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The Effect of Designing an Interactive Digital Platform Based on Design Thinking Skills on Developing Awareness of EDT among University Students

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ABSTRACT

The current research aimed to improve university students' understanding of emerging and new digital technologies by developing an interactive digital platform. Consequently, three groups of undergraduate students from King Khalid University's College of Education were randomly selected. These groups were called the empirical group (consisting of 31 students who used the Edx platform), the control group (consisting of 33 students who used the standard training strategy), and the second empirical group (consisting of 34 students who used the Blackboard platform). The research findings were analyzed using the One-Way ANOVA test. The second research hypothesis was thus rejected because, after applying the measure of awareness of Emerging digital technologies (EDT), there was a statistically significant difference at the level (0.05) in the mean scores of the first empirical group (which used the Edx platform), the second empirical group (which used the Blackboard platform), and the control group (which used the standard procedure). The findings showed that university students' awareness of EDT increased higher when they utilized the Edx platform than when they used the Blackboard platform or the training strategy.

INTRODUCTION

Interactive participation in education is crucial for institution success, especially in the era of technological advancements. In the Fourth Industrial Revolution era, passive listening to lectures and taking notes could harm creativity and innovation among students and influence attitudes toward learning negatively. The concept of "cross-national education" is gaining popularity due to technological advancements, aiming to provide educational services through cooperation between educational institutions worldwide with similar goals (Martin, 2018). This approach is based on modern, flexible methods and organizations, ensuring preparation, follow-up, planning, and implementation in line with international quality standards. One significant example of this is the widespread open Digital courses, Massive Open Online Courses (MOOCs), which are university courses that include lectures, activities, assessments, and other educational materials. Therefore, in 2008, the quality of education was improved when the University of Manitoba introduced widespread digital courses for cost reduction. (Hinnawi, 2018).

The development of e-learning platforms for professional development is now offered by many open educational resources, including Udemy, EDX, Coursera, and Khan Academy, as well as some Arab platforms such as Rwaq, Edraak, and Nafham. Learning Management Systems (LMS) are digital platforms used in Higher Education Institutions (HEIs), including open-source and free Moodle platforms and closed-source platforms like Blackboard providing professional educational content (Jalbout & Farah, 2016; Kameas et al., 2023; Maican & Lixandriou, 2016).

Digital educational platforms, in combination with social networking and e-learning management systems, offer online services to assist students, teachers, and parents with interactive tools that offer improved delivery of educational content. Therefore, for a comprehensive web-based system, these platforms are known for their safe and user-friendly interface (Kiryakova-Dineva et al., 2017). Harvard, Stanford, MIT, and Massachusetts Institute of Technology are among the top US universities that have successfully introduced MOOCs. In 2015, the EDX platform offered over 500 courses across 40 colleges, while Coursera offered over 1,000 courses across 112 universities, and over 7.1 million students participated in MOOCs in America (Hinnawi, 2018).

Consequently, past studies highlighted the significance of designing educational platforms to meet desired learning outcomes for university students. It is specifically useful in developing economies where traditional systems are challenging to expand due to high material and human costs (Alibraheim et al., 2023). Similarly, another study focused on designing an educational platform based on participatory stories and recommended the necessity of providing digital platforms to deliver university courses encouraging students for effective learning and participation in online educational communities (Faris et al., 2019).

The research by Holotescu et al. (2017) highlighted the importance of engaging open e-learning systems MOOCs among university students, concluding that these systems enabled the creation of innovative software for designing smart cities. Arab universities continue to provide traditional majors that do not meet the demands of the labor market and do not adequately prepare

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graduates for entry into the workforce, despite their interest over the past ten years in developing programmes and majors to help students progress (Holotescu et al., 2017). Therefore, university graduates have a far higher unemployment rate than other demographics. It indicates that Arab institutions do not prepare their students and graduates to launch and advance their technical initiatives (Maydi, 2023). Therefore, modern and exciting emerging technologies that open up a wide field for technological innovation are significant for students, including Robotics, Big Data Analytics (BDA), Artificial Intelligence (AI), and the Internet of Things (IoT) (Ghosh et al., 2018).

