

Assessing Distance Education Quality Through Logistic Regression: A Case Study of Management Sciences Students at Yahia Fares University of Medea.

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Abstract:

Distance education is considered an effective means of providing education in the era of modern technology, and with the increasing reliance on this method, it becomes necessary to evaluate its effectiveness and identify the factors that affect its success, so the logistic regression equation is considered, among the modern statistical non-barometric methods developed to predict the set of nominal or ordinal qualitative variables, our study aims to find out the impact of the quality of the material programmed for students on distance education, and to achieve this goal, we dropped our study on a sample of second-year students Department of Management Sciences Medea University, where we relied on students for two different subjects during the period 2014-2024.

One of the most important findings is that there is no significant effect between the independent variables(the nature of the subject, the number of students, the success and repetition rate) and the dependent variable (there is distance education/there is no distance education).

Keywords: Distance education, Traditional education, Logistic regression, SPSS.

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1. INTRODUCTION

In the era of modern technology, distance education has become one of the most prominent developments in the field of education, providing innovative solutions to meet the needs of students at various academic levels. Especially in universities, where the subjects are varied and require different teaching methods, where the role of distance education emerges as

an effective tool to enhance learning and improve academic results for students.

The distance learning experience is an opportunity for students to interact with the study content in flexible ways, allowing them to allocate their time according to their personal schedule, however, this type of education raises questions about its effectiveness compared to traditional education, especially in subjects that require direct interaction between professors and students.

- The problem of research

Through the foregoing, the following problem can be posed:

How can the quality of programmed educational materials in distance learning be evaluated using logistic regression?

- Research hypothesis

As a preliminary answer to the main problematic, the following main hypothesis can be formulated :

There is a significant effect between the independent variables (the nature of the subject, the number of students, the percentage of success and repetition) and the dependent variable (there is distance education/there is no distance education).

-The importance of research

Importance of the topic: The topic of assessing the role of distance education in the results of university students is of great importance for many reasons:

- Meet changing needs: with the increasing reliance on technology, universities need to offer educational methods that match the changing needs of students;
- Improve the quality of education: by evaluating the effectiveness of distance education, universities can identify better strategies to improve the quality of Education ;
- Provide flexible options: the study contributes to understanding how distance education can provide students with flexible educational options;
- Promoting academic research: this study contributes to enriching the academic literature on distance education, encouraging further research and study in this field.

- Research objectives

The objectives of the topic can be stated as follows:

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- Determining the impact of the quality of various academic subjects, whether theoretical or applied, on the performance of students in distance education ;
 - Analyze the level of student interaction, exploring the extent to which students interact with the study materials through distance education platforms;
 - Collect and analyze the opinions and experiences of students about the quality of distance education, and how the study materials affect their educational experience as a whole.
- **Research methodology:**

We will adopt the descriptive-analytical approach in this study, and we will look at conducting a case study during which we will collect, categorize and interpret data in order to test hypotheses, and draw conclusions. Logistic regression will be used using statistical tools and tables through the SPSS package.

2. The Theoretical Framework

2.1 The concept of traditional education

Traditional education refers to the educational process in which students come to the classrooms and interact face-to-face with teachers and peers, this approach usually involves the transfer of knowledge from the teacher to the student through lectures, discussions, assignments and other elements of the educational process. (al-Halabi, 2023, p. 118)

2.2 The concept of distance education

Distance education is meant as an educational style focused on pedagogy using technology, through the design of an educational system, where content is transmitted over the internet and the interaction is synchronous and asynchronous between the student and the professor. Therefore, e-learning is naturally suitable for distance learning and flexible learning. (Mubarak Al-Khatir Al-Arimi, 2014, p. 83)

The types of distance education are as follows: (Abu Dhabi room, 2020, p. 5)

- **Online (simultaneous)e-learning:** The communication in it is direct with the professor, by setting a certain time for the lesson, which includes the presence of the professor and each student in front of any electronic device, and the student in it is connected to the professor directly, so that he gets the material ;
- **Indirect (asynchronous)e-learning:** In it, the student receives education without direct contact with the professor, but he can connect to the educational material directly through several ways, such as educational

platforms that are dedicated to educational lessons and do not limit the student or professor to a specific time ;

- **Two-time distance education:** It combines synchronous and asynchronous distance learning, as it allows the student to participate in learning anytime and anywhere during the asynchronous parts of the academic subject content. (Martin & Oyarzun, 2023, p. 428)

2.3 The concept of integrated e-learning

Integrated e-learning is defined as an educational program that integrates traditional learning in lecture halls and online learning into one program, so the student receives knowledge through the internet partially], as well as inside lecture halls with teachers, it is also called Learning by technology, web-based enhanced learning, or blended learning, and integrated education aims to take advantage of multiple platforms to provide educational and training content to students, by mixing theoretical online content with practical application.

