

The Reality of Using Information and Communication Technology (ICT) in Supporting the Educational Process Among Secondary School Students

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Abstract

This study aimed to investigate the reality of secondary school students' use of Information and Communication Technology (ICT) in supporting their learning within the school environment, with a focus on the nature of this usage, the most commonly used tools, and statistically significant differences related to gender and educational level. The descriptive method was adopted due to its suitability for analyzing educational phenomena as they exist in the field.

The sample consisted of 290 students from "Abou Bakr El-Hadj Issa" Secondary School in Laghouat, selected using a stratified random sampling technique. A questionnaire comprising 18 items was used, distributed across three main axes: educational platforms, educational videos, and educational mobile applications, along with demographic data (gender and academic level).

The study reached several important findings:

- *Students showed a statistically significant positive attitude towards using ICT to support their learning.*
- *Educational videos ranked first in terms of usage, followed by mobile applications, then educational platforms.*
- *There were statistically significant differences in favor of female students in their level of educational technology use.*
- *There were no statistically significant differences in ICT usage related to students' academic level.*

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1. Introduction

Information and communication technology (ICT) has become an important part of many fields, including education, which is going through a huge structural change because of the digital revolution that has happened in the modern world. It's now clear that current technologies are having a bigger and bigger impact on how teachers teach. These include computers, the internet, cellphones, educational apps, interactive platforms, and digital movies that are used in and out of the classroom. This change is happening all across the world, but its effects are different in different educational and cultural settings. In rich countries, technology is seen as a key tool for improving the quality of education. However, many other countries, including Algeria, have trouble adapting their educational systems to the needs of the digital age. These issues include limited infrastructure and the need for important people in schools to have more training in how to teach.

The COVID-19 pandemic was a turning point that made it clear that we need to rethink traditional educational systems and made it even more important to be ready to accept distance learning as a long-term solution rather than just a temporary fix. Even though the crisis could lead to new ideas and more openness, the digital divide in schools, especially in high school, is still a big problem when it comes to resources and students actually using the tools that are available to them. In Algeria, students' ability to use ICT well depends on more than just having access to the right devices. It also depends on things like their level of awareness, gender,

academic level, intrinsic motivation, and the teaching methods that are most common in their classes. During this phase, the focus shifts from just getting access to technology to figuring out how to use it effectively to improve learning.

This means that we need to look at how students in Algerian secondary schools use ICT, paying special attention to common usage patterns and how students' demographic and pedagogical characteristics affect their use. Answering these questions could help us figure out important parts of making a complete national plan for integrating educational technology that fits the needs of Algerian students and the local school system.

1.2-Research Problem:

The contemporary world is seeing swift advancements in information and communication technology (ICT), impacting numerous facets of life, particularly in the realm of education, which is at the front of these digital transformations. In the digital era, education has become progressively reliant on contemporary technology media, including computers, the internet, cellphones, educational platforms, and interactive films. As a result, numerous countries—especially industrialized nations—have commenced the incorporation of these tools into educational systems to enhance the learning experience, invigorate motivation, and promote a departure from conventional teaching methodologies. Marshall McLuhan articulated this profound transformation by asserting that humanity has evolved from oral communication to written forms, then to audiovisual communication, and ultimately to digital

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interaction via information networks—a transition from the knowledge society to the screen society (Azzi, 2000).

In recent years, there has been an increasing interest in incorporating ICT into the educational system, particularly due to the modifications necessitated by the COVID-19 pandemic, which rendered digital media an essential tool for maintaining the continuity of distance learning. A field research conducted in various Algerian secondary schools indicated that a significant proportion of students possess cellphones and internet-enabled PCs. Nonetheless, the practical application of these tools for educational purposes is constrained within classrooms, attributable to reasons such as inadequate training, insufficient infrastructure, or the lack of definitive pedagogical methodologies for implementation. Additional educational data indicate that secondary school instructors are the least inclined to utilize ICT in comparison to their primary education counterparts, with regular usage not surpassing 37% of teachers. Furthermore, the techniques predominantly employed are restricted to presenting video information or utilizing rudimentary educational platforms (Ammouden, 2022).

