are you satisfied with the present E-Learning System?
	What is the rating you would give to the existing E-Learning System that you use?
	Do you think there is a need for the change/upgrade of the E-Learning System?
	Is the present E-Learning System efficient enough for the teaching and learning procedure?
	Are the MOOC Courses sufficient for teaching over the E-Learning System?
BL	Do your E-Learning System support Blended Learning Options?
	Can Blended Learning be used over the Traditional Learning Methodology of E-Learning System?
	Do you think that use of IoT can be more helpful in providing Blended learning to modern E-Learning System?
	Can we replace human evaluation procedures with the help of Software Driven System?
	Which one is better Blended learning, Traditional Learning, Machine Based learning, or Online Learning?
AIELS	Do you think we can measure Cognitive Skills of a student using Artificial Intelligence?
	Do you think we can measure Intelligence Quotient of a student using Artificial Intelligence?
	Can we use social media as a Learning Platform for teaching?
	Can the software-based systems be

used to evaluate the Lab Learning / Practical based learning to students?

Is Sentiment Analysis possible using the Artificial Intelligence?

Do you think that AI can improve the Teaching methodology for staff members?

The three factors that are projected in Table 3, are ELS (which targets the present e-learning system), BL (used to focus on blended learning) and AIELS (opinions of staff members towards artificial intelligence-based e-learning services).

Following are the tables for questions used for the evaluation of the various factors in the study by for student respondents.

Table 4. The factors that are responsible for identifying the students' opinion presented

Factor	Questions
ELSS	Are compatible with the present e-learning system?
	Do you use the e-learning system 100% of the time without failure?
	Are you engaged for all of the time in the e-learning system without any other work?
	Is your e-learning system sufficient to learn your course completely?
	How many times you use the e-learning system in one-day?
	Are you able to understand your teacher during classroom with the help of online learning?
	Is your e-learning system able to identify your sentiments?
	Is your e-learning system able to identify your emotions while you're taking a class?

ELS-AI Do you think that blended learning is important, as compared to the traditional e-learning system?

Are online studies better than the traditional mode of teaching and learning?

Do you think that e-learning system is able to check your intelligence quotient?

Which is better traditional learning or e-learning?

Do you think you can roll back to traditional learning?

Rate your e-learning system on a scale of one till five?

TL How much is your comfort level with your present e-learning system?

Rate your experience with e-learning system?

The factors that are responsible for identifying the students' opinion presented in Table 4 are, ELSS (it represents the present e-learning system, which is student uses), ELS_AI (this factor focuses on students' perception towards artificial intelligence-based e-learning system) , and TL (which represents the traditional learning model used by various universities and schools since ancient time). The entire focus on the questions is on identification of students' opinion towards upgradation expected on the present e-learning system.

Table 5. Factors that are analyzed to support the hypothesis

HYPOTHESIS	FACTORS THAT ARE ANALYZED TO SUPPORT THE HYPOTHESIS
H1:H5	
H1	TL
H2	BL
H3	AIELS, ELSAI
H4	BL, TL
H5	ELSS, ELS

The results that were given by various factors are analyzed to find out intentions of students and teachers towards upgrading the present e-learning system with blended learning and artificial intelligence. All the hypothesis that were mentioned in Table 3, corresponds to the factors which are responsible for providing value-added learning system amid Covid 19. The requirement for such a system that is capable of evaluating and imparting quality education is required. These factors were analyzed and the technology acceptance model was applied to identify the behavioral intentions of staff and student towards acceptance of this model.

4. Discussion and analysis of faculty intentions

4.1 Statistical Modelling data – E-Learning System Acceptability

The total number of records sets taken into consideration by various respondents are 1089. All the values by the respondents are completely filled and there is no missing value as per the analysis tool.

Table 6. Case processing summary

		N	%
Cases	Valid	1089	100.0
	Excluded *	0	0.0
	Total	1089	100.0

*List wise deletion based on all variables in the procedure

Table 7. Reliability statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.765	0.752	3

The initial first factor comprises of discussion over the point in which the staff members are questioned about various facts related to the present e-learning system. They all are expecting an improvement in the technique, which are applied at the present time. The Cronbach's relativity value between these questions based on the responses is calculator as 0.765, it shows a clear inclination of the staff member towards improvement in the existing e-learning system.