This type of education is an effective and low-cost teaching method compared to traditional learning, and helps to compensate for the lack of funding for the needs of the educational process, blended learning combines connected and offline models of learning, often connected models through the internet, and for offline models are in traditional classrooms, and includes a set of media that are designed to complement each other, so the program combines many learning tools, such as instant e-learning programs, internet-based courses, self-learning courses, electronic performance support systems, and also mixes simultaneous learning And asynchronous (al-Halabi, Distance learning as an alternative to traditional learning, 2023, p. 123)

2.4 The difference between distance education and traditional education

There are a lot of differences between distance education and traditional education in terms of the tools used in the educational process, and the following table illustrates these differences:

Table No.(1): differences between distance education and traditional education

Differences	Distance education	Traditional education
Teaching style	By Web pages and various technology tools	By just the book or some technological tools sometimes
Range Interactivity	It is based on the degree of interactivity between the	It is allowed only between the professor

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	learner and multimedia and between the professor and the learner as well	and the learner and not between the learner and the book
The possibility of updating	Easy, inexpensive, and post-deployment too.	Very difficult because you need to collect all the books and destroy them for modification, very, very expensive
Availability	Available anywhere anytime	Available at specific places and times
Reliability	It depends on the professor in terms of guidance, advice and counseling, and the learner more because of the use of technological tools in the search and use of information	It depends on the professor, he is the carrier and the prompter, and he has the main role in simplifying and communicating the information
Education system	Flexible - not specified by place and time	Inflexible-defined by place and time
Financial cost	It requires a large financial cost because it needs infrastructure, electronic devices and equipment	Does not require a large financial cost
Educational content	More attractive and exciting because it contains written texts, still and moving images, and audio clips	A printed book with biblical texts, some photos
Monitoring and evaluation	It is carried out in a purely electronic way	Done in a purely human way
Credibility	Difficult due to fear of malpractice such as cheating	Easy due to the direct observation of the professor and reduce fraud

Source: (Abdullah Mustafa al-awaysha, 2021, p. 19)

2.5 The new roles of Professor and learner in distance education

Distance education does not mean canceling the role of a professor, but his role becomes more important and more difficult, he is a creative

person with high competence who ably manages the educational process and works to achieve the ambitions of progress and technology.

2.6 The roles of the professor in distance education

These tasks can be summarized as follows: (Tahraoui, 2021, p. 07)

- **Process facilitator:** he must verify the occurrence of some targeted educational processes during the students ' practice of their activity and interaction with each other, as he provides guidance and allows learners to discover the learning materials themselves without interfering in their learning path ;
- **Simplified content:** it focuses on providing students with the appropriate knowledge, facts and concepts for the continuous flow of knowledge of Science, and The Associated practical skills, values and trends to enable them to deal correctly with this flow of knowledge and associated technologies ;
- **Researcher:** when a professor automatically seeks to research a problem, in order to identify its causes and results, following the scientific methodology in its study, this first of all benefits him, and the entire educational process, which requires continuous development, as a result of the continuous development of the surrounding conditions ;
- **Technological:** to help students navigate the ocean of information, to choose the most suitable, critically analyze, their vision and perception of the world around ;
- **Designed for educational experiences:** he supervises some educational activities commensurate with his experiences, inclinations and interests, because they complement what the student acquires inside the classroom or virtual classrooms ;
- **The role of an educational process manager:** it determines the number of participants in online courses, the dates of virtual meetings on the network, the methods of content presentation, calendar methods and other elements of the educational process ;
- **Leadership role:** to achieve the desired goals he takes their hand all the time for fruitful hard work ;
- **Mentor and advisor:** he must be constantly, continuously and renewably connected with everything new in his field of specialization, in his teaching methods and what is happening in his society, so that he can meet the needs of his students and their various queries, and also provides them with advice on what is difficult for them.