The significance of ICT integration extends beyond technical and instrumental elements to include psychological and cognitive factors. These tools can augment learners' motivation, incite curiosity, and foster positive engagement with educational content, contingent upon their integration through a meticulously devised strategy that accounts for individual variances among students regarding

gender, academic level, and cognitive capabilities. Global research reveals notable disparities in technology usage between males and girls; males predominantly engage in technical and entertaining activities, whereas females exhibit a more constant inclination towards utilizing digital media for educational objectives. The extent of advantage derived from these tools may differ by academic level, contingent upon the student's maturity and previous educational experiences. This underscores the necessity to examine such disparities to formulate comprehensive and inclusive educational solutions.

The research challenge arises from the backdrop of continuous initiatives to incorporate ICT into secondary education in Algeria, and the degree to which its utilization differs among pupils based on gender and academic level. Consequently, the investigation is directed by the subsequent research inquiries:

- To what degree do secondary school pupils utilize ICT to enhance their learning?
- How are various ICT domains (educational platforms, instructional videos, smartphone utilization, and applications) prioritized with their effectiveness in enhancing secondary students' learning?
- Are there statistically significant differences in ICT usage patterns for learning support based on gender (male/female)?
- Does the degree of ICT utilization in the educational process vary greatly according on academic level (first,

second, or third year of secondary school)?

1.3-Study Hypotheses:

- Secondary school students exhibit a statistically significant level of engagement in utilizing information and communication technology (ICT) to enhance their learning.
- The educational video sector is anticipated to lead in the extent of ICT use for enhancing secondary students' learning, surpassing educational platforms and mobile applications.
- Statistically significant disparities exist in the utilization of ICT in the educational process based on gender (male/female).
- Statistically significant disparities exist in the utilization of ICT in the educational process based on academic level (first-year, second-year, third-year secondary students).

1.4-Study Objectives:

The objective of this study is to:

- Assess the degree of participation of secondary school students in utilizing ICT to enhance their learning within the school context, and examine the characteristics of this usage regarding its frequency, students' motivation, and the educational objectives they seek to accomplish through it.
- Ascertain the hierarchy of ICT domains (e.g., educational platforms, instructional videos, mobile applications) according to their utilization in facilitating learning among secondary school students.

- Demonstrate statistically significant variations in ICT usage patterns for learning support among secondary school students based on gender (male/female).
- Examine variations in the extent of ICT utilization in the educational process among secondary school students based on academic level (first, second, and third year of secondary education).

1.5-Importance of the Study:

This study is significant due to the contemporary educational landscape, wherein secondary school in Algeria is experiencing heightened efforts to include ICT throughout all phases of learning.

Nonetheless, these initiatives remain devoid of rigorous scientific assessment that elucidates the true nature of students' technology utilization, their degree of engagement, and the underlying reasons, as well as any discrepancies associated with gender and academic standing. The significance of this study resides in its objective to address a genuine knowledge deficiency in national educational literature by offering credible field data based on a scientific investigation of technology utilization trends in secondary schools.

The theoretical importance of the study is in its contribution to educational psychology by examining the interplay between motivation, learning behavior, and digital media utilization. It provides an analytical framework to assist researchers in comprehending the dynamics of technology utilization from a psycho-educational perspective, considering individual and group variances among students.

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This study's findings aim to furnish educational decision-makers, inspectors, and school administrators with actionable insights to devise more effective and customized strategies for integrating ICT in education, aligned with learners' psychological and cognitive requirements.

The study may assist in developing alternative pedagogical tactics that account for the efficacy and frequency of educational media utilization, while advocating for deliberate, guided technology use instead of arbitrary or consumerist approaches. It also has the potential to initiate new research pathways into deeper characteristics such as academic accomplishment, critical thinking, or classroom engagement within the framework of technology integration.

This study transcends basic diagnosis of the current situation; it seeks to provide a scientific perspective that may enhance the quality of educational practices and facilitate the digital transformation of education grounded in robust psychological and pedagogical principles.