Research Problem

HEIs have not consistently invested in Information and Communications Technology (ICT) to capitalize on technological advancements, resulting in inadequate digital instructional content that fosters student innovation. In contrast to many industrialized nations that have made significant investments in ICT has emerged as the primary tool for learners, allowing them to access material whenever, wherever swiftly, and however they choose for the public good. The instructor benefited from it by learning more about what he is teaching, and the guardian gained from it by being able to communicate with those who teach his children (Al Omar, 2018). The evolution of educational tools, approaches, and requirements is crucial to keep up with technological advancements that impact not only the subject matter but also the overall educational environment (Miranda et al., 2021).

Higher education establishments are still acquainting themselves with new or developing digital technologies and comprehending the significance these technologies hold for society, the economy, and education. Students, instructors, and administrators will find it simpler to use developing digital technologies effectively and beneficially the sooner they become interested in them; conversely, the later they become interested, the more challenging it will be to reap the benefits (Khan & Qudrat-Ullah, 2021). In this regard, it can be concluded that college students are ignorant of the term “Emerging digital technologies (EDT)”, are unfamiliar with many of them, and are unsure of how to use them to their advantage in both their academic and personal lives (Elnadeef & Elneil, 2023).

Based on the gaps mentioned, the current research's problem was determined to be King Khalid University students' inadequate understanding of new digital technologies and how to use them for instruction. In order to address this shortcoming, the current research aimed at developing awareness of EDT among university students through designing a Digital platform based on design thinking skills. The research emphasizes the importance of higher education officials being aware of the use of digital platforms in the classroom, offering a paradigm shift in distance learning, providing students with training sessions to enhance their digital technology knowledge, and encouraging students to use digital platforms for self-

learning, communication, and idea sharing.

The course material for King Khalid University's College of Education's “Using Computers in Education” can be created, presented, shared, managed, and assessed using this interactive online learning environment. The goal is to help students gain an understanding of the latest digital technologies, including their tools, capabilities, and numerous interactive activities.

Awareness of EDT is the understanding of the nature of contemporary technologies and how to use them to meet societal and educational demands by King Khalid University College of Education students. The grade that pupils receive on the scale designed for this purpose serves as the indicator.

Research Question

The research question addressed in this research is:

1. How does creating a digital platform using design thinking affect students at King Khalid University's College of Education in terms of raising their knowledge of new and upcoming digital technologies?

Research Hypothesis

The goal of the current research is to confirm the following hypothesis:

H1: There is no statistically significant difference at the level (0.05) between the average scores of the first empirical group that used the Edx platform, the second empirical group, which used the Blackboard platform and the control group (which used the usual strategy in training) in the post-application of the measure of awareness of EDT.

METHODOLOGY

The research employed a quasi-experimental methodology that involved creating control and empirical groups and applying performance measurements both before and after.

The following steps were carried out to determine the efficacy of creating a digital platform for bachelor's students at King Khalid University's College of Education to improve awareness skills of EDT:

Step 1: Selection of the Research Sample

Three sets of bachelor's degree candidates from King Khalid University's College of Education made up the research sample, which was chosen at random:

- The first empirical group was trained through the platform (<https://ahmedsadek.edunext.io>) designed via (EDX) platform.

- The second empirical group was trained using the Blackboard learning management system.

- The third group used the traditional training strategy for the course “Using Computers in Education-424 TRB-2”.

The research tools were pre-applied to ensure the equality of the groups, and Table 1 below represents the computed results.

In the pre-application of the awareness scale of EDT,

Table 1: One-way ANOVA of Awareness Scale of Emerging Technologies in Pre-Application

Tool	Variance source	Total squares	Degree of freedom	Average squares	F Calculated value	Significance level
Awareness scale of EDT	Inter-group	4.585	2	2.293	0.705	0.479
	Intra-group	309.088	95	3.254	0	0
	Total	313.673	97			

there were no statistically significant differences between the first, second, and control groups. According to Table 1, the “Awareness Scale for EDT” has a computed (F) value of (0.705), which is not significant at the level (0.05). Both sides of the calculation are significant, with a degree of freedom (2) representing the largest variance and a degree of freedom (95) representing the smallest variance. It demonstrates how the three groups’ levels of awareness of newly EDT among King Khalid University’s Faculty of Education students are equivalent.