2.7 The roles of students in distance education

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These tasks can be summarized as follows: (Tahraoui, Cloud computing is the key to activating e-learning in Algerian higher education institutions - between inevitability and choice-, 2021, p. 08)

- The information seeker ;
- The ability to use information and communication technologies ;
- The ability to manage time The ability to take responsibility for learning ;
- The ability to retrieve information ;
- The ability to deal with electronic sources ;
- The ability to make educational decisions ;
- The ability to evaluate oneself ;
- The planning process.

3. Application framework

3.1 The reality of traditional and distance education at the Faculty of economics, business and management sciences at Yahya fares University in Medea

Both traditional and distance education represent important aspects of the educational process in the Faculty of economic, commercial and management sciences, through the following table, which represents the results of second-year students Management Sciences in the subject of computer science² and foreign language³, through which the reality of both will be shown in the Faculty of economic, commercial and Management Sciences:

Table No.(2): the results of second-year students Management Sciences in the computer science² and the foreign language³

Academic year	Academic material	Number of students	The successful ones	Ratepayers	Success rate %	Repetition rate %
2014-2015	foreign language ³	429	335	94	78	22
2014-2015	computer science ²	429	126	303	29	71
2015-2016	foreign language ³	337	114	223	34	66
2015-2016	computer science ²	386	108	278	28	72
2016-2017	foreign language ³	312	149	163	48	52
2016-	computer	325	114	211	35	65

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2017	science2					
2017-2018	foreign language3	380	171	209	45	55
2017-2018	computer science2	339	92	247	27	73
2018-2019	foreign language3	541	487	54	90	10
2018-2019	computer science2	541	284	257	52	47
2019-2020	foreign language3	334	228	106	68	32
2019-2020	computer science2	334	249	85	74	25
2020-2021	foreign language3	277	266	11	96	4
2020-2021	computer science2	277	260	17	93	6
2021-2022	foreign language3	269	206	63	76	23
2021-2022	computer science2	269	129	140	47	52
2022-2023	foreign language3	256	169	60	76	23
2022-2023	computer science2	256	134	122	52	48
2023-2024	foreign language3	251	236	15	94	6
2023-2024	computer science2	252	230	22	91	9

Source: (Department of automated information, 2024)

Figure No. (1) : the results of second-year students Management Sciences in the computer science² and the foreign language³

Source: prepared by researchers based on the data of Table No. 2

We note through Table No.(2) and figure No. (1) Above, which represent the results of second-year students Management Sciences in the computer science² and the foreign language³ during the university years, which in turn is divided into two periods, a period representing traditional education, which was from 2014 to 2019, and the second period, which represents distance education, which was from 2020 to 2024.

3.1.1 Analysis of the period of traditional education

- During the academic year (2014-2015), the number of second-year management science students taking the foreign language³ examination was estimated at 429 students, where the success rate was 78%, while the number of second-year management science students taking the computer science² examination was also estimated at 429 students, where the success rate was 29% ;
- During the academic year (2015-2016), the number of second-year management science students taking the exam for foreign language³ was estimated at 337 students, where the success rate was 34%, while the number of second-year management science students taking the exam for the subject of computer science² was estimated at 386 students, where the success rate was 28% ;
- During the academic year (2016-2017), the number of second-year management science students taking the exam for foreign language³ was estimated at 312 students, where the success rate was 48%, while the

number of second-year management science students taking the exam for the subject of computer science² was estimated at 325 students, where the success rate was 35% ;

- During the academic year (2017-2018), the number of second-year management science students taking the exam for foreign language³ was estimated at 380 students, where the success rate was 45%, while the number of second-year management science students taking the exam for the computer science² was estimated at 339 students, where the success rate was 27% ;
- During the academic year (2018-2019), the number of second-year management science students taking the Foreign Language³ exam was estimated at 541 students, where the success rate was 90%, while the number of second-year management science students taking the computer science² exam was estimated at 541 students, where the success rate was 52%.

