

**نظام مقترح قائم على التنقيب في البيانات للإدارة
الرقمية للاختبارات التعليمية**
*A Proposed System Based On Data Mining For
Digital Management Of Educational Tests*

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A Proposed System Based On Data Mining For Digital Management Of Educational Tests

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Abstract

As the technology has rapidly become more powerful on scoring exams and essays, especially from the 1990s onwards, partially or wholly automated grading systems using computational methods have evolved and have become a major area of research. In particular, the demand of scoring of natural language responses has created a need for tools that can be applied to automatically grade these responses. In this paper, we focus on Educational electronic tests envision a future in which the question can be linked to the answer through many modern technologies such as data mining technology that will revolutionize the field of e-learning. This research presents a proposed system based on data mining for digital management of educational tests . In this paper, we explored in depth the role of mining In developing the construction of electronic tests that will depend on data mining technology to provide students with the skills of analysis and conclusion. The proposed system helps the student to search in the content about all paragraphs related to the keywords in the question , the student read this paragraphs and analysis them and thus has the ability to choose the most accurate answer.

Key Words : Data Mining , Digital Management , Educational Tests.

1. INTRODUCTION

In the past decade, we have witnessed a tremendous rise in the use of electronic devices in education. Starting from nursery classes at the pre-school level to the postgraduate programs at the universities, electronic devices are being used extensively to enhance and facilitate quality of education. Although the use of computer networks is an inherent feature of online learning, the traditional schools and universities are also making extensive use of network connected electronic devices such as mobile phones, tablets, and computers.

However, it is humanly impossible to analyze enormous volume of data generated from the active usage of devices connected through a large network. The educators and academic administrators can benefit from their counterparts in business and service industries where a complex system of methods and techniques, usually referred as data analytics or data mining, are being used to analyze a large influx of real-time data in decision-making. Researchers have started paying attention to the application of data mining and data analytics to handle big data generated in the educational sector. In the context of education, these techniques are specifically referred to as Educational Data Mining (EDM) and Learning Analytics (LA).

Generally, EDM looks for new patterns in data and develops new algorithms and/or new models, while LA applies known predictive models in instructional systems. Currently, there are many revolutions in the field of knowledge, information and technology. Which poses the education sector the task of preparing a generation capable of dealing with the developments of this era of communication technology and the Internet, electronic lessons and lectures, and finally mobile learning, Proceeding from the existence of many challenges facing education in Egypt, In addition to changing the role of the teacher from a tutor and transmitter of knowledge to a mentor and guide for learners, the need came to use technological innovations in order to raise the efficiency of the educational process and achieve the required goals [1].

Portable devices provide educational materials and electronic tests well to learners if they are designed in proportion to the characteristics of the technology used, and requires the production of electronic courses and exams via mobile devices from developers. The content is to change their attitudes and create an environment commensurate with the technology and characteristics of mobile devices, in order to ensure the interaction of learners in the learning environment. Electronic tests are today a preferred method for assessment in both virtual and traditional learning environments, due to their effectiveness, increased reliability, transparency about how they are corrected, and many other benefits for teachers and learners. And the educational process such as saving time, effort, costs and ease of access for students [2].

Electronic tests are an ideal method for evaluation because of their flexibility, multiplicity of tools, the possibility of applying them at any time and place, and the possibility of monitoring them, and thus leads to the accuracy of their results. [3]. Education experts have settled that mobile devices can provide a variety of services in the field of electronic tests, which depend on the use of data mining technology, which in turn extracts cognitive patterns from large data sets by combining statistical methods and artificial intelligence with management Databases. Where knowledge is extracted from large data sets stored in databases and data warehouses. Data mining provides many techniques for data analysis. large amount of data currently in student databases exceeds human ability to analyze and extract the most useful information without help from automated analysis techniques. Knowledge discovery (KD) is the process of nontrivial extraction of implicit, unknown, and potentially useful information from a large database [4]. Data mining techniques help to extract useful information from different databases. And data mining technology has been used in the educational process, which in turn explores the unique types of data that are taken from educational environments, whether in courses or electronic tests, and presents them to students, thus achieving a better understanding of them. Educational Data Mining (EDM) is concerned with developing methods for exploring the unique types of data that come from educational environments, Provide useful information to the student. Modern educational institutes need data mining for their strategy and future plans [5].

RESEARCH aim to Establishing a connection between the field of computer science and the educational tests, as well as making use of current technology in the process of resolving issues related to education fields, Helping the student to reach the most accurate answer within the multiple answers to the question through linking between the key words of the question and the electronic content associated with these words, Providing the student with higher-order thinking skills, which is the ability to analyze content to reach the correct answer, Saving the student's time and effort.

