

The Role of Digital Technology in the Quality of the Educational Process at the Secondary Education Level



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Abstract

The study explored the role of digital technology in the quality of the educational process at the secondary education level. It was based question: Does digital technology contribute to improving the quality of education at the secondary education level? the following hypotheses: The available equipment and tools contribute to improving the quality of education at the secondary education level; Programs and applications help improve the quality of education; Methods and strategies contribute to improving the quality of education. To achieve its objectives, the descriptive approach was adopted, through a questionnaire designed to measure the study's variables, with a sample of 50 teachers from two secondary education institutions, one in Constantine province and the other in Mila province (Algeria). After the statistical analysis of the results, The results concluded that the hypotheses established at the outset of this study were confirmed.

Keywords

Digitalization
Educational Technology
Quality
Educational Process
Secondary Education
Level

الكلمات المفتاحية

الرقمنة
تكنولوجيا التعليم
الجودة
العملية التعليمية
طور التعليم الثانوي

دور التكنولوجيا الرقمية في جودة العملية التعليمية في طور التعليم الثانوي ملخص

بحثت هذه الدراسة في دور التكنولوجيا الرقمية في جودة العملية التعليمية وذلك في مرحلة التعليم الثانوي، حيث انطلقت من التساؤل الرئيس التالي: هل تساهم تكنولوجيا الرقمنة في تحسين جودة التعليم في مرحلة التعليم الثانوي؟ وبنيت على الفرضيات التالية: تساهم التجهيزات والوسائل المتوفرة في تحسين جودة التعليم في مرحلة التعليم الثانوي، تساعد البرامج والتطبيقات في تحسين جودة التعليم في مرحلة التعليم الثانوي، تساعد الطرق والاستراتيجيات في تحسين جودة التعليم في مرحلة التعليم الثانوي. ولتحقيق أهدافها تم اعتماد المنهج الوصفي، من خلال استبيان مصمم يقيس متغير الدراسة مبني على بعض الأدبيات المتناولة في الموضوع محل الدراسة، على عينة قدرت بـ: 50 أستاذ من كلا الجنسين في مؤسستين للتعليم الثانوي الأولى بولاية قسنطينة، والثانية بولاية ميله (الجزائر). بعد التحليل الإحصائي للنتائج خلصت هذه الدراسة إلى أن التجهيزات والوسائل، إضافة للبرامج والتطبيقات المستخدمة في العملية التعليمية، وكذا الطرق والاستراتيجيات تساهم فعلا في تحسين جودة العملية التعليمية في مرحلة التعليم الثانوي.

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Doi:

I- Introduction- problem statement :

The educational process plays a pivotal role in developing the educational system as it contributes to the growth and dynamics of social and economic life, provides learners with various intellectual and professional skills and competencies, helps solve problems in various forms, and keeps pace with modern life developments. Education is one of the most important fields that contributes to creating life benefits for society, like other fields. An observer of the matter will notice that most educational institutions at all levels worldwide have adopted a policy of reform and review of their educational system and policies, with continuous and gradual changes in their goals and reforms aimed at finding alternatives and strategies for the success of the educational process. In this context, the world has witnessed a major revolution and qualitative leap in the field of information and digital technologies, where the use of modern technology has expanded more than ever, covering all aspects of life and becoming an essential necessity for human activity. Technology, in this context, is a necessary tool in every field, especially in education, as it offers numerous advantages for the educational process and the learner. This is due to the significant development in the exchange of information and knowledge, which has become faster and more accessible, with the emergence of numerous electronic and even virtual platforms that enable quick transmission and reception of information. This is in light of the rapid use of learning based on digital data and artificial intelligence to make the educational process more flexible and aligned with learners' needs.

In this context, the educational field has witnessed broad and active movement focused on expanding the use of educational technology and digitalization in the teaching process, improving the cognitive communication between teacher and student within an interactive educational relationship. For instance, Urhan and others, in their study on the impact of educational videos as a digital teaching tool in increasing student activity, especially in mathematical practices, noted that video technology played a major role in enhancing problem-solving skills, particularly in math (Urhan, 2024).

In line with this information revolution, Algerian educational institutions, through ongoing educational reforms, have sought to keep pace with technological developments, known as digitalization, due to its significant role in energizing the educational process. Therefore, we observe a gradual transition from traditional education to the use of modern tools to convey knowledge effectively, with the teacher being the central figure in this process.