Through the above, it is possible to evaluate the results obtained on the basis of traditional education, as the fluctuation of the success rate for Foreign Language³ was at high rates in some years and it was at low rates for some years, and this is due to the fact that traditional education requires students to be banned at specific times, which may be difficult for some, and a lack of personal interaction sometimes some students may feel anxious or uncomfortable in large groups.

As for the evaluation of the results obtained in the success rate of the computer science², it ranged from 29% to 52%, this is due to the fact that traditional education requires students to be banned at specific times, which may be difficult for some.

3.1.2 Analysis of the distance education period

- During the academic year (2019-2020), the number of second-year management science students taking the exam for the foreign language³ was estimated at 334 students, where the success rate was 68%, while the number of second-year management science students taking the exam for the computer science² was estimated at 334 students, where the success rate was 74% ;
- During the academic year (2020-2021), the number of second-year management science students taking the foreign language³ exam was estimated at 277 students, where the success rate was 96%, while the number of second-year management science students taking the computer science² was estimated at 277 students, where the success rate was 93% ;

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- During the academic year (2021-2022), the number of second-year management science students taking the exam for foreign language³ was estimated at 269 students, where the success rate was 76%, while the number of second-year management science students taking the exam for the computer science² was 269, where the success rate was 47%.
- During the academic year (2022-2023), the number of second-year management science students taking the exam for the foreign language³ was estimated at 256 students, where the success rate was 76%, while the number of second-year management science students taking the exam for the computer science² was estimated at 256 students, where the success rate was 52%.
- During the academic year (2023-2024), the number of second-year management science students taking the foreign language³ examination was estimated at 251 students, where the success rate was 94%, while the number of second-year management science students taking the computer science² examination was estimated at 252 students, where the success rate was 91%.

Through the above, the results obtained can be evaluated on the basis of distance education, as the success rate of the foreign language³ has been at high rates in all years, and this is due to the fact that distance education allows students to learn on their own time and from anywhere. As well as the subject to be taught

As for the evaluation of the results obtained on the basis of distance education for the computer science², it was high in some years, and this is due to a special period that the world experienced, the corona pandemic, after which there was a noticeable decrease in the rates, which was two years after the pandemic, due to the nature of the scale, it is an applied subject, it requires technology represented by a good internet flow as well as appropriate devices, and it may be difficult to maintain discipline and concentration in non-traditional environments; As for the last year, there was a noticeable increase in the success rate, and this is due to the need for students to adapt to the nature of the teaching style, especially after the inclusion of all the horizontal module subjects for distance learning.

3.2 Logistic regression analysis

3.2.1 Purpose of logistic regression analysis

The logistic regression model is one of the statistical models that are used in many applied fields, such as economic, agricultural, medical, and other scientific fields. This model is concerned with studying and analyzing the impact of several independent variables (their type is not required) on a

qualitative dependent variable consisting of two or more incompatible groups. in such cases, it is difficult to use the linear regression model, because it requires unfulfilled assumptions in the applied aspect.

3.2.2 Binomial logistic regression

It is considered the most famous type of logistic regression, and the binary logistic regression is used to explain the effect of interpreted variables on binary responses, in the sense of explaining the ability of a group of stable variables (predictors) of different levels to predict one dependent variable that is bifurcated, so the values either exist and take the value 1 or do not exist and take the value 0, and the equation of : (Amin Daish & sari, 2017, p. 126)

$$b_n x_n + \dots + x_2 b_2 + x_1 b_1 + b_0 Y = b$$

Where:

- Y : represents the dependent variable (binary) ;
- b_0 : represents the constant limit in the binomial logistic regression equation ;
- $b_n x_n$: represents the logistic value for independent variables.

3.2.3 Description of the research sample and how to collect data

The data was collected from the Faculty of Economics and Business Sciences and management sciences at Yahya fares University in Medea for second-year students from the Department of Management Sciences, based on the files of students results in foreign language³ and computer science² located in the automated media department at the College, from 2014 to 2023, representing the following five (05) years: (2014-2015), (2015-2016), (2016-2017), (2017-2018), (2018-2019) The first group is represented by traditional education, as for The following years are:(2019-2020), (2020-2021), (2021-2022), (2022-2023), (2023-2024) the second group was represented by the representative of distance education, since education was considered a dependent variable.