In this research, a data mining algorithm is used for the digital administration of educational tests. This paper studies the main factors that affect the performance of first year secondary students in chemistry and uses these factors to predict the status of passing the exam, which provides a scientific basis for teachers to develop the construction of electronic tests to be based on analysis and conclusion instead of memorizing and remembering. At the same time, the link between the question and the answer is made through the search process within the electronic content, where all the paragraphs in the electronic content related to the keywords in the question header are searched. This paper analyzes in depth the concept, process, function and common algorithms for data mining. This paper presents a brief statistical analysis of the score results of a sample of students after undergoing the proposed electronic test, and compares these results with the results of the same sample of students after undergoing the traditional electronic test. Data mining tools are used during the process of searching for paragraphs within the electronic content related to the keywords in the question.

2. RELATED THEORIES AND TECHNOLOGIES OF DATA MINING

2.1. Overall System Structure of Data Mining.

The overall structure of data mining system is mainly composed of the following parts: database and data warehouse. It means that the data mining object is composed of database, data warehouse, data form, or other information databases [6]. Data cleaning and data integration operations are usually used to process these data objects. The database or data warehouse server is responsible

for reading the relevant data according to the user's data mining request. The structure of data mining is shown in Figure 1. Knowledge stock is the area of information that records mining needs, which will be used to inform the search system of information mining or to assist in considering the mining results

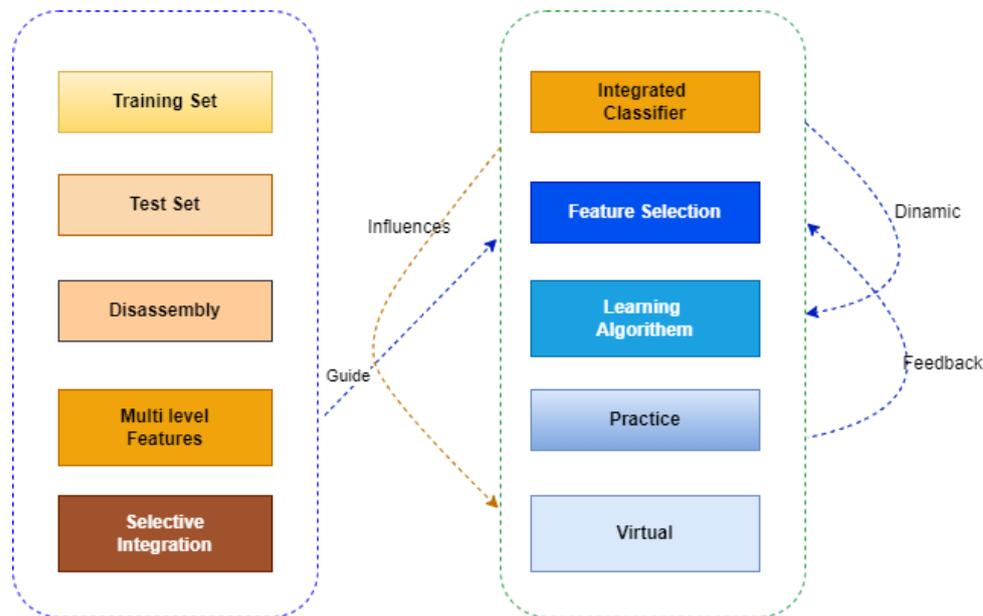


Figure 1 : The Structure of data mining

The simplest area of expertise in the mining method is the user-defined threshold [7]. The most basic part of the facts mining system, the data mining engine, often includes a collection of mining feature modules, including qualitative induction, affiliation analysis, classification induction, evolutionary computation, and deviation analysis. According to the interest standard, the pattern knowledge assessment module can assist the data mining module in concentrating on mining more significant pattern knowledge [8]. Of course, the specific mining algorithm employed in the data mining module will determine whether the module can be integrated with it. It goes without saying that combining the knowledge evaluation method with the data mining algorithm will help to increase the effectiveness of data mining. Users can interact with the data mining system more easily because to the visual user interface. Users

submit their mining requests or tasks to the mining system through the module and provide the pertinent information required for mining search on the one hand; on the other, the system shows or explains the results or intermediate results of data mining to users through the module; in addition, the module can also assist users in browsing the content of data objects and data definition patterns and evaluating the mined pattern knowledge, as well as a variety of forms[9]. Data mining can be seen as the most advanced stage of online analysis and processing from the perspective of a data warehouse, but it has much greater data analysis capabilities than the online analysis and processing capabilities of a data warehouse based on data aggregation.

