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THE EFFECT OF PERCEIVED E-LEARNING SERVICE QUALITY ON E-LEARNING STUDENT SATISFACTION IN ALGERIAN HIGHER EDUCATION

This study aims to identify the effect of perceived e-learning service quality on e-learning student satisfaction in Algerian higher education, by distributing an online survey to a stratified random sample of 241 students enrolled in the second year of their Master's degree (2023/2024), in the faculty of ECMS (economics, commercial and management sciences), at Saida University in Western Algeria. The results revealed that there are contributions of e-learning service quality dimensions to perceived e-learning service quality (second-order construct). Moreover, the results showed that there is a positive and significant effect of perceived e-learning service quality on e-learning student satisfaction at Saida University.

Keywords: e-learning, perceived e-learning service quality, e-learning student satisfaction, higher education: Algeria.

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Statement of the problem in general form and its connection with important scientific or practical tasks. In the last few years, the world has witnessed a health emergency (COVID-19), which prompted the World Health Organisation (WHO) to impose strict social measures, including a quarantine to prevent the spread of the disease [1]. This situation has required special attention to reviewing the communication process in organisations by looking for a new mechanism to reinforce the required social distancing protocols [2]. In the context of higher education, higher institutions had to adopt and embrace an advanced way of modern learning [3]. From this necessity, the e-learning strategy emerged as a mechanism to adapt to the situation and the most accessible means for education [4]. E-learning is the use of Internet technologies that can provide a wide range of solutions to enhance knowledge and performance. It facilitates and enhances learning through and based on computer and communication technology [5].

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Moreover, e-learning has an active role in delivering useful information to all segments of society. This strategy also provides access to information in remote areas that lack adequate educational resources and contributes to saving users' time and increasing productivity [6]. More precisely, e-learning provides an interactive virtual classroom environment, enabling students to engage with the efficiency of a classroom without the need for physical presence [7].

To shift towards e-learning, higher education institutions (HEIs) had two options: (1) Create their platforms and use them. (2) Purchasing or utilising other platforms and incorporating existing remote communication tools [8]. Recently, many HEIs have adopted e-learning platforms to afford greater accessibility and flexibility, which leads to enhanced student learning outcomes [3]. And increase general satisfaction with education during COVID-19 [6]. The students' outcomes and satisfaction are good indicators for assessing the quality and effectiveness of online programmes. It is of concern for HEIs to know whether their students, in general, are satisfied with their learning experience [9]. In the e-learning environment, student satisfaction is described as an emotional, attitudinal, and judgmental response to e-learning experiences that students are subjected to during successive e-learning sessions [10]. Therefore, e-learning student satisfaction is considered a critical variable that affects a student's decision to take another online course [11]. Moreover, it affects their overall levels of satisfaction with their university experiences [12].

Unlike developed countries, Algeria as a developing country, was not fully prepared to shift towards the new teaching method, although e-learning requirements were in place before COVID-19. To prevent the spread of the disease, the Ministry of Higher Education and Scientific Research relied mainly on e-learning platforms (e.g., Moodle, Universeco, and Progres) to deliver educational content and activities. These platforms are still being adopted even after COVID-19, in tandem with face-to-face learning [13]. This situation allowed students to judge service quality in e-learning and compare it with service quality in face-to-face learning. Overall, perceived e-learning service quality has been characterised as the students' perceptions about the e-learning quality they receive from HEIs [14].

Analysis of the latest research and publications, which initiated the solution of this problem and on which the author relies.

E-learning system quality and perceived e-learning service quality. System quality is defined by DeLone & McLean as the user's assessment of the information system's overall performance [15]. [16] indicated that system properties are determined according to system quality based on several factors: availability, adaptability, usability, and reliability. These factors affect users' perceptions of e-learning systems and are crucial in enhancing their adoption and use. Empirically, numerous earlier studies have indicated that e-learning system quality is an important component in determining e-learning service quality [10], [14], [16]–[20].