A value of 0 was given for traditional education and a value of 1 for distance education; The independent variables that have been identified are three (03) variables, which are:

- X1: Nature of the material, where we encode 1 for the foreign language³, and encode 2 for the computer science² ;
- X2: number of students ;

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- X3: the success rate and the failure rate, where we code with 1 successful and 0 failed.

3.2.4 Model testing

The logistic regression model is based on the maximum likelihood method of estimating the model, where this method is based on finding the maximum reduction (by repeating the calculation process) of the difference between the values of the elements of the variance Matrix or correlations for the sample, and the values of the elements of the variance Matrix or correlations generated by the extracted factors; Where we examine the following table, which represents the variables of the logistic regression equation before introducing the predictors:

Table No.(3) : variables of the logistic regression equation before the introduction of predictors

	Constant value	Standard error	The value of the Wald test	Degree of freedom	Level of significance	Weighting ratio
Block0 The constant	0.000	0.447	0.000	1	1.000	1.000

Source: prepared by researchers based on the results of SPSS

Table 3 shows the value of the constant limit, estimated at 0, and the value of the Wald test, estimated at 0, as it shows that it is not a function statistically, which means that the model is not able to predict the independent variable before the predicted changes are introduced.

The following table No.(4) shows the ratio of the correct classification for education and for the block0 model :

Table No.(4) the correct classification for education for the block0 model

Predicted values		Predicted values		
		Variable education		The percentage of correct classification
		There is no distance education	There is Distance Education	
The dependent variable	There is no distance education	0	10	0,00
	There is Distance	0	10	100

	Education			
Overall percentage				50

Source: prepared by researchers based on the results of SPSS

The above table shows the correct classification ratio for the "there is no distance education (traditional education)" group and the "there is Distance Education" Group in the model that does not contain the predictor variables, as it is clear from it that all the sample members were classified in the there is Distance Education category, which means that the model does not have the ability to predict the "there is no distance education and there is Distance Education" Group, and this classification is due to the fact that the "there is Distance Education" Group is considered the reference group for the model, so the individuals were classified in one category. And then the predictive variables are entered, represented by about : Nature of the material, Number of students, Determine the success rate, and the failure rate.

And then we come to the examination of Table No.(5), which represents the significance of each predictor variable, before entering it into the equation, where it appears as follows:

**Table No.(5) : The significance of each predictor variable
before entering it into the equation**

Variants	The sign	Degree of freedom	Level of significance
Nature of the material	0.000	1	1.000
Number of students	10.369	1	0.001
Success rate and failure rate	10.769	1	0.001
Comprehensive statistics	18.369	3	0.000

Source: prepared by researchers based on the results of SPSS

It is clear from Table No.(5) that all the independent variables (predictors) came as a function statistically, the table also shows the significance of comprehensive statistics for all variables where a function came statistically, meaning that if variables were introduced into the model, it would improve its conformity and ability to predict a variable: there is no distance education/ there is Distance Education.

Table No.(5) can be interpreted as follows:

- The independent variable X1, which represents Nature of the material, is not statistically significant because the level of significance is greater than 0.05, that is, traditional education (there is no distance education) is not affected by the nature of the material, whether it is theoretical (foreign language3) or Applied Material (computer science2) ;

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- The independent variable X2, which represents the number of students d statistically because the level of significance is less than 0.05, i.e. traditional education (there is no distance education) is affected by the presence of students ;
- There is an independent variable X3, which represents the success rate and the failure rate D statistically because the level of significance is less than 0.05, that is, traditional education (there is no distance education) is affected by the success rate and the failure rate.

Let's get to the presentation of the binomial logistic regression model with predictive variables, which is called Block1, where the following table No.(6) shows the examination of the conformity of the model to the data :

Table No.(6) : Checking the conformity of the model to the data

	Kai square	Degree of freedom	Level of significance
Block1	27,726	3	0.000

Source: prepared by researchers based on the results of SPSS

The basic test of the conformity quality for the binomial logistic regression is called the hosmer-lemeshow test, where this test uses the chi-square value to judge the quality of the model's conformity to the data, and it is clear from the table above that the chi-square value (x2) amounted to 27.726 at 3 degrees of freedom, where R function came statistically, this means that the model does not match the data, and there are differences between the conceptual model and its data, and it also indicates the inability of the model to distinguish between the two groups of "no distance learning" And "there is Distance Education".