2.2. Algorithm of Data Mining.

The data mining algorithm is a collection of calculations and heuristics used to build data mining models from data. It examines user-provided data and identifies particular patterns and trends. The method determines the ideal parameters for building mining models using the findings of this investigation. To extract workable patterns and thorough statistical data, these criteria are applied to the entire data set. Most data mining methods employ a number of search and goal functions. techniques to find a point or a small area in the data body or in the data space where the distance relationship is established, including the heuristic algorithm, maximum and minimum method, gradient descent method, and network deduction method [8]. Data mining algorithms can be categorized into teacher type and non teacher type, often known as supervised learning and unsupervised learning, based on the mining techniques. A teacher's signal is first delivered in supervised learning, which can supply category label and classification cost for each input sample in the training sample set and identify the direction to lower the overall cost. The unsupervised learning technique clusters the incoming samples automatically and lacks an explicit teacher [8]. Application-wise, data mining algorithms can be categorized into the following six groups: association rules, clustering analysis, regression, classification, timing, and deviation checking algorithms [8]. Regression analysis is the major algorithm used in this article. One type of

regression algorithm is linear regression. Data are simulated by a straight line in linear regression. A random variable y is used in bivariate regression as a linear function of another random variable x .

$$y = \tau + \ell x + \|\tau - \ell x\|, \quad (1)$$

When the y -axis line's intercept and slope are represented by the regression coefficients, and the variance of y is represented by a constant. The error between the real data and the line's estimation can be reduced by using the least squares approach to calculate these coefficients. The regression coefficient can be determined using the following formula when given s samples or data points in the form of $(x_1, y_1), (x_2, y_2), \dots, (x_n, y_n)$, etc.

$$\ell = \frac{\sum_1^n (x_i - \bar{x}) y_i - \bar{y}}{\sum_1^n (x_i - \bar{x})^2 + \sum_1^n (x_i - \bar{x})}, \quad (2)$$

where \bar{x} represents the average of x_1, x_2, \dots, x_n , and \bar{y} represents the average of y_1, y_2, \dots, y_n . The addition of many factors to linear regression is known as multiple regression. A multidimensional eigenvector's linear function may be the corresponding variable y . According to two predictors, x_i and x_{i-1} , multiple regression looks like this:

$$y = (\tau - \ell x_i) \ell x_{i-1}. \quad (3)$$

2.3. Process Analysis of Data Mining Three stages must be completed before applying a data mining algorithm : data preparation, data mining, and data result expression and interpretation. In Figure 2, the data mining process is depicted.