1.6-Theoretical Framework and Literature Review:

The incorporation of ICT into educational systems, especially at the secondary level, has become increasingly vital due to swift technological progress. A multitude of studies has examined this transition by assessing students' access to digital resources, usage patterns in educational environments, and the correlation between ICT, academic performance, gender equity, and national teacher training programs.

Amouden (2022) , in a report published in *Pratiques & Didactique*, performed a comprehensive field investigation about technology utilization among Algerian secondary pupils. The results indicated that almost 90% of pupils possessed a computer, although just 56% had internet connection at home, underscoring a considerable digital divide. Notwithstanding governmental initiatives to lower internet expenses, obstacles such as inadequate mobile network coverage and deficient landline infrastructure—particularly in rural regions—persist in obstructing connectivity. Notably, students in peri-urban areas had superior internet access (60%) compared to their urban counterparts (54%), presumably due to a scarcity of alternative options such as libraries or cultural centers.

The survey revealed negligible gender disparities regarding computer ownership and internet access, with girls somewhat more likely to possess home internet connection, owing to their restricted utilization of public internet cafés. Nevertheless, male students indicated greater ICT utilization, predominantly for non-academic activities such as leisure and social networking. Ninety-four percent of students utilized computers, and approximately seventy-five percent accessed the internet; however, female students indicated higher usage durations, potentially attributable to more time spent at home, while male students exhibited greater engagement in entertainment-related activities.

Regarding formal education, merely 66% of students obtained computer science training, indicating disparities in the

integration of ICT across all educational levels. This indicates an absence of systematic ICT integration, especially at the primary level.

These results correspond with the research conducted by Guemide and Benachaiba (2012), who investigated the influence of e-learning on the professional advancement of secondary school English educators in Algeria. Their research highlighted the necessity of a nationwide digital platform for teacher training, indicating that such an endeavor might mitigate regional and social differences while enhancing overall teaching quality.

Qazi et al. (2022) identified persistent global gender differences in ICT skills and usage, although some findings were statistically insignificant. Their findings highlighted the necessity for measures to tackle these gaps, especially in underrepresented regions of the Global South. Fayda-Kinik and Cetin (2024) established that students' attitudes toward ICT—specifically confidence, interest, and autonomy—exhibited a favorable correlation with academic achievement in mathematics, science, and reading. Their extensive, hierarchical analysis of more than 300,000 students across 53 nations revealed that use technology mostly for social connection was inversely associated to academic performance, particularly among lower-achieving pupils.

Courtney et al. (2022) validated these findings through evaluations of four PISA cycles, indicating that the degree of technology utilization does not inherently improve academic achievement unless coupled with favorable attitudes and genuine competencies. They promoted the cultivation of learner autonomy and

reflective behaviors in the utilization of ICT, rather than concentrating exclusively on accessibility.

Sultana and Hasan (2023) identified various structural impediments to ICT integration in secondary education in Bangladesh, including infrastructural deficiencies, power interruptions, and a lack of specialized training, especially among non-technical educators. Notwithstanding these obstacles, their study underscored the significance of ICT tools in lesson design and execution, advocating for blended learning models and incremental enhancements to educational platforms and social media use.

Despite the burgeoning local and international research on ICT utilization in secondary school, a critical examination indicates that the majority of studies have focused mostly on access and superficial usage, frequently overlooking comprehensive analyses of the impact these tools have on teaching and learning. Amouden's (2022) study highlighted access discrepancies but failed to offer a comprehensive review of the impact of these digital tools on educational quality or the development of higher-order cognitive skills.

Conversely, international studies—such as those conducted by Courtney et al. (2022) and Fayda-Kinik and Cetin (2024)—investigated the correlations among ICT-related attitudes, skills, and academic achievement. Nevertheless, this research depended on extensive datasets such as PISA, which may not be entirely relevant to Algeria's unique educational and social environment.

Furthermore, current research predominantly emphasizes pupils as individual units of analysis. The dynamics of classrooms, pedagogical approaches, and the changing role of educators in technology-enhanced settings have been relatively neglected, particularly in developing educational institutions. Research on teacher development, shown by the work of Guemide and Benachaiba, frequently remains theoretical or in its nascent stages, lacking substantial empirical confirmation or practical application.