E-learning information quality and perceived e-learning service quality. According to [14] information quality refers to the perceived effectiveness of the system outputs and the content that can be downloaded and accessed from the e-learning website. [15] add that information quality relates to the accuracy, timeliness, comprehension, relevance, and consistency of information in a system of information. In a similar context, [21] asserts that information quality represents an important and essential aspect in determining the effectiveness of information and e-learning systems. After reviewing several studies on electronic service quality, [22] concluded that information quality is an important sub-dimension of the electronic service quality construct. Another study conducted by [23], provided evidence that information service quality contributed more to the formation of the overall service quality (second-order factor).

E-learning administrative and support service quality and perceived e-learning service quality. Support in the higher education context refers to the availability of guidance and counselling services for students at the university. These include orientations to online learning, administrative assistance, and social interaction with participants [24]. The relationship between administrative and support service quality and perceived e-learning service quality has been investigated by several scholars [25]. explored that administrative and support services are key attributes of perceived service quality in higher education virtual learning environments. Likewise, [10], [16], [26], revealed that the sub-dimension e-learning administrative and support service quality, is one of the main attributes that constitute overall e-learning service quality [18], [19] also found that both sub-dimensions, e-learning administrative service quality and e-learning support service quality, have a positive and significant impact on the overall e-learning service quality (second-order construct).

E-learning administrative and support service quality and perceived e-learning service quality. Student satisfaction in the broadest sense refers to the subjective assessment of students about various results and experiences with education and campus life [27]. In the e-learning environment, [10] described student satisfaction as an emotional, attitudinal and judgmental response to e-learning experiences that students are subjected to during successive e-learning sessions. [17] regarded student satisfaction in online education as one of the most important factors in understanding the effects of overall quality. Moreover, it is considered a critical factor in determining the success or failure of online learners, courses, and programs [28]. Regarding the relationship between e-learning service quality and e-learning student satisfaction, several prior studies revealed that overall e-learning service quality affects e-learning student satisfaction [10], [14], [16], [20], [29], [30].

Highlighting the previously unresolved parts of the general problem to which the article is devoted. In traditional learning, several studies have addressed the relationship between service quality provided by Algerian higher education institutions and student satisfaction. However, in the virtual environment, e-learning is still a grey area in Algeria. To the best of our knowledge, the relationship between perceived e-learning service quality and e-learning student satisfaction has not yet been examined. Therefore, the present study seeks to fill this research gap by determining the effect of e-learning service quality on e-learning student satisfaction in the Algerian higher education context.

Formulation of the purpose of the article (statement of the problem). This paper aims to identify the contributions of e-learning service quality dimensions to perceived e-learning service quality at Saida University in Algeria. Moreover, to determine the effect of perceived e-learning service quality on e-learning student satisfaction at Saida University.

To achieve the research objective, we suggest the following hypotheses:

H1: E-learning system quality has a contribution to perceived e-learning service quality at Saida University.

H2: E-learning information quality has a contribution to perceived e-learning service quality at Saida University.

H3: E-learning administrative and support service quality has a contribution to perceived e-learning service quality at Saida University.

H4: Perceived e-learning service quality has a positive and significant effect on e-learning student satisfaction at Saida University.

Statement of the main material of the research with full justification of the scientific results obtained. To investigate the relationship between perceived e-learning service quality and e-learning student satisfaction in Algerian higher education, the researchers focused on students enrolled in the second year of their Master's degree (2023/2024), in the faculty of ECMS (economics, commercial and management sciences) at Saida University in

Western Algeria (394 students), upon information obtained from the Vice Dean in charge of studies and issues related to students.

We used an online survey as a study tool to collect data from the students. To ensure adequate representation, we randomly sent the survey to a stratified random sample of 350 students through emails and social media (Facebook). After 21 days, 264 responses were returned, among them 23 were incomplete, and 241 were valid for conclusive analysis, representing 61% of the total number of students.

The survey was developed based on previous studies, and consists of two main parts: (1) the characteristics of participants (gender, age, and department); (2) 21 items related to: e-learning administrative and support service quality [10]. E-learning system quality, e-learning information quality, and e-learning student satisfaction [14]. Students responded to the survey on a five-point Likert scale range was calculated based on (1) Extremely disagreed, (2) Disagree, (3) Neutral, (4) Agree, and (5) Extremely agree.

Analysis and Results. Respondents' Demographic (Table 1).

Table 1– Respondents' Demographic

Characteristics	Detail	Frequency	Percentage
Gender	male	97	40.2
	female	144	59.7
Age group	22-26	139	57.6
	27–31	57	23.6
	32-36	26	10.7
	> 36	19	07.8
Department	Management Sciences	88	36.5
	Economic Sciences	57	23.6
	Commercial Sciences	51	21.1
	Accounting and Financial Sciences	45	18.6

Source: Data adapted from authors using IBMSpss.

Regarding the respondents' demographic, Table 1 indicates that 59.7% of the survey respondents were females. However, males made up 40.2% of the respondents. For age, respondents in the age group 22-26 reached 57.6%, followed by the 27–31 age group at 23.6%, the 32-36 age group at 10.7%, and the students aged above 36 years accounted for 7.8% of the respondents. Most of the respondents were from the Department of Management Sciences and made up 36.5%, 23.6% from the Department of Economic Sciences, 21.1% from the Department of Commercial Sciences, and 18.6% from the Department of Accounting and Financial Sciences.

Structural equation modelling (SEM). To evaluate the model and test the proposed hypotheses, the structural equation modelling (SEM) method was adopted using CB-SEM with IBM Spss Amos software (v24.0.0). According to [31], in the SEM method there are two main steps: assessing first the measurement model, and then testing the causal relationships among the latent variables in the structural model.

Measurement model. According to [32], before testing the proposed hypotheses, the measurement model must first be evaluated through a set of criteria. Starting with the indicator's reliability [32], suggested that the indicator's outer loadings equal to or higher than 0.70 are considered very important and ensure the validity of the measurement model in explaining the latent variables. As a result, we excluded seven indicators from the analysis process that failed to meet the cut-off value and kept the remaining indicators, as illustrated in Figure 1.

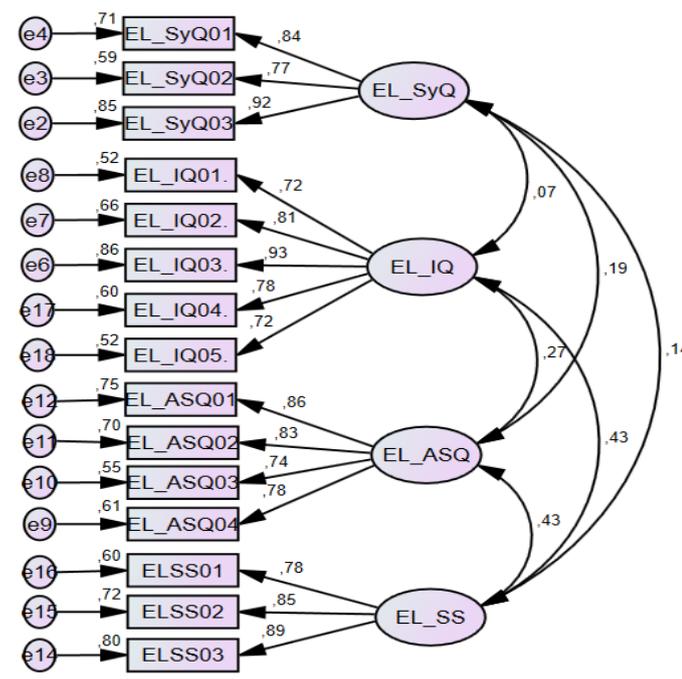


Figure 1 – Measurement model

Notes: EL_SyQ; E-Learning system quality, EL_IQ: E-Learning information quality, EL_ASQ: E-learning administrative and support service quality, EL_SS: E-learning student satisfaction

Source: adapted from authors using IBMAMOS

In addition, the correlation value between the sub-constructs (e-learning system quality, e-learning information quality, and e-learning administrative and support service quality) of the second-order construct perceived e-learning service quality is less than 0.85, indicating that every sub-construct is distinct from the others [31].

The internal consistency reliability was verified through two criteria, Cronbach’s Alpha and CR (composite reliability), as shown in Table 2. Cronbach’s alpha (α) values ranged between 0.851 and 0.877, and the (CR) values ranged between 0.882 and 0.895, all these values were higher than the designated threshold (0.70) [32]. Furthermore, the AVE values (average variance extracted) ranged between 0.633 and 0.718, which were greater than the designated threshold (0.50), signifying adequate convergent validity [33].

Concerning discriminant validity, which refers to the degree of difference between two or more constructs [32], is assessed first through the square root of AVEs (SRAVEs) utilising the Fornell-Larcker criterion, where the SRAVE for each factor must be greater than its highest correlation with any other factors, as shown in the table below. By utilising the HTMT criterion (Heterotrait-Monotrait), the findings showed that all HTMT values are lower than 0.85 (threshold value) [32]. Thus, the discriminant validity requirement was met (Table 2).

Structural model. Normality and collinearity. To assure the validity of our model for testing the hypotheses, we assess its feasibility through the examination of normality and collinearity issues. We first examined the collinearity among the predictor constructs using the tolerance values (T) and variance inflation factor (VIF). According to [32], the VIF value must be less than 5, and the tolerance value must be greater than 0.2. The results of these tests showed a low degree of collinearity, with $VIFs \leq 4.078$ and $Ts > 0.247$. Indicating the absence of collinearity problems.

Table 2 – Measurement model assessment

Constructs (factors)	α	CR	AVE	Fornell–Larcker criterion				Heterotrait–Monotrait ratio (HTMT)			
				EL_SyQ	EL_IQ	EL_ASQ	EL_SS	EL_SyQ	EL_IQ	EL_ASQ	EL_SS
EL_SyQ	0.875	0,884	0,718	0,847							
EL_IQ	0.869	0,895	0,633	0,069	0,796			0,095			
EL_ASQ	0.851	0,882	0,652	0,191	0,266	0,808		0,218	0,234		
EL_SS	0.877	0,887	0,663	0,132	0,459	0,444	0,814	0,143	0,455	0,441	

Notes: α : Cronbach’s alpha, CR: Composite reliability, AVE: The average variance extracted, EL_SyQ: E-Learning system quality, EL_IQ: E-Learning information quality, EL_ASQ: E-learning administrative and support service quality, EL_SS: E-learning student satisfaction.

Source: Data adapted from authors using IBMAmos.

Regarding the assumption of normality, we relied on the mean, standard deviation, skewness, and kurtosis (M, SD, Sk, and Ku) (Table 3). The outcomes in the table below reveal that the factors with higher values of M and SD have values of 3.373 and 1.197, respectively, with lower values of 3.037 and 1.018. This indicates that the levels of perceived e-learning service quality and e-learning student satisfaction at Saida University are higher than the average level. In addition, the Skewness value ranged from -0.589 to -0.095 (± 2), and the Kurtosis value ranged between -1.207 and -0.213 (± 2). Hence, it can be concluded that the skewness and kurtosis values met the normal distribution criteria [34].

Table 3 – Normality Inner Mean, SD, Skewness, and Kurtosis values

Main Construct	Variables	Mean	SD	Skewness	Kurtosis
Perceived E-learning Service Quality	E-Learning System Quality	3.146	1.120	-0.095	-0.702
	E-Learning Information Quality	3.037	1.197	-0.099	-1.207
	E-learning administrative and support service quality	3.373	1.123	-0.463	-0.566
E-learning Student Satisfaction	E-learning Student Satisfaction	3.404	1.018	-0.589	-0.213

Source: Data adapted from authors using IBMSpss.

Model Fit. After accomplishing the normality and collinearity assumptions, the structural model has been created, to evaluate the model fit, the significance of path estimates, and R2. As shown in Figure 2.

Based on table number 4, it can be noted that the structural model presents reasonably satisfactory fit indices. χ^2 / df (2.396) was less than 3.00. GFI (0.907) was higher than 0.90. CFI (0.945) and TLI (0.919) were both higher than 0.90. SRMR (0.073) and RMSEA (0.013) were less than 0.08. This indicates that all fit indices have met the goodness of fit criteria [35].

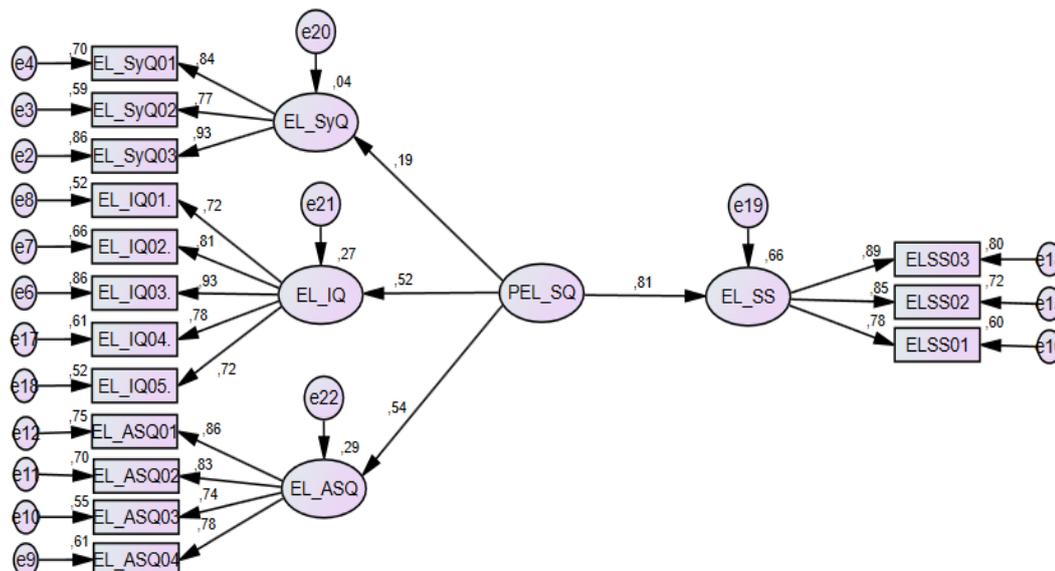


Figure 2 – Structural model

Source: adapted from authors using IBMAmos

Table 4 – Goodness of fit indices

Index	p-value	χ^2 /df	GFI	CFI	SRMR	RMSEA	TLI
Model Value	0.00	206/86 (2.396)	0.907	0.945	0.073	0.013	0.919
Threshold		<3.00/5.00	>0.90	>0.90	<0.08	<0.08	>0.90
Results	Accepted	Accepted	Accepted	Accepted	Accepted	Accepted	Accepted

Source: Date adapted from authors using IBMAmos

Hypotheses testing (Table 5).

Table 5 – Hypotheses testing.

Hypothesis	Estimate		CR	P-value	Decision
	Standardized	Unstandardized			
H1 E-learning system quality → Perceived e-learning service quality	0.405	0.192	2.236	0.025	accepted
H2 E-learning information quality → Perceived e-learning service quality	0.705	0.520	2.671	0.000	accepted
H3 E-learning administrative and support service quality → Perceived e-learning service quality	0.468	0.539	2.176	0.000	accepted
H4 Perceived e-learning service quality → E-learning student satisfaction	0.710	0.811	2.078	0.000	accepted

Source: Date adapted from authors using IBMAmos

Regarding whether the three sub-dimensions have contributions to perceived e-learning service quality or not (i.e., H1, H2, H3). The results revealed that there is a variation in the regression coefficient values for the three sub-dimensions, which ranged between 0.192 and 0.539. Moreover, the results showed that the Cr values obtained ranged from 2.176 to 2.671, which are greater than +1.96. Besides, the p-values ranged between 0.000 and 0.025, are statistically significant at $p < 0.05$. Accordingly, H1, H2 and H3 were supported, proving that the sub-dimensions e-learning system quality, e-learning information quality, and e-learning administrative and support service quality have contributions to perceived e-learning service

quality at Saida University.

For the fourth hypothesis, the regression coefficient between the dependent and independent variables was 0.81, and the CR was 2.078, this value is greater than +1.96. The p-value accounted for 0.000, and it is statistically significant at $p < 0.05$. Furthermore, the coefficient of determination (R^2) achieved 0.66, meaning that 66% of the variance in e-learning student satisfaction can be explained by perceived e-learning service quality. As a result, H4 was supported, which indicated that perceived e-learning service quality has a positive and significant effect on e-learning student satisfaction at Saida University.

The results of the first hypothesis showed that e-learning system quality has a contribution to perceived e-learning service quality at Saida University, regardless of its minor contribution compared to the remaining dimensions. This finding corroborates previous studies that indicated that e-learning system quality is an important dimension and has contributed to perceived e-learning service quality [10], [14], [16], [20], irrespective of the environments in which these studies were conducted.

The finding of the second hypothesis showed that e-learning information quality has a contribution to perceived e-learning service quality at Saida University. This finding is consistent with previous studies [14], [22], [23]. These researchers confirmed that e-learning information quality is an essential element in perceived e-learning service quality, and has a contribution to determining it.

Confirmation of the third hypothesis supports that e-learning administrative and support service quality has a contribution to perceived e-learning service quality at Saida University. This result demonstrates that e-learning administrative and support service quality is a key determinant of perceived e-learning service quality. This result resonates with previous studies that considered e-learning administrative and support service quality as a significant attribute of perceived e-learning service quality [10], [16], [18], [19], [26].

The result of the fourth hypothesis confirmed the positive and significant effect of perceived e-learning service quality on e-learning student satisfaction at Saida University. This result demonstrated that Saida University provided distinguished e-learning services to its students. This reflected positively on their satisfaction with e-learning, which was considered an objective for higher education institutions [36]. This result gained empirical support from many previous studies that found that in the e-learning environment, service quality affects student satisfaction towards e-learning [10], [14], [16], [20], [29], [30].

Conclusions from this research and prospects for further developments in this area. This study aimed to investigate the contributions of e-learning service quality dimensions (i.e., e-learning system quality, e-learning information quality, and e-learning administrative and support service quality) to perceived e-learning service quality (second-order construct) in Algerian higher education. Furthermore, to determine the effect of perceived e-learning service quality on e-learning student satisfaction. Four hypotheses were developed from the literature. Data were collected online from a stratified random sample of students enrolled in the second year of their Master's degree (2023/2024), in the faculty ECMS at Saida University. Lastly, the data was analysed using IBMSpss and IBMAmos. The results revealed that there are contributions of e-learning service quality dimensions (e-learning system quality, e-learning information quality, and e-learning administrative and support service quality) to perceived e-learning service quality (second-order construct). Moreover, the results showed that there is a positive and significant effect of perceived e-learning service quality on e-learning student satisfaction at Saida University.

Given the conclusions, the researchers recommend that Algerian higher education institutions: (1) update their e-learning systems and develop the digital platforms they use to provide students with educational materials. (2) Developing e-learning applications on

smartphones that make it easier for the student to download his courses and interact synchronously with his peers and professors. (3) Providing tutorials on higher education institutions' websites that acquaint students with the tasks and icons of digital platforms adopted by their universities, e.g., Moodle and Progres.

Although this study contributes to improving knowledge about perceived e-learning service quality and its effect on e-learning student satisfaction in one of the developing countries. However, there are still some limitations: First, the data were collected from a limited sample size consisting of students enrolled in the second year of their Master's degree (2023-2024) in the faculty of ECMS at Saida University, which makes generalisability a difficult task. Therefore, future studies could broaden the target sample scope to include the remaining faculties and levels to increase the generalisability of the results. Second, the scope of the current study was limited to one university, knowing that the Algerian higher education institutions include, in addition to universities, university centres, national higher schools, higher normal schools, and national institutes. Future studies should take into account the remaining Algerian higher education institutions. Third, in the present study, students' perceptions were used to generalise about the effect of perceived e-learning service quality on e-learning students' satisfaction. It is recommended that future researchers inquire from other stakeholders in higher education, such as professors and administrators, to gain richer perceptions.

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Вплив якості послуг он-лайн навчання на задоволеність здобувачів вищої освіти Алжиру.

Дослідження має за мету визначення впливу рівня задоволеності студентів електронним навчанням у вищій освіті Алжиру та сприйняття якості послуг електронного навчання шляхом проведення онлайн-опитування серед стратифікованої випадкової вибірки з 241 студентів, яких було зараховано на другий курс магістерської програми (2023/2024), факультету ЕСМС (економіки, комерційних та управлінських наук) в Університеті Саїда в Західному Алжирі. Результати показали, що існує вплив якості послуг електронного навчання на параметри сприйняття якості послуг електронного навчання (конструкція другого порядку). Крім того, результати показали, що існує значний позитивний вплив рівня задоволення від навчання в університеті Саїда на сприйняття якості послуг електронного навчання.

Ключові слова: он-лайн навчання, оцінка якості послуг он-лайн навчання, задоволеність студентів он-лайн навчанням, вища освіта Алжиру.

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