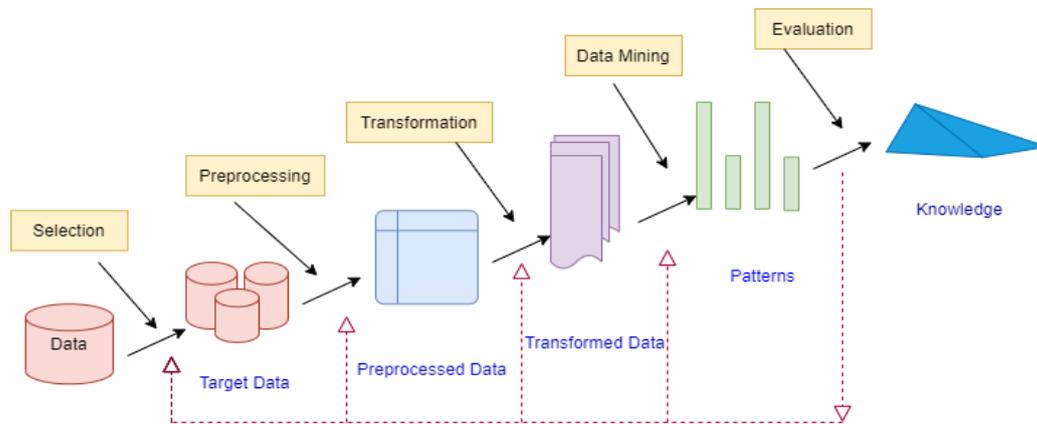


Figure 2: The Process of data mining

2.3.1. Data Preprocessing.

In order to produce analysis results with high reliability, it is necessary to integrate, filter, and process the source data appropriately in accordance with the data information requirements of the algorithm during this stage, which is used to provide data information that can be used for direct processing and analysis. This section of the job a significant amount of the overall performance analysis work [8]. The information used for data mining in the analysis of students' performance may cross multiple domains or disciplines, so it is important to gather and sort these data, clear up semantic fuzziness between data sources, address information defects, and organize them into a single, standardised data format. The data analysis space created by the collection of source data may contain a large amount of unnecessary data. Although the burden would increase, these data do not assist the development of data mining [10]. The selection of data is thus the second component of data preparation. The chosen data should contain pertinent information that is beneficial for analysis and effectively limits the processing options. The filtered data could contain difficulties with noise, incompleteness, or consistency. In order to guarantee the accuracy and legitimacy of the analysis results, data preparation operations are currently required to further enhance and enrich the data structure in the data analysis database. It is also important to convert the database's attribute field information into recognizable and processable coding data in order to assist the algorithm analysis.

2.3.2. Data Mining.

The executive portion of the overall student accomplishment analysis is this work. To process and analyze the data information in the database and investigate the available internal relations or knowledge map, it must use a number of data mining techniques [11]. The mining target or task must be identified first. Next, the appropriate mining algorithm must be chosen based on the mining target in order to build the data model and the specific parameters that need to be analyzed. Finally, the model must be used to mine and analyze the pertinent parameters in the database, identify the association rules and data regression structure that satisfy the requirements, and provide the pattern expression that can be used for evaluation and analysis. In real-world applications, Data mining can be chosen immediately after algorithm selection to finish data mining automatically.

There are many studies in electronic tests fields which this study indicated that build a scale of students' attitudes towards electronic tests and to identify the indications of validity and reliability coefficients for this scale . Research was based on the descriptive (survey) approach factorial validity, convergent validity, discriminative validity and the values were statistically significant ,The search results revealed that the total level for students attitudes towards electronic tests was high.[12]

As indicated by this study pointed to Evaluation has a great and essential importance in the teaching and learning process. Electronic tests are one of the evaluation tools that contribute to overcoming the problems of paper test, This research aims to Building electronic tests in the subject of theoretical music rules for the second band, Studying the attitudes of second year students towards electronic tests, and whether their exposure to them affects their attitudes towards them, Studying the relationship between students' attitudes towards electronic tests and academic achievement, Appropriateness of the current conditions of the Corona pandemic, which require remote testing.[13]

This study also confirmed that The potential influence of data mining analytics on the students' learning processes and outcomes has been realized in higher education. Hence, a comprehensive review of educational data mining (EDM) and learning analytics (LA) in higher education was conducted it was found that specific EDM and LA techniques could offer the best means of solving certain learning problems. Applying EDM and LA in higher education can be useful in developing a student-focused strategy and providing the required tools that institutions will be able to use for the purposes of continuous improvement. [14]

And in this study indicated that Educational Data Mining (EDM) is a research field that focuses on the application of data mining, machine learning, and statistical methods to detect patterns in large collections of educational data. The main goals of this study are to identify the EDM tasks that have benefited from Deep Learning and those that are pending to be explored, to describe the main datasets used, to provide an overview of the key concepts, main architectures, and configurations of Deep Learning and its applications to EDM. [15]

In another study pointed that the plethora of research has been done in the past focusing on predicting student's performance in order to support their development. Many institutions are focused on improving the performance and the education quality; and this can be achieved by utilizing data mining techniques to analyze and predict students' performance and to determine possible factors that may affect their final marks . Experimental results show that the proposed ensemble models achieve high accuracy and low false positive rate at all stages for both datasets. [16]

This study also confirmed that Student performance modeling is one of the challenging and popular research topics in educational data mining (EDM). Multiple factors influence the performance in non-linear ways; thus making this field more attractive to the researchers we present a systematic review of EDM studies on student performance in classroom learning. It focuses on identifying the predictors, methods used for such identification, time and aim of prediction. It is significantly the first systematic survey of EDM studies that consider only classroom learning and focuses on the temporal aspect as well. [17]

3. RESEARCH METHODOLOGIES

The method used in this study is the Descriptive method an experimental method research method that fits with this type of studies through studies. Designed an Android application that makes the student able to search within the electronic content so that he can choose the most accurate answer from among the multiple answers to the question while performing the electronic tests , and it was applied to a sample of First year high school students at El Lozy Secondary School for Girls in Damietta to developing the structure of electronic tests based on data mining to provide students with skills of analysis and conclusion.