Moreover, while research such as that conducted by Qazi et al. (2022) has examined gender disparities in ICT utilization, sociocultural factors—such as norms regarding digital participation and the obstacles encountered by female students—are often inadequately represented, particularly in conventional societies experiencing technological shifts.

In the Algerian setting, there is a significant lack of research that investigates the relationship between technology and learning quality from a holistic, qualitative standpoint. Most current research predominantly depends on quantitative survey data, which offers superficial insights and fails to investigate how digital technologies transform cognitive processes, classroom interactions, or knowledge building.

This highlights the pressing necessity for empirical research conducted in the field that concentrate on the quotidian realities of educational practice in ICT-integrated settings. Such studies should emphasize the lived experiences of students and teachers using qualitative or

mixed-method approaches that reveal underlying meanings and contextual elements. Moreover, the correlation between ICT utilization and educational quality, along with the educator's function as a digital facilitator, remains inadequately examined in Algerian studies.

1.7-The Concept of Information and Communication Technology (ICT) in Education:

Comprehending ICT in education necessitates a reference to the foundational concepts of educational technology, as both notions are intricately linked and signify overlapping dimensions within the educational sphere. Educational technology refers to the application of modern technical breakthroughs in educational settings to enhance many facets of the teaching and learning process. Lumsdaine (1964) defined educational technology as the utilization of equipment and devices for the dissemination of educational content, thereby embodying the application of scientific principles and theories, particularly learning theories, to improve educational efficacy. (Al-Hila, 2000)

As science progresses and reliance on technology grows, new instruments such as instructional cinema, projection devices, educational television and radio, and audio recording tools have been integrated into the teaching process. These instruments were subsequently termed "media technologies," denoting items of technical advancement utilized to educate persons and furnish them with pertinent knowledge regarding their surroundings. As these tools gained prevalence, their application in educational institutions increased, albeit

to differing extents based on each country's technical progress and educational policy aims.

Nonetheless, the technological revolution extended beyond the basic utilization of tools. Emerging educational trends have acknowledged the necessity of advancing beyond a rudimentary instrumental comprehension to cultivate pedagogical methodologies centered on intentional integration. Fathallah Abdel Halim Sayed (1995) observed that a new cohort of educational theorists advocated for a transition from simple “use” to “strategic deployment,” contending that educational enhancement should encompass not only the tool or its delivery method but also the learner, the pedagogical approach, and the comprehensive educational framework.

Consequently, it is pedagogically acknowledged that the simple utilization of media technologies in the classroom does not ensure enhanced learning outcomes. Disorganized or arbitrary usage may produce harmful outcomes and impede student development. In this setting, Gagné underscored that learning is not merely a communal event, but fundamentally an individual endeavor necessitating assistance and guidance. This indicates that learners require an educational setting that integrates tools in a manner that honors individual variations and fosters self-awareness and autonomous learning.

This change in perspective signifies an increasing recognition of the importance of ICT in education—not alone as technical instruments but as integral elements within more holistic and profound teaching methodologies. These tactics seek to enhance student engagement, cultivate

cognitive capabilities, and attain learning objectives with adaptability and efficiency. (Boudarbala, 2007, p. 327)

2. Research methodology

2.1 Methods & Procedures

This study employs the descriptive technique due to its appropriateness for the research's nature and objectives. This methodology facilitates the examination of ICT utilization in secondary education by monitoring occurrences in their natural context, precisely describing them, and comprehending their interrelations without interference. It aids in revealing existing patterns, assessing students' attitudes toward educational technology tools, and identifying potential disparities within the sample depending on variables such as gender and academic level.

2.2-Study Group and Sample Size:

The study population comprises all students registered in Aboubaker El-Hadj Aissa Secondary School in Laghouat, totaling 1179 students over the three secondary education levels (first, second, and third year). This demographic was selected for its pertinence to the subject matter and the presence of conditions within the school that facilitate the observation of actual ICT utilization in classroom and learning environments.