Then we come to the examination of Table No.(7), which shows the correct classification of the model, which appears as follows:

Table No.(7) : the correct classification of the model

Predicted values	Predicted values		
	Variable education		Correct prediction percentage
	There is no distance	There is Distance	

			education	Education	
Block1	The dependent variable	There is no distance education	0	10	0,00
		There is Distance Education	0	10	100
	Overall percentage				50

Source: prepared by researchers based on the results of SPSS

Table No.(7) shows the ability of the model to correctly classify the "No Distance Education" and "there is distance education" groups, through its ability to predict each group, where the model was able to classify as many as 10 years from the "No Distance Education" Group, by which we mean traditional education with a prediction rate of 100%, which is an excellent percentage, while 10 years were classified in the "there is Distance Education" Group with an excellent 100% . The overall percentage of the model in its correct ability to predict the variable "there is no distance education / there is Distance Education" was estimated at 100%, which is an acceptable percentage indicating that the model has excellent predictive ability with the dependent variable.

3.2.5 Estimation of model parameters

The model parameters are shown in the program through Table No.(8) as follows:

Table No.(8) : model parameters

Predictive variables	The value of parameter B	Standard error	Degree of freedom	Semantics	Weighting ratio EXP(B)
Nature of the material	3.141	24867.222	1	1.000	23.138
Number of students	-0.376	112.473	1	0.997	0.687
Success rate and failure rate	45.072	15772.554	1	0.998	3.755
Fixed	95.030	48741.195	1	0.998	1.866

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Source: prepared by researchers based on the results of SPSS

The table shows the logit values of the logistic regression equation, where the logistic regression equation can be written relative to the model through it, and the model equation comes as follows:

$$Y=95.03+3.141X_1-0.376X_2+45.072X_3$$

Table number 8 can be interpreted as follows:

- The independent variable X1, which represents the nature of the subject, is not statistically significant because the level of significance is greater than 0.05, that is, Distance Education is not affected by the nature of the subject, whether it is a theoretical (the foreign language3) or an applied subject (the computer science2) ;
- The independent variable X2, which represents the number of students, is not statistically significant because the level of significance is greater than 0.05, meaning that distance education is not affected by student attendance ;
- The independent variable X3, which represents the success rate and the failure rate, is not statistically significant because the level of significance is greater than 0.05, meaning that distance education is not affected by the success rate and the failure rate.

4. CONCLUSION

Through this research paper, it has been shown that students ' results obtained on the basis of traditional education are low and high both for the foreign language3 and the computer science2, and this is because traditional education requires students to be banned at specific times, which may be difficult for some, and a lack of personal interaction at times, and some students may feel anxious or uncomfortable in large groups.

As for the results obtained by students on the basis of distance education, the success rate for the foreign language3 was generally high, and this is due to the fact that distance education allows students to learn on their own time.

As for the results obtained on the basis of distance education for the the computer science2 were fluctuating, sometimes high and sometimes low, so the student must adapt to the nature of the pattern of education,

especially after the inclusion of all the materials of the horizontal module for Distance Teaching.

The results from the logistic regression analysis are:

- That there is no significant effect between the independent variables(the nature of the subject, the number of students, the percentage of success and repetition) and distance education‘
- There is a moral impact between (number of students, success and failure rate) and traditional education‘
- There is no moral difference between the nature of the material and traditional education.

Recommendations

- The curriculum should be reviewed periodically to meet the needs of students, with a focus on including Applied Materials and promoting practical learning;
- Using a variety of teaching methods such as live lectures, videos, and interactive discussions, in order to attract students ' interest and enhance their interaction with the content;
- Providing good technological resources, such as fast internet flow, modern devices, to ensure the student's ability to access educational content easily‘
- Enhancing academic support through the establishment of academic programs including workshops;
- Conduct periodic evaluations to measure the effectiveness of the study materials and their impact on student achievement, using the results of the evaluation to guide future improvements;
- Organizing online events and seminars that bring together students, professors and experts in the field to enhance learning and interaction.

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