4. THE PROPOSED SYSTEM

This research proposes a system based on data mining for digital management of educational tests . This system consists of the main stages, which are: Analysis stage, Design stage, Production stage for testing, Data mining stage, Experimentation phase, The actual implementation, Evaluation stage and Electronic publishing stage. In the field of electronic tests, learners have become more educated about their education, their eagerness to pass the highest grades while performing electronic tests, and the ability to overcome the problems they face, which is wasting their time and effort in searching for answers within the open book, and thus the inability to solve all Questions on time

In this paper, the researcher presented a proposed system to overcome the problems that students face while performing the electronic test. The proposed system consists of an electronic test for digital management based on data mining . This system provides the scientific material electronically to the student and he can deal with it with ease, as the proposed application links the question and the answer . The proposed application helps the student to obtain the most accurate paragraphs related to the required question by making query through the main and keywords in the question. Thus, the student's ability to reach the most accurate answer within the multiple answers to the main question The proposed application provides the student with some higher-order thinking skills, which are the ability to analyze content to reach the correct answer

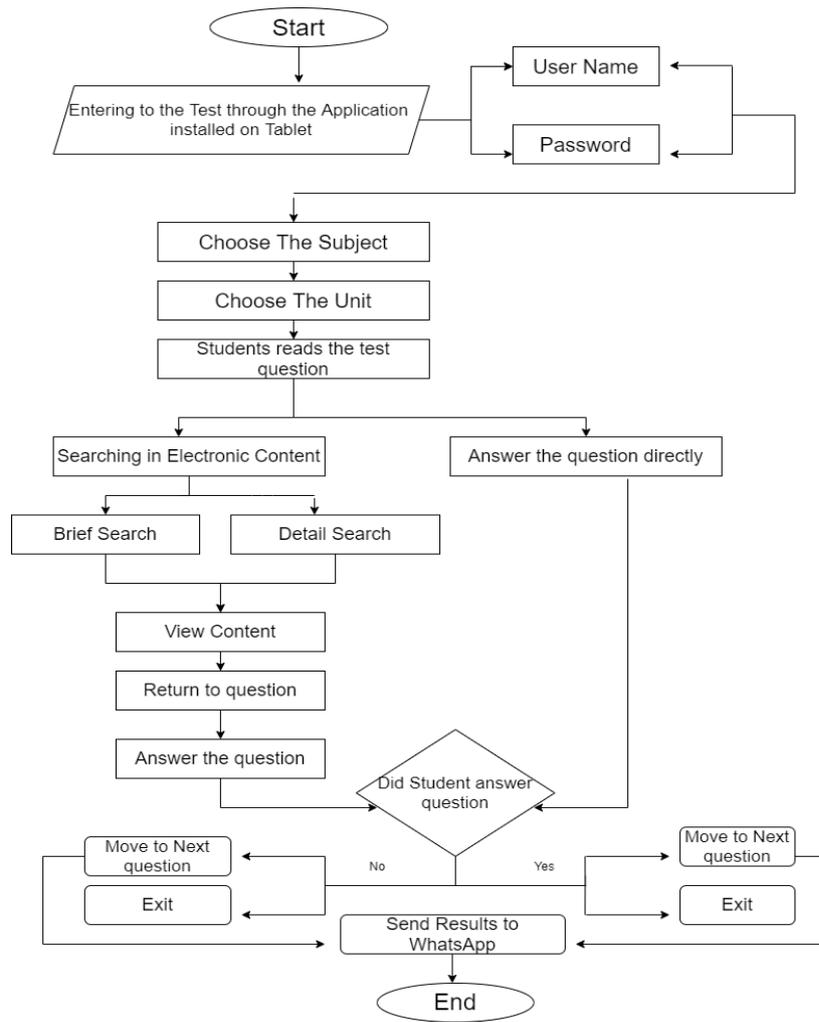


Figure 3: Flowchart of Electronic Test System

Use case diagram of the proposed system

use case displayed a graphical overview of the function that the system provided in terms of actor , goals and any dependencies between use cases . an actor was any one or an thing that interact with the system being built . use case was a high level part of functions which the system would provide in another meaning , use case explained how some one could use a system . in brief , use case diagram include two actor as show in figure 4.