The study employed a stratified random sampling method for the sample. The Yamane Taro formula (1967), a recognized statistical equation in educational research, was employed to ascertain an adequate sample size. This formula calculates sample size from a finite population with scientific accuracy, considering the permissible margin of error

and the required confidence level. The selection was based on its appropriateness for the study population of 1179 students, ensuring a representative sample that could produce results generalizable to the original population with a statistically acceptable level of confidence.

$$n = \frac{\left(\frac{z}{d}\right)^2 \times (0.50)^2}{1 + \frac{1}{N} \left[\left(\frac{z}{d}\right)^2 \times (0.50)^2 - 1\right]}$$

Where N = the population size,

Z = the z-score corresponding to a 0.95 confidence level, which equals 1.96,

d = the margin of error, which equals 0.05."

$$n = \frac{\left(\frac{1.96}{0.05}\right)^2 \times (0.50)^2}{1 + \frac{1}{1179} \left[\left(\frac{1.96}{0.05}\right)^2 \times (0.50)^2 - 1\right]} = 289.93$$

The estimated sample size for our study was: 290.

2.2-Research Instrument:

The research instrument, a questionnaire, was formulated based on contemporary educational literature and prior studies examining the efficacy of information and communication technology (ICT) in educational settings, specifically within secondary education. The questionnaire topics were created to reflect the existing scientific information in this domain, concentrating on three primary categories that represent the principal technological instruments utilized by students: educational platforms, smartphone applications, and educational videos.

Educational platforms included indicators that reflect students' perceptions regarding their role in offering exercises

and lessons, enabling self-assessment, and diminishing the necessity for tutoring. This aligns with the findings of studies by Guemide & Benachaiba (2021) and Ammouden (2022), which underscored the significance of these platforms in improving academic performance and bridging knowledge gaps, contingent upon the provision of adequate training and support. The items also incorporated observations from studies such as Sultana & Hasan (2023), which highlighted the inadequate emotional and psychological engagement on certain platforms. This prompted the inclusion of statements assessing students' personal preferences for teachers over platforms and their perceptions of interaction and dialogue within these digital environments.

Concerning smartphone applications, the pertinent items were designed based on studies by Courtney et al. (2021) and Qazi et al. (2021), which emphasized the varied applications of these tools for research, communication between students and educators, and assignment completion. These studies also identified difficulties associated with smartphone usage, including diminished engagement with information and a propensity for passive consumption. The questionnaire evaluated these qualities by examining the educational efficacy of the applications and their physical convenience, juxtaposed with elements of disengagement or intermittent lack of motivation.

The educational videos were derived from findings of multiple studies, including Fayda-Kinik & Cetin (2023) and Courtney et al. (2021), which demonstrated the beneficial effects of visual content in

elucidating intricate concepts, facilitating flexible information repetition, and enhancing memorization and recall. The poll also addressed the social aspect of digital content, encompassing its shareability among students and pedagogical suggestions for its utilization as a compensatory resource beyond class hours.

The theoretical basis for constructing the questionnaire was grounded in these and additional studies to guarantee both face validity and content validity, while ensuring the instrument's elements corresponded with the variables being examined. The questionnaire's form and the statements' nature were crafted to assess the behavioral, cognitive, and emotional dimensions associated with students' utilization of ICT in their actual educational environment.

The study questionnaire, titled “The Scale of Modern Technology Use in Learning among Students of El Hadj Aissa Aboubaker Secondary School,” comprises 18 items that assess the degree of students' utilization of educational technology, including educational platforms, instructional videos, and smartphone applications. The assertions are categorized into three axes as follows:

- Axis 1: Educational Platforms – comprising 6 items.
- Axis 2: Smartphone Applications – including 6 items.
- Axis 3: Educational Videos – including 6 items.

And The questionnaire contains a section for personal information, specifically gender and educational attainment.

Table 1. Scale Response Levels. Source

Response Option	Score
Disagree	1
Neutral	2
Agree	3

Source: (Prepared by the researchers)

To determine the direction of the respondents' answers and the length of each category, we applied the following formula to calculate the class interval:

(Highest score - 1) / Highest score

Based on this, the class interval is calculated as: $(3 - 1) / 3 = 0.66$

Thus, the length of the class is 0.66, as shown in the table below:

Table2. Interpretation of Scale Ranges.