Step 2: Preparing Research Materials
Designing a Learning Environment Based on E-Learning Platforms

Several earlier studies, were conducted to create a learning environment based on the digital learning platform using the generic ADDIE design paradigm (Almelhi, 2021; Bağkala & Bağkala, 2020; Mexia et al., 2017). It was applied in this research as follows:

The First Stage: Analysis

At this stage, the following procedures were taken:

- Identifying the overall goals of the educational setting by utilizing e-learning resources. The main objective of the digital learning platform-based learning environment at King Khalid University’s College of Education is to help bachelor’s degree candidates become more aware of and proficient with EDT.
- Identifying the attributes of students: In the first semester of the current academic year (19/2020 AD), King Khalid University’s College of Education is enrolling seventh-level bachelor’s students in “Using Computers in Education 424, Terb-2”. Their familiarity with computers and Internet networks is practically the same, and they both live in comparable environments. Thirteen students were in the first empirical group, thirty-four students were in the second empirical group, and thirty-three students were in the control group.
- The College of Education’s computer lab was utilized, demonstrating the capabilities of the learning environment.
- Educational materials: Each training topic was assigned five training units, along with behavioral targets that were specifically tailored to each unit.

The Second Stage: Design

During the design phase, the following procedures are defined for the learning environment based on the digital learning platform: learning strategy, content, activities, and evaluation techniques. A comprehensive vision for

the content, learning strategy, and activities is developed.

Procedural Objectives of the Learning Environment Based on E-Learning Platforms

Behavioral objectives were set for each of the training topics as follows:

The First Topic: Emerging Platforms and Technologies

After completing this lesson, the student should be able to:

- Understand the platforms.
- Describe the features of innovations.
- Describe the most significant new technology.
- Talk about how emerging technologies are advancing education.

The Second Topic: Designing Interactive Digital Content

After completing this lesson, the student should be able to:

- Know about the Digital content.
- Explain the elements of Digital content.
- Use Digital content authoring tools.
- Designs Digital content according to SCORM standards.

The Third Topic: Designing Educational Websites

After completing this lesson, the student should be able to:

- Know the meaning of the educational website.
- Explain website design specifications.
- Know the Drupal website design system.
- Design a website on <https://caramel.la>.

The Fourth Topic: Digital Walls

After completing this lesson, the student should be able to:

- Know what Digital walls are.
- Explain the importance of Digital walls in education.
- Design a Digital wall.
- Publish the Digital wall.

The Fifth Topic: Word Cloud

After completing this lesson, the student should be able to:

- Know what a word cloud is.
- Explain the importance of word clouds in education.
- Design a word cloud in his field of specialization.
- Survey cloud words in a poll.

The Content of the Participatory E-Learning Environment

The content of the learning environment based on the learning platforms included the following topics:

- The First Topic: Emerging platforms and technologies.
- The Second Topic was digital content design.

- The Third Topic was designing educational websites.
- The Fourth Topic: Digital Walls.
- The Fifth Topic is Word Cloud.

Digital Platform Environment

Based on the procedural objectives and the content of the learning environment, the learning strategy using the learning platform proceeded according to the following flowchart:

The Learning Strategy and Activities Used in the

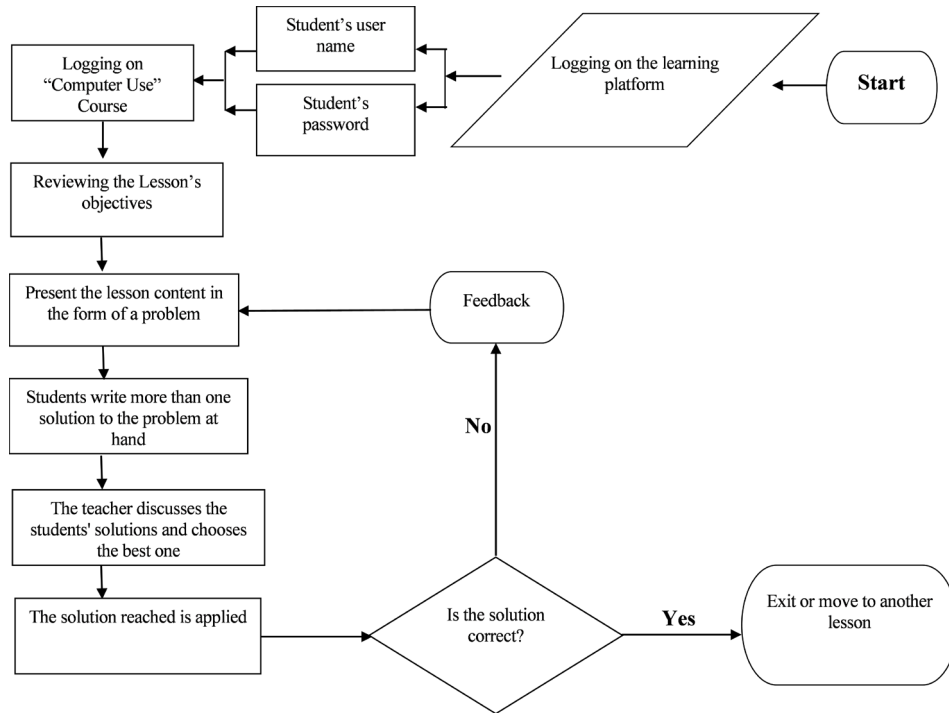


Figure 1: Flowchart of online learning strategy

Learning Strategy Via the E-Learning Management System (Blackboard)

Based on the procedural objectives and the content of

the learning environment, the learning strategy proceeded using the e-learning management system “Blackboard” according to the following flowchart:

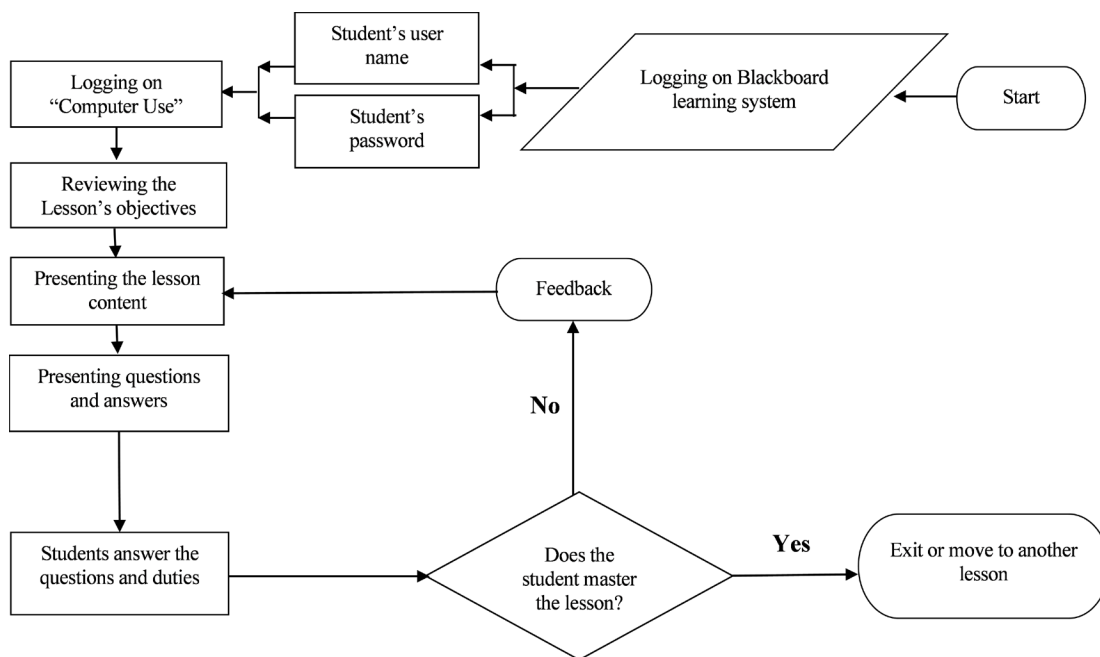


Figure 2: Flowchart for Learning Strategy via Learning Management System (Blackboard)

Evaluation Methods

A variety of assessment techniques were used, such as formative evaluation to drive student learning and provide feedback during each lesson and pre-evaluation to measure prior learning at the start of each session. After researching all of the training materials created in accordance with the digital learning platform, a final evaluation is conducted to ascertain the bachelor’s students at King Khalid University’s College of Education’s awareness of developing digital applications.

Step 3: Development

Currently, studies are using a few computer programs to create training materials that assist College of Education students in becoming aware of and proficient with new digital technologies. These websites and programs that are the most well-known are as follows:

- Blackboard learning management system
- Video Scribe program
- <https://www.edx.org> platform
- <https://answer garden.ch> website
- <https://ar.padlet.com>
- Articulate Storyline program

Step 4: Implementation

At this stage, the Digital content was published on the Edx platform through the link (<https://ahmedsadek.edunext.io>) in order to research the content of the “Using

Computers in Education” course. It also explained how to access the platform and the tasks required to be performed.

Step 5: Evaluation

At this point, a group of experts in “educational technologies” were shown the material of the e-learning platform. After examining all of the instructional materials among the research group students, the measurement instruments for the awareness of new digital technologies in education were also implemented.