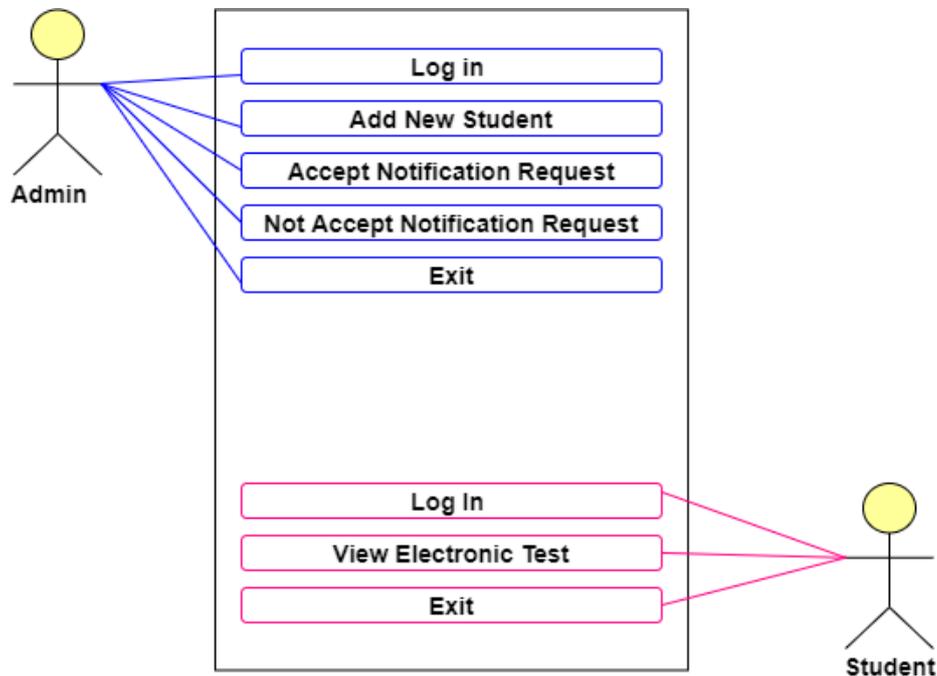


Figure 4: The Proposed System Use Case Diagram

Graphical Interface For Admin

In this part, it is concerned with dealing with the admin only, who has the authority to accept the student's registration request to enter the electronic test or reject the request

Graphical Interface for User (Student) : that consists of the login screen for each student that requires entering the user name and password, and then moving to the test.

This screen contains a button called (**About the application**) , which contains information about the proposed application inside



Figure 5: Main interface of Application.



Figure 6: choose the Subject

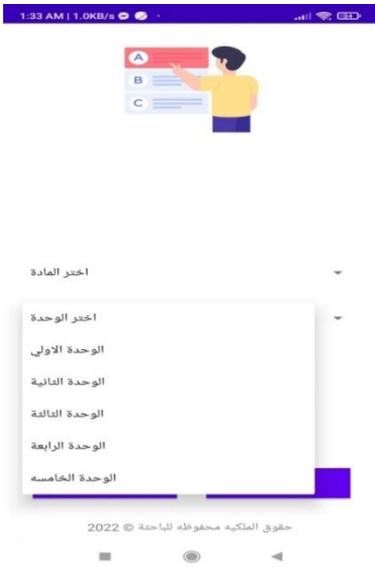


Figure 7: choose the Unit.



Figure 8 : Showed the first Question



Figure 9 : Showed the result1 of search



Figure 10 : showed the final Result

The role of data mining comes in, as you link between the question and the electronic content through the search button inside the test, which displays all the paragraphs within the electronic content that are related to the key words in the question and display them to the student, and the student reads them and the ability Analyze it and choose the most accurate answer. Content chapters are linked to each other and do not focus on a specific part within the content.

5. RESULTS

The effectiveness of the proposed application and the results showed the following:

1. There are statistically significant differences at the level of 0.05 between the average scores of students of each of the pre -post test , which indicates the effectiveness of the proposed application and thus the research hypothesis was achieved Already .

The researcher used the T-Test to indicate the difference between the mean scores of students in the pre test and the post test.

The results test using the SPSS program. The following table presents the results of the application of the test.

Table 1 demonstrates the results of the applied test

Groups	N	Mean	Std. Deviation	T-test	Sig.
Pre-Test	20	23.10	2.59	39.83	.000
Post-Test	20	47.57	2.01	105.6	.000

the arithmetic mean of post-applying of the achievement test (47.57) is the greater than the mean of pre-applying of the test (23.10) , indicating the efficiency of the proposed test.

by comparing the actual level of significance with the specified significance level 0.05 it is clear that the actual level of significance is less than the predetermined level , so we reject the null hypothesis

it is clear from the above table than the mean degrees of student in post-application is greater than the mean degrees of the students in the tribal application in the test (47.57) while the mean grade of students in the tribal application (23.10)

the results indicate that there is statistically significant difference at 0.05 between the average scores of the students in the study simple in the two dimension (pre- post) for the benefit of the dimension application and that this difference is significant and not due to the coincidence factor , the value indicate the high level of test of students after learning using the proposed system to manage educational mobile applications

The researcher explains this distinction between the per and post measurement due to the effective impact of the proposed system in building knowledge among students

2. There are positive trends towards the students of the experimental group (who have undergone the post-test) towards using the proposed application, and therefore the research hypothesis has already been achieved.