In this approach, digital technology in teaching is realized through the effective and efficient use of various methods and strategies to deliver, produce, or create educational content, and by establishing a quality, effective teacher-student educational relationship. With the emergence of artificial intelligence as a method for producing and delivering information easily and quickly, it has been integrated into the educational process through the use of educational applications like ChatGPT, an advanced artificial intelligence model. Delian Wang and others, in their study aimed at exploring the impact of this application on increasing educational outcomes, found that teachers expressed satisfaction with its role in the educational process (Wang, 2024), confirming that it indeed contributes to improving educational quality, which is crucial for the success of the educational system and achieving its objectives.

As the educational system is structured in several stages, secondary education represents a crucial link in the educational ladder, connecting two important educational phases and coinciding with adolescence. This stage has also witnessed significant movements and qualitative shifts in digital technology to enhance the learning process, aiming to achieve the set goals and produce competent learners with the necessary intellectual skills and problem-solving abilities. Moreover, learning at this stage is considered a continuous, integrated, and planned process that helps students understand themselves physically, mentally, emotionally, and socially, ultimately contributing to their personal, educational, and social well-being.

Therefore, based on the importance of digital technology in the educational field for transferring knowledge and information to students, this study aimed to assess the extent to which these tools and digital technologies contribute to improving educational quality in secondary education and energizing the learning process. The main research question is: Does digital technology contribute to improving the quality of education in secondary education?

This question is subdivided into the following sub-questions:

- Do the available equipment and resources contribute to improving the quality of education in secondary education?
- Do programs and applications help improve the quality of education in secondary education?
- Do methods and strategies contribute to improving the quality of education in secondary education?

Based on these questions, the study is grounded in the following hypotheses:

- Digital technology contributes to improving the quality of education in secondary education.
- Available equipment and resources contribute to improving the quality of education in secondary education.
- Programs and applications help improve the quality of education in secondary education.

II -Methods and strategies help improve the quality of education in secondary education.

Previous Studies in Light of the Studied Variables:

- Yazid Qada (2012):

This study aimed to identify the reality of applying Total Quality Management (TQM) in Algerian educational institutions, with a specific focus on secondary schools in the province of Saïda. The researcher used a stratified random sample of 27 schools and adopted a descriptive-analytical approach along with statistical methods such as percentages, frequencies,

means, standard deviations, Cronbach's alpha, Pearson correlation, T-test for differences between means, linear regression analysis, and one-way ANOVA. The study concluded with the following results:

Algerian educational institutions apply quality management from the perspective of school principals.

Algerian educational institutions do not apply quality management from the perspectives of teachers and students.

A significant relationship was found between the application of TQM and the quality of school management, the curriculum, and the educational environment (Qada, 2012, p. 10).

- Amal Zidan (2021):

This study aimed to explore the digital technological transformation in higher education institutions, specifically at the College of Islamic Studies for Women at Al-Azhar University. The researcher used a random sample of 80 individuals and applied a descriptive case study approach. The study concluded with the following results:

Digitalization is not just about applying digital communication tools inside an institution but is a comprehensive program targeting the institution's organizational culture and internal and external work methods.

Measurement indicators for strategic plans and processes implemented to support the institution's digital transformation. Digitalization played an essential and effective role in disseminating, producing, updating, and efficiently using information among university students.

Digitalization provides opportunities for retaining knowledge, accessing it at the right time, diversifying sources, and easily updating content (Zidan, 2021, p. 463).

- Urhan, S. (2024):

This study investigated the impact of different types of video lectures on students' performance in problem-solving practices, particularly in mathematics. The study involved a sample of 19 students in problem-solving practices requiring prior knowledge and 22 students in problem-solving practices needing procedural knowledge. The practices were conducted in algorithm and programming courses. Three types of video lectures (teacher's whiteboard, teacher's audio booklet, and teacher's cards) were used in both courses. One-way repeated measures ANOVA was applied to determine significant differences in students' problem-solving performance based on the type of video lecture. The study concluded that in the algorithm and programming course requiring prior knowledge, students' problem-solving scores were significantly higher (Urhan, S., 2024, p. 117).

- Ivanenko, N., et al. (2024):

This study aimed to highlight the need for introducing innovative digital technologies into the future education system as a natural response to current changes. The study emphasized the active use of digital technologies through the concept of e-functions. It also highlighted key trends in the development of digital education, anticipating that these dynamics would continue to evolve in the future. The study concluded that digital transformation in education has become a global trend, aiming to create and establish an innovative digital environment in an information society (Ivanenko, N., et al., 2024).

III -Methodological and Field Procedures for the Study:

Method Used:

This study relied on a descriptive approach due to its suitability for the nature of the current research.