The Third Stage: Preparing Performance Measures Awareness of EDT Scale

The awareness scale for EDT was prepared according to the following steps:

Analyzing the Purpose of the Scale

The scale’s goal is to gauge College of Education students’ level of understanding regarding new digital technologies. Through a training program based on the Digital Learning Platform, this scale has three dimensions: identifying the EDT, applications of EDT in education, and difficulties of EDT.

Scale Items

The scale consists of three dimensions, represented in Table 2.

Table 2: Items and Dimensions of Scale in its Initial Form

S	Dimension	Phrases
1	What are EDT	11
2	Applications of EDT in education	16
3	Challenges of EDT	11
Total	3	38

Scale Adjustment

Presenting the Initial form of the Scale to a Group of Arbitrators

The scale was completed and then presented to a committee of experts in the fields of psychology and educational technology. Their opinions clarified the scale’s applicability for the intended use while removing and rephrasing several of the scale’s phrases, including “EDT will help combat corruption in the first dimension” and “credibility of data obtained from EDT in the third dimension.”

Exploratory Application of the Scale

A survey sample of twenty-two bachelor’s students from King Khalid University’s College of Education was administered to assess the scale for measuring expressions’ language and academic appropriateness. Their answers demonstrated that the statements on the scale were appropriate and free of any linguistic or intellectual difficulty.

Internal Consistency of the Scale (statistical validity)

Table 3 below represents the correlations determined between the entire scale dimensions and the total score:

Table 3: The Correlation Coefficient Matrix

Dimension	What are EDT	Applications of emerging technologies in education	Challenges of emerging technologies
What are EDT	1		
Applications of EDT in education	0.73	1	
Challenges of EDT	0.19	0.32	1
The entire scale	*0.78	*0.86	*0.70

Table 3 above concluded that the correlation coefficients for the first, second, and third dimensions with the entire scale are respectively equal to 0.78, 0.86, and 0.70, which are all statistically acceptable and significant values. It suggests that the scale's dimensions measure the same thing as the scale as a whole, demonstrating the validity of both the scale and its dimensions.

Calculating the Average time of the Scale

The scale time was calculated by finding the average of the times of all students, each according to their speed, and it was approximately equal to (35) minutes.

Calculating Scale Reliability

After presenting the scale to a group of arbitrators and piloting it on (22) students, Cronbach Alpha was used to compute the scale reliability, which was calculated approximately equal to (0.81), showing an appropriate reliability coefficient.

The Final form of the Scale

After formulating the scale and adjusting it statistically, the scale became valid for the final application.

FINDINGS AND DISCUSSION

The following research issues were addressed after keeping an eye on the student's performance on the post-application awareness of developing digital technologies measure and making necessary adjustments:

The response to the first query, which asks: How does creating a digital platform using design thinking affect students at King Khalid University's College of Education's knowledge of future digital technologies?

The following research hypothesis was tested to answer this question:

"There is no statistically significant difference at the level (0.05) between the average scores of the first empirical group that used the Edx platform, the second empirical group used the Blackboard platform, and the third group (which used the usual strategy) in the post-application of the measure of awareness of EDT.

The statistical technique of "one-way analysis of variance (one way ANOVA)" was used to test the validity of this hypothesis and to compare the scores of the three groups in the awareness scale of EDT. Table 4 shows the results of applying one-way ANOVA.

Table 4 demonstrates that the computed value of (F)

Table 4: One-way ANOVA of Awareness Scale of Emerging Technologies in Post-Application

Tool	Variance source	Total squares	Degree of freedom	Average squares	F Calculated value	Significance level
Awareness scale of EDT	Inter-group	1230.183	2	615.091	*12.573	0.001
	Intra-group	4581.817	95	48.230		
	Total	5812.000	97			

is (12.573) at the significance level (0.05), the degree of freedom (2) for the highest variance and the degree of freedom (95) for the smallest variance, as well as the significance of both sides. It suggests that after applying the awareness scale of developing digital technologies, statistically significant differences were observed between the first, second, and control groups.

The second research hypothesis was thus rejected

because, after applying the measure of awareness of EDT, there was a statistically significant difference at the level (0.05) in the mean scores of the first empirical group (which used the Edx platform), the second empirical group (which used the Blackboard platform), and the control group (which used the standard procedure). Table 5 below illustrates the application of the Scheffe test to determine the direction of this discrepancy.