Table 2 Show Student’s attitude towards the proposed Application
(Statistical result of questionnaire)

Direction Scale Expressions	Strongly Agree		Agree		Not Agree		X ²	Sig.	General direction
	F	%	F	%	F	%			
1-I support the use of a mobile device in the educational process.	40	80%	10	20%	0	0%	18	.000	Strongly Agree
2- Electronic exams increase student stress.	0	0%	5	10%	45	90%	32	.000	Not Agree
3- Electronic tests help to solve problems experienced by traditional tests.	46	92%	4	8%	0	0%	35	.000	Strongly Agree
4- Electronic tests do not take into account the individual differences between students.	0	0%	3	6%	47	94%	38	.000	Not Agree
5- Searching within electronic content is better than using an open book.	48	96%	2	4%	0	0%	42	.000	Strongly Agree
6- The use of a mobile device in the educational process reduces interaction between student and teacher	10	20%	40	80%	0	0%	18	.000	Agree
7- Electronic tests save student time and effort.	45	90%	5	10%	0	0%	32	.000	Strongly Agree
8- questions do not correspond to the allotted time.	0	0%	2	4%	48	96%	42	.000	Not Agree
9- Electronic tests fight phenomenon of cheating among students.	45	90%	5	10%	0	0%	32	.000	Strongly Agree
10- Using tablet requires student to have adequate training.	10	20%	40	80%	0	0%	18	.000	Agree
11- similarity in multiple answers to question gives student most important higher-order thinking skills.	45	90%	5	10%	0	0%	32	.000	Strongly Agree
12- I trust the results of electronic tests for their accuracy and overcoming many human errors.	47	94%	3	6%	0	0%	38	.000	Strongly Agree

The table shows the statistical analysis of the measure of students' attitude towards the proposed application, where all members of the study sample And that was their number 50 students confirmed that the importance of these elements and it is clear from their choice of agreeing to the positive elements and not agreeing to the negative ones, which indicates a positive attitude of students towards the use of the proposed application and confirms this: To achieve the hypothesis third .

3- Researcher has followed the basic stages of designing described previously.

The researcher took into account the opinions agreed upon by the experts **which was their number 50, and also presented the proposed design to the arbitrators** to express their opinions through the arbitration form for the proposed system. Their consent after taking notes and making some of the amendment in the forms. The proposed system was applied to the research sample, after the approval of the arbitrators by the validity of its application.

Table 3 show List of Foundation and Standards

Constructs	Items	Strongly Agree		Agree		Not Agree		(x ²)	Sig.	General Direction
		F	%	F	%	F	%			
Educational Standards	1- Electronic test is devoid of ambiguous phrases.	43	86 %	7	14 %	0	0%	25.9	.000	Strongly Agree
	2- Electronic test questions link the content chapters to each other	45	90 %	5	10 %	0	0%	32.0	.000	Strongly Agree
	3- Electronic test questions focus on higher-order thinking skills (analysis – Conclusion)	43	86 %	7	14 %	0	0%	25.9	.000	Strongly Agree
	4- The application works securely and has a degree of privacy through the user name and password of each student	45	90 %	5	10 %	0	0%	32.0	.000	Strongly Agree
	5- The electronic test questions have a specific time	47	94 %	3	6 %	0	0%	38.7	.000	Strongly Agree
	6- Application links the question and the content paragraphs with the key words of the question	47	94 %	3	6 %	0	0%	38.7	.000	Strongly Agree
Software Standards	1- The suggested application is working properly	47	94 %	3	6 %	0	0%	38.7	.000	Strongly Agree
	2- Ease of navigating through the screens of the application using the buttons	45	90 %	5	10 %	0	0%	32.0	.000	Strongly Agree
	3- View the electronic content paragraphs in detail or briefly through the search button	49	98 %	1	2 %	0	0%	46.1	.000	Strongly Agree
	4- Application works securely and has a degree of privacy	48	96 %	2	4 %	0	0%	42.3	.000	Strongly Agree
	5- proposed application contains a database that serves the test	46	92 %	4	8 %	0	0%	35.2	.000	Strongly Agree
	6- The proposed application is supported by most mobile operating systems	47	94 %	3	6 %	0	0%	38.7	.000	Strongly Agree
	7- proposed application takes advantage of the advantages of mobile operating system	49	98 %	1	2 %	0	0%	46.1	.000	Strongly Agree
Technical Standards	1-Presenting the test questions in a simple way	45	90 %	5	10 %	0	0%	32.0	.000	Strongly Agree
	2-The application is free from spelling errors	48	96 %	2	4 %	0	0%	42.3	.000	Strongly Agree
	3-The colors are clear and well staffed	48	96 %	2	4 %	0	0%	42.3	.000	Strongly Agree
	4-The size of the test image is suitable for the screen size of the mobile device (tablet).	47	94 %	3	6 %	0	0%	38.7	.000	Strongly Agree
	5-The questions presented are free of crowding	47	94 %	3	6 %	0	0%	38.7	.000	Strongly Agree
	6-The question screen is simple in design	49	98 %	1	2 %	0	0%	46.1	.000	Strongly Agree
	7-Display information in a simple way	45	90 %	5	10 %	0	0%	32.0	.000	Strongly Agree