Table 8. Inter-item correlation matrix

	ELS1	ELS2	ELS3	ELS4	ELS5
ELS1	1.000	0.802	0.382	0.382	-0.047
ELS2	0.802	1.000	0.325	0.325	0.045
ELS3	0.203	0.115	1.000	-0.062	0.023
ELS4	0.382	0.325	1.000	1.000	0.063
ELS5	-0.047	0.045	0.023	0.063	1.000

The correlation between various factors, as well as the dependence on the questions that were provided to the staff or faculty person, is represented in the table above. A large number of observations contributes to the acceptability of improvements in current e-learning as well as its replacement with blended learning technology, as demonstrated by the data collected.

4.2 Blended Learning Integration

Table 9. Reliability statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.543	0.545	4

It is possible to determine the suitability of blended learning integration with e-

learning systems with the assistance of an examination of the question linked to the second component. With a score of 0.543, it indicates that a significant percentage of individuals are also in favor of the enhancement of e-learning paradigms through the integration of blended learning and Internet of Things devices. It should also be noted that different members of the staff are unable to implement various types of Internet of Things devices or blended learning approaches at the same time. These approaches are not widely used, but they are extremely successful in the context of e-learning and teaching in the future.

Table 10. Scale statistics

Mean	Variance	Std. Deviation	N of Items
7.39	4.020	2.005	4

The mean value, which is calculator for all the questions and factors towards the blended learning integration represents a strong association between the results given by various staff members as respondents. Unless value of standard deviation accounts for acceptability of the results from various respondents.

4.3 Artificial Intelligence Acceptability

Table 11. Reliability statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.556	0.552	4

All the respondents have given feedback about the use of artificial intelligence in e-learning. At this stage, the integration of methodologies that are responsible for calculating the emotional and sentimental

quotient of pupils is unquestionably necessary. The availability of information for the purpose of calculating one's intelligence quotient is, without a doubt, necessary by any educational environment.

The Alpha factor which is calculated with the help of information received from various respondents is good enough to accept the fact that artificial intelligence will be a very strong tool towards the acceptance of technical improvement. Since a large number of teaching and learning methodologies are working online amid Covid-19, there is a strong requirement for such tools.

Table 12. Scale statistics

Mean	Variance	Std. Deviation	N of Items
9.93	6.112	2.472	4

The statistical analysis shows that mean value of 9.93 is really good. Towards the adaption of artificial intelligence, respondents believe that it is going to help a lot.

5. Discussion and analysis of students intentions

5.1 Affinity of Students towards E-Learning

Table 13. Case processing summary

	N	%
Cases	740	100.0
Excluded *	0	0.0
Total	740	100.0

***List wise deletion based on all variables in the procedure**

Around 740 respondents from that students domain have replied to the survey, conducted towards the adaption of e-

learning. All the students have given a proper understanding and responses towards all the questions asked.

Table 14. Reliability statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.712	0.703	5

The Alpha value is computed based on the analysis of the findings and replies provided by all of the survey participants. The reliability coefficient of 0.712 indicates that the results are quite reliable in relation to the questions answered. It makes perfect sense to assume that students find it appealing, and the characteristics identified by the survey model may be utilized to tailor e-learning to the needs of individual students.

Table 15. Scale statistics

Mean	Variance	Std. Deviation	N of Items
14.95	24.598	4.960	5

A very high value of mean and a lower value of standard deviation accounts for the fact that the information is really easy to manage and derive the conclusion towards the adaptability by the students.

5.2 Artificial Intelligence – Students Perception

Table 16. Reliability statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.728	0.744	5

Various students have responded with the fact that the present e-learning system is adaptable and can be improved with the help of new tools like blended learning and IoT devices to improve the value of education. It is further derived that 0.728 is

a very good value towards the reliability from the responses given by the respondents.