Range	Interpretation
[1.00–1.66[	Disagree
[1.67–2.33[	Neutral
[2.34–3.00]	Agree

Source: (Prepared by the researchers)

2.3-Pilot Investigation

A pilot study was done with a sample of 30 students from El Hadj Aissa Aboubaker Secondary School in Laghouat to ascertain the clarity, appropriateness of phrasing, and usefulness of the research instrument for the target demographic. Participants were chosen from different grade levels (1st, 2nd, and 3rd year of secondary school) to guarantee broad representation that accounts for potential age and cognitive variations between educational stages.

This pilot study aimed to assess students' comprehension of the questionnaire items, identify persistent difficulties, evaluate the suitability of the response scale (3-point Likert scale), and

estimate the time needed to complete the instrument.

The results indicated that students were predominantly capable of comprehending and responding to the items effectively, reflecting the clarity of phrasing and accessibility of language. Minor observations were noted—especially about item similarity and the necessity for elaboration of certain concepts—which were considered and rectified in the final draft of the instrument. Furthermore, the pilot study facilitated an initial evaluation of the tool's validity and reliability, encompassing the computation of Cronbach's alpha coefficient to determine the internal consistency of the questionnaire's dimensions, in anticipation of its application in the main study.

The pilot study was essential for enhancing the research instrument and confirming its preparedness for deployment to the broader population.

2.4-Psychometric Characteristics of the Research Instrument:

2.1.4-Content Validity:

Prior to distributing the final iteration of the questionnaire to the primary sample, it underwent reviewed by a panel of nine (9) academic experts in psychology and educational sciences. They were requested to assess each item regarding clarity, language, relevance to the issue, and connection with the study's objectives.

Lawshe's (1975) formula was employed to generate the Content Validity Ratio (CVR) for each item in order to assess content validity. This ratio indicates the percentage of experts who classified an item as "essential" for assessing the construct. (Haynes, 1995)

The research indicated an average CVR of 0.91 (91%) across all questions, signifying a substantial consensus among experts concerning the necessity and suitability of the items for assessing the intended dimensions.

Minor revisions were implemented to several items to enhance phrasing and conceptual clarity, based on the reviewers' recommendations. The instrument was then completed and authorized for implementation in the primary research, exhibiting robust content validity.

2.2.4-Construct and Internal Consistency Questionnaire Validity:

Two forms of validity were evaluated to ascertain the credibility of the research instrument: Construct validity refers to the extent to which an instrument accurately represents the theoretical construct it aims to measure. It is regarded as one of the paramount forms of validity in educational and psychological research. (Cronbach, 1955)

Internal Consistency denotes the extent of interconnection among items inside a scale, utilized to ascertain that all items are assessing the same fundamental construct. (Tavakol, 2011)

Table 3. Internal and Construct Validity of the Study Instrument

Axis	Consistency Validity	Construct Validity
Educational Platforms	0.91	0.84
Smartphone Applications	0.63	0.87
Educational Videos	0.35	0.86

The results presented in the table above demonstrate that the Pearson correlation coefficients, pertaining to both internal

consistency and construct validity, were statistically significant at the 0.05 or 0.01 levels. This indicates strong coherence among the items and their corresponding domains, illustrating that each question is well-aligned with the construct it intends to assess.

The correlation coefficients between items and their respective domains varied from 0.119 to 0.918, deemed acceptable to high according to educational research criteria. This corroborates the premise that objects are significantly connected to the dimension they aim to evaluate.

The computed correlations between each domain and the overall scale ranged from 0.841 to 0.873, all statistically significant, thereby affirming that the items effectively embody the theoretical constructs of the three domains (Educational Platforms, Smartphone Applications, and Educational Videos).

The questionnaire has substantial validity, characterized by strong internal consistency and accurate construct representation, hence augmenting its reliability and suitability for assessing students' views about the utilization of ICT in education.

2-4-Reliability of Instruments:

To guarantee the precision of results and the dependability of statistical analysis in this study, the Cronbach's Alpha coefficient was computed. This coefficient is a prevalent way for assessing the internal consistency of an instrument, namely the extent to which items measuring the same concept are interconnected. This is a crucial metric for evaluating the quality and dependability of measurement