All resulting P-values were less than 0.000 continuity and interaction (CAI) Application Efficiency (AE), Evaluation of shape (EOS), compatibility and clarity (CAC) and application quality (AQ) All favorable for the use of application.

6. CONCLUSION AND FUTURE WORK

The current study describe the proposed system based on data mining for digital management of educational tests , the proposed system called (Smart Test). System designed to develop the construction of electronic tests that will depend on data mining technology to provide students with the skills of analysis and conclusion and to save the students time and effort and help him get the most accurate paragraphs related to the required question by making query through the keywords in the question, and thus choosing the most accurate answer among the multiple answers to the question. And also providing the student with some higher-order thinking skills, which is the ability to analyze the content to reach the correct answer. The results showed the following: Firstly : A set of foundations and standards have been reached to design a proposed system for electronic tests based on data mining for mobile devices (educational standards - software standards - technical standards). secondly : The effectiveness of the proposed application and the results showed the following: There are statistically significant differences at the level of 0.05 between the average scores of students of each of the pre -post test , which indicates the effectiveness of the proposed application and thus the research hypothesis was achieved Already . There are positive trends towards the students of the experimental group (who have undergone the post-test) towards using the proposed application, and therefore the research hypothesis has already been achieved. The study stressed the importance of using the proposed application for its benefits. using the criteria reached in the design of proposed application. We can develop this application by adding many features to it such as presenting the research output in the form of adding links connected to the Internet and related to the keywords in the question. This application can be used in the process of searching for information within any other institution such as companies and hospitals. Data mining technology can be linked with artificial intelligence in the work of many different applications.

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نظام مقترح قائم على التنقيب في البيانات للإدارة الرقمية للاختبارات التعليمية

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الملخص

نظرًا لأن التكنولوجيا أصبحت أكثر قوة في تسجيل الاختبارات والمقالات ، خاصةً من التسعينيات فصاعدًا ، فقد تطورت أنظمة الدرجات الآلية جزئيًا أو كليًا باستخدام الأساليب الحسابية وأصبحت مجالًا رئيسيًا للبحث. و بشكل خاص أدى طلب تسجيل استجابات اللغة الطبيعية إلى ظهور الحاجة إلى الأدوات التي يمكن تطبيقها لتصنيف هذه الاستجابات تلقائيًا. في هذه الورقة ، نركز على الاختبارات الإلكترونية التعليمية والتي تتصور مستقبلاً يمكن فيه ربط السؤال بالإجابة من خلال العديد من التقنيات الحديثة مثل تقنية التنقيب في البيانات التي ستحدث ثورة في مجال التعلم الإلكتروني. يقدم هذا البحث نظاماً مقترحاً يعتمد على التنقيب في البيانات للإدارة الرقمية للاختبارات التعليمية. في هذه الورقة ، استكشفنا بعمق دور التنقيب في تطوير بناء الاختبارات الإلكترونية التي ستعتمد على تقنية التنقيب في البيانات لتزويد الطلاب بمهارات التحليل والاستنتاج. يقدم النظام المقترح المساعدة للطلاب على البحث في المحتوى الإلكتروني عن جميع الفقرات المتعلقة بالكلمات المفتاحية في السؤال ، يقوم الطالب بقراءة هذه الفقرات وتحليلها وبالتالي يكون لديه القدرة على اختيار الإجابة الأكثر دقة.

الكلمات المفتاحية : تنقيب البيانات - الإدارة الرقمية - الاختبارات الإلكترونية