Table 17. Summary Item Statistics

	Mean	Min	Max	Rang e	Max/Min e	Variance	Items
Item Means	2.324	1.703	3.459	1.757	2.032	0.461	5
Item Variance	2.475	1.779	3.740	1.961	2.102	0.644	5
Inter-Item Covariances	0.864	0.385	1.445	1.060	3.750	0.115	5
Inter-Item Correlations	0.368	0.147	0.715	0.568	4.867	0.026	5

The variance between various items and the correlation is giving less values. It can reflect that large number of students have similar perception and a large number of students believe that the e-learning systems when integrated with blended learning and IoT based devices can be very helpful.

Table 18. Scale statistics

Mean	Variance	Std. Deviation	N of Items
11.62	29.654	5.446	5

The deviation, which is observed between the values and the answers given by students is fair enough. For all the items in this factor analysis, high value of variance shows perfect result for the adaption of second factor.

5.3 Traditional Learning Affinity Analysis

Table 19. Reliability statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.240	0.344	4

The acceptability of traditional learning and affinity of the student towards it is found to have a very less value of Cronbach's Alpha. This results in the observation that the value is corresponding to the less acceptability of old traditional teaching methodologies. As an inverse, it can be concluded that more of the modern means are accepted by various students.

Table 20. Summary Item Statistics

	Mean	Min	Max	Rang e	Max/ Min e	Varianc e	Items
Item Means	3.416	2.919	4.108	1.189	1.407	0.249	4
Item Variance s	1.477	1.090	1.856	0.766	1.702	0.115	4
Inter-Item Covariances	0.108	-0.695	0.971	1.666	-1.398	0.619	4
Inter-Item Correlations	0.116	-0.444	0.683	1.127	-1.538	0.297	4

The summary of all the variances and correlations proves that very less affinity is considered by the respondents towards the traditional learning methodology.

6. Results and discussion

According to the results of the analysis of the replies received from various respondents, this study finds that an update to the current educational paradigm is

required. During pandemic outbreaks, the following phase shift in instructional methodologies is observed:

Table 21. results of the analysis of the replies received from various respondents

S.No	FACTOR	CRONBACH VALUE
Staff Intentions		
1.	ELS	0.765
2.	BI	0.543
3.	AIELS	0.556
Student Intentions		
4.	ELSS	0.712
5.	ELSAI	0.728
6.	TL	0.240

The values of Cronbach's Alpha, finally signifies that there is high probability for improvement of integration of blended learning with the educational system. The e-learning systems can be upgraded with the help of artificial intelligence to provide emotional and sentimental analysis. The students also accepted, the adaption of such techniques that will be required for the improvement of individual intelligence quotient

Table 22. hypothesis are suggested to be supported by various factors

H1:H5	Factors	Results
H1	TL	Supported
H2	BL	Supported
H3	AIELS, ELSAI	Supported
H4	TL, BL	Supported
H5	ELS, ELSS	Supported

The composite values of various Cronbach Alpha, leads to the observation that all the hypothesis are suggested to be supported by various factors taken into

account. The survey comprises of questions focused upon the factors. The respondent provide their responses. All the analysis

7. CONCLUSION

This research is being carried out in order to improve the current e-learning management systems through the use of Internet of Things (IoT) based devices. There is a great need for development in teaching technique that is centered on digital and technological equipment, and this is a pressing issue. It is the goal of this study to examine the intents of teachers and students toward adaptation in order to improve the current e-learning systems. Various aspects are investigated, and appropriate statistical modeling is carried out in order to draw conclusions based on the information gathered from the survey participants. The primary goal of this study was to determine the adaptability of a new anticipated system in the field of teaching based on input from students and faculty members from a variety of demographic and regional backgrounds. According to the findings of the study, there is an expectation of improvement in the blended learning environment as a result of the use of Internet of Things (IoT) based devices. The discovery highlights a particularly important issue for e-learning system designers: improving the integration of Internet of Things devices through the application of artificial intelligence. Because of the use of such procedures. With the aid of machines and Internet of Things devices,

which is done in this study is based upon the replies given by various participants.

it will be possible to bring about a significant shift in learning and teaching paradigms.

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