Table 5: Scheffe Test Results for Mean Differences Between the Three Groups

The Groups	First Group	Second Group	Third Group
The first group	0		
The second group	*5.99	0	
The thirds group	*8.57	2.58	0

* Significant at level 0.05

Table 5 makes this evident: the first empirical group scored higher than the second empirical group, with a significant difference between the two groups scores. Their average is higher than the second empirical group's average, which is (63.97). Their average is (69.97). Additionally, Table 5 demonstrates that there is a difference between the first empirical group's scores and the control group's scores, with the first empirical group's mean being higher at 61.39 than the control group's.

The researchers believe that the previous result could be due to the following:

- The Edx platform encompasses the utilization of contemporary educational applications, including cloud computing, AI, and interaction with King Khalid University's e-learning platform, <https://kkux.org>. These applications, which focus on modern applications like BDA, design thinking, AI, and the IoT, have all contributed to raising students' awareness of EDT in the

College of Education.

- The educational platforms' philosophy is grounded in social constructivism theory, as demonstrated by the students' utilization of bar codes via the website (<https://www.qr-code-generator.com>) for data recording and sharing. Students were able to understand one of the new digital tools in education because of this.

- University libraries have implemented IoT apps that provide a connection between a student's checked-out books, mobile phone, and national identification document.

- Every student in the research sample is interested in

growing personally and exploring new areas, and the Edx platform caters to their pursuit of new knowledge in the realm of technology. As a result, this setting contributed to the College of Education students' increased knowledge of developing digital technology.

Academic and Practical Significance of the Research Results

Table 6 explains the practical or applied importance of the research results by finding the effect size of the independent variable on the dependent variable (•)¹.

Table 6: The Academic and Applied Importance of the Research Results

Independent variable	Dependent variable	Total squares /gross total	Effect
Digital platform design	Awareness of EDT	0.21	Significant

It is clear from Table 6 that the size of the effect of using Digital platforms in developing awareness skills of EDT in education is (0.21), which is a large percentage.

The findings demonstrated that, when it came to raising awareness of new digital technologies, the students in the first empirical group who utilized the Edx platform had a higher and statistically significant capacity than the students in the second group and the control group. It indicates that students who trained via the Blackboard platform or the conventional methods did not profit as much from the Edx platform as did the students in the first empirical group. It might be a result of the Edx platform's use of contemporary technology and its provision of teachers with useful examples of IoT uses in the library sector and in the areas of creating "barcodes" and student-to-student information exchange. Students' understanding of new digital tools in education increased as a result of all of this. The findings of this investigation align with previous literature findings as well (Faris et al., 2019; Lattabi, 2018).

Limitations and Future Research

The current research is limited to training on practical projects such as emerging platforms, interactive digital content, educational websites, digital walls, and Word Cloud, the course "Education with Computers—424 TRP-2", and measuring awareness of new digital technologies using a scale. The research suggests implementing a learning platform-based training program in the future to enhance university students' digital leadership skills, creating an online learning environment using design thinking for digital platform design proficiency, and creating a course on IoT applications to prepare students for future digital transformation and digital transformation.

RECOMMENDATIONS

Based on the results of the current research, the following can be recommended:

- Increasing university students' understanding of contemporary digital technologies and their potential educational benefits is an important area of focus. "IoT

Applications," "smart education," "BDA," and 3D printing are a few of the most well-known.

- Educators must receive training on e-learning platforms so they can facilitate open communication and information sharing among their students, thereby fostering the development of their inventive talents in the classroom.

CONCLUSION

The research aimed to enhance students' awareness of EDT in education through the design of an interactive digital platform at King Khalid University. The research hypothesis tested was that there was no significant difference between the average scores of the first empirical group using the Edx platform, the second empirical group using the Blackboard platform, and the third group using the standard procedure. However, the results showed that the first empirical group scored higher than the second group, with a significant difference between their scores. The Edx platform utilized contemporary educational applications, such as cloud computing, AI, and interaction with King Khalid University's e-learning platform, which contributed to raising students' awareness of EDT. The platform's philosophy was grounded in social constructivism theory, as demonstrated by the students' utilization of bar codes via the website. University libraries implemented IoT apps, and the platform caters to students' interests in growing personally and exploring new areas. The academic and practical significance of the research results was found to be significant, with the first empirical group having a higher and statistically significant capacity to raise awareness of new digital technologies.

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