Study Sample:

A sample of 50 teachers was selected from two secondary schools: Saqiat Boukhmies Secondary School in Constantine and Maatar Azawiya 1955 Secondary School in Mila. The selection was purposive and distributed equally across genders.

Data Collection Tools:

A questionnaire was designed to measure the study variables, based on theoretical frameworks and previous literature on the topic. It consisted of three sections with 15 items.

Psychometric Properties of the Designed Questionnaire:

Validity: The self-validity method was used to calculate the questionnaire's validity, based on the square root of the reliability value obtained. The reliability value was found to be 0.66, so the square root of this value is 0.81. This value indicates that the questionnaire is valid and can be reliably used in application.

Reliability: The split-half method was used to calculate the reliability of the questionnaire. The questionnaire was divided into two main parts: odd-numbered questions and even-numbered questions. Statistical processing of the data and calculating the correlation between them yielded a reliability value of 0.66. Based on this, the questionnaire was deemed reliable and suitable for use.

Statistical Methods:

Percentages: Used to calculate the responses of the sample members and extract their percentages.

Pearson Correlation Coefficient: Used to determine the consistency of the study as follows:

$$rp = \frac{n \sum xy - (\sum x)(\sum y)}{\sqrt{[n \sum x^2 - (\sum x)^2][n \sum y^2 - (\sum y)^2]}}$$

Standard Deviation: Also used in the tabulation and analysis of the sample members' responses.

The arithmetic mean: It was relied upon in tabulating and analyzing the responses of the targeted sample.

The standard deviation: It was also relied upon in the process of tabulating and analyzing the responses of the targeted sample.

IV - General Presentation of the Results Obtained:

Tabulation and Analysis of the Study Sample Responses on the First Axis:

Table No. (01) Shows the Responses of the Sample Members on the First Axis

Standard Deviation	Arithmetic Mean	Sometimes	No	yes	Statements Alternatives	Axis theme
1.2	2.4	12 24%	09 18%	29 58%	Have you ever used any digital device (computer, projector, etc.) during the teaching process?	Digital Technology Tools
1.19	2.32	28 56%	08 16%	14 28%	Does the institution provide you with digital devices and tools to conduct the teaching process?	
1.17	2.36	22 44%	05 10%	23 46%	Do digital devices contribute to enhancing student focus in secondary education?	
1.09	2.24	20 40%	09 18%	21 42%	Do you face any technical problems with the digital devices used in the teaching process?	
1.61	2.8	06 12%	02 04%	42 84%	Does the internet provide you with the opportunity to improve the content of the educational process?	

Analysis of the Results:

From the results shown in the table, which represent the responses of the study sample on the statements of the first axis regarding digital technology tools, we observe that various digital devices significantly enhance the effectiveness of the teaching process for students, as well as provide them with knowledge and intellectual skills, especially in learning. This is evident from the first statement, where the majority answered "Yes," accounting for 58%, i.e., 29 teachers out of 50, which is a relatively high percentage compared to the answers "No" and "Sometimes."

Most teachers use digital devices such as computers and projectors during their teaching process, as the internet provides a great opportunity to improve the quality of the educational process. This was evident from the fifth statement, where 84% of the sample, or 42 teachers out of 50, confirmed this, while 16% (8 teachers) reported that the institution did not provide them with the necessary digital devices for teaching.

Moreover, these digital devices contribute significantly to the process of focus among secondary school students, as seen in statement number 3, where 46% of the teachers (23 out of 50) answered "Yes."

Additionally, some teachers reported encountering technical problems with the digital devices used in the teaching process, as indicated by 42% of the responses (21 teachers). However, some teachers' responses were neutral, reflected in the "Sometimes" option, showing a mix of views on the availability and functionality of these devices during the teaching process.

Tabulation and Analysis of the Study Sample Responses on the Second Axis:

Table No. (02) Shows the Responses of the Sample Members on the Second Axis

Standard Deviation	Arithmetic Mean	Sometimes	No	yes	statements Alternatives	Axis theme
1.4	2.6	10 20%	5 10%	35 70%	Did the digital content and its programs contribute to developing your intellectual skills in self-learning?	Digital Technology Applications
1.2	2.38	10 20%	11 22%	29 58%	As a secondary school teacher, do you use digital programs for communication between you and the institution, such as email?	
1.1	2.2	13 26%	14 28%	23 46%	Have you noticed that the digital programs used to improve the quality of education have been effective?	
1.13	2.28	14 28%	11 22%	25 50%	In your opinion, is the use of digital technology to improve the quality of secondary education beneficial in your institution's work environment?	
1.19	2.28	20 42%	8 16%	22 42%	Do digital applications play a role in increasing motivation for learners in secondary education?	

Analysis of the Results:

From the results in the table above, which represent the responses of the study sample on the statements of the second axis concerning digital technology applications, we observe that digital technology applications significantly enhance self-learning skills by connecting students to educational resources, allowing them to access them when needed, and helping them acquire certain scientific skills such as observation accuracy and the ability to interpret results. This was evident in the first statement, where the majority answered "Yes" (70%), i.e., 35 teachers out of 50, which is a very high percentage compared to the "No" and "Sometimes" responses.

Digital programs also help students improve their ability to interact with communication tools, enhancing their ability to communicate with their peers and the institution. This was especially noted in statement 2, where 58% of the teachers (29 out of 50) affirmed that they use digital programs, such as email, for communication with the institution. Conversely, 22% (11 teachers) reported that they were unable to communicate with the institution via digital means.

Moreover, digital programs have proven effective in improving the quality of education, as indicated by 46% of teachers (23 out of 50) who agreed with this statement. These programs make learning experiences more engaging, and they allow the world to be brought into the classroom through digital means. This is evident from statement 3, where the majority of responses were positive. Furthermore, digital technology and applications motivate students to learn new skills and solve problems, which enhances the quality of education. This was evident from statement 5, with 42% of teachers (22 out of 50) agreeing that digital applications contribute to increasing student motivation.

Tabulation and Analysis of the Study Sample Responses on the Third Axis:

Table No. (03) Shows the Responses of the Sample Members on the Third Axis

Standard Deviation	Arithmetic Mean	Sometimes	No	yes	Statements Alternatives	Axis theme
1.7	2.3	25 50%	10 20%	15 30%	Do you think that the curricula of secondary education encourage the use of digital tools to improve the quality of education?	Digital Technology Strategies
1.2	2.36	20 40%	6 12%	24 48%	Do you think that the use of digital methods enhances the concentration of secondary school students?	
1.13	2.16	20 40%	12 24%	18 36%	Do you think that the use of digital methods (such as the internet) has	

					improved the educational relationship between teachers and students?	
1.11	2.12	16 30%	20 40%	14 30%	Have digital strategies (such as websites, Google tools, etc.) contributed to increasing student attention?	
0.99	2.28	18 36%	9 18%	23 46%	Do you think there is a clear impact of digital technology on the quality of education in secondary education?	
1.7	2.3	25 50%	10 20%	15 30%	Do you think that the curricula of secondary education encourage the use of digital tools to improve the quality of education? (Repeated question)	

Analysis of the Results:

The responses provided above, reflecting the study sample's feedback on the third axis related to digital technology strategies, reveal that digital strategies significantly aid in providing quick and effective support to students. Additionally, 48% of teachers (24 out of 50) confirmed that digital strategies enhance students' concentration during lessons. This shows a positive impact of digital methods on the attention and focus of students during educational activities.

Moreover, 46% of teachers (23 out of 50) believe that digital technology indeed affects the quality of education by offering greater opportunities for knowledge formation. However, 9% of teachers disagreed, saying that digital technology does not influence educational quality, which is a very small proportion compared to the majority who agreed.

Furthermore, 36% of teachers (18 out of 50) acknowledged that digital strategies, such as websites and Google search engines, improved the teacher-student relationship, while 24% (12 teachers) disagreed. However, a large portion of teachers, 50%, was neutral in their responses, highlighting a mixed opinion on the improvement in relationships resulting from the use of digital strategies.

Lastly, regarding the use of digital tools in improving students' attention, 30% of teachers (14 out of 50) agreed that digital strategies contributed to increased attention, while 40% (20 teachers) disagreed, showing that there is a balance in teachers' perceptions regarding the effectiveness of these tools in enhancing students' focus during lessons.

In conclusion, digital technology and strategies have shown promising impacts in enhancing student engagement, improving educational quality, and fostering better communication between teachers and students. However, some challenges remain, such as the need for further optimization of digital tools to maximize their effectiveness in educational contexts.

V - Discussion of Study Hypotheses in Light of Results:

- Discussion of the First Partial Hypothesis: The available equipment and tools contribute to improving the quality of education in secondary education:

Through presenting and analyzing the results of the first hypothesis, it became clear that digital technology tools significantly contribute to improving and enhancing the quality of education in secondary schools. This effect is clearly seen through the integration of technological devices and tools into the educational process, which aligns with the findings of Amal Zidan's 2020 study, which emphasized the important role of digital tools in disseminating, producing, and updating information efficiently. These tools also contribute to promoting effective communication and enhancing student engagement in the learning process, making it easier for students to access information and improve their educational outcomes.

The main benefits of these technological tools include improving student interaction with educational content, turning students into active learners, and motivating them to participate, which leads to better academic achievement. The transition from traditional educational methods to modern teaching methods that rely on technological tools helps improve students' understanding and focus, thus enhancing educational outcomes.

Additionally, technologies like display screens and educational videos help make lessons more engaging and interactive, which ultimately leads to better student performance. Based on the results obtained from the study sample, we conclude that modern digital technology tools effectively contribute to improving the quality of education in secondary education.

- Discussion of the Second Hypothesis: Programs and applications help improve the quality of education in secondary education:

By analyzing the results of the second hypothesis, the importance of digital technology applications in improving educational outcomes becomes evident. These applications not only improve the cognitive aspect, such as research and reading skills, but they also provide effective feedback between teachers and students. They contribute to boosting students' motivation for learning and encouraging active participation.

Furthermore, these applications help teachers enhance their ability to prepare educational content and achieve clear learning objectives, leading to high-quality educational outcomes. However, it is worth noting that many educational institutions in Algeria lack the necessary technological resources, which negatively impacts the effectiveness of these applications in improving the quality of education. This was confirmed by the study of Quadir Amzor, who found that educational institutions in Algeria suffer from a significant lack of digital resources and educational applications.

Based on the results, we can conclude that modern digital programs and applications contribute significantly to improving the quality and type of education in secondary education, despite some challenges related to the availability of these technologies in certain educational institutions.

- Discussion of the Third Hypothesis: Methods and strategies contribute to improving the quality of education in secondary education :

Through the analysis of the results related to the third hypothesis, it became clear that digital strategies significantly help students understand and expand their lessons. They also assist students in completing their assignments by relying on diverse information sources available on the internet or through electronic platforms and virtual communication tools provided by teachers. This approach allows students to retain information for longer periods because it is supported by audio, video, and a deeper understanding, in contrast to traditional methods that mainly rely on lecturing and listening.

Moreover, the integration of these modern strategies into the educational process is essential because it raises the cognitive level of students and ensures optimal time management, thus fostering creativity, knowledge transfer, and problem-solving skills. Additionally, these digital strategies help enrich students' knowledge and provide them with many opportunities to learn various skills and achieve personal development.

On the other hand, digital strategies also improve the teacher-student relationship by encouraging students to express their opinions and ideas freely, which enhances the overall educational experience. This results in more effective and dynamic participation in the educational process. These strategies also contribute to enhancing student engagement and motivation, ultimately improving the overall quality of education. This aligns with the findings of Yazid Qada, who confirmed that there is a relationship between quality education management and both curriculum quality and the educational environment.

Based on these results, we can conclude that the various digital strategies employed in delivering educational content have a clear and positive impact on the educational process, improving the overall quality of education and raising student achievement. This confirms that the third hypothesis in the study has been validated.

- Based on the discussions above, it can be concluded that all three hypotheses of the study have been generally validated. Technological tools, digital programs and applications, and digital strategies all contribute significantly to improving the quality of education in secondary education. However, there are still challenges, such as the lack of technological resources in some educational institutions, which requires further investment in developing technological infrastructure to fully benefit from these tools in enhancing the educational process.

VI - Conclusion:

The aim of this study was to examine the role of digital technology in improving the quality of education among secondary school teachers. Based on the results, it was found that digital technology indeed contributes to enhancing the quality of education at the secondary education level. It became clear that technological tools and equipment that support the production and delivery of information to learners effectively improve the quality of education in secondary schools. Additionally, modern programs and applications play a significant role in improving the quality of education, creating information, and enhancing educational content. Furthermore, the results indicated that digital methods and strategies that rely on digital technology in the educational process truly help improve the quality of education at the secondary school level.

Therefore, it can be concluded that digitalization in the educational process plays an active role in revitalizing the teaching-learning process. It also contributes to creating an appropriate educational environment and enhances the teacher-student relationship. Based on these findings, a set of recommendations and suggestions can be drawn, which are as follows:

- Further expansion of the use of educational technology and digitalization in teaching practices across all educational levels.

- Incorporating courses based on the use of digital technology into various subjects at different educational stages.
 - The necessity of activating the use of digital technology, especially in teaching foreign languages.
 - Establishing a national plan and strategy for implementing digital education in educational processes.
 - Continuous awareness of the importance of using various digital platforms and tools in the field of learning.
 - Focusing on training and educating teachers about new technological advancements to improve the teaching process.
- Working to provide modern electronic tools and equipment in educational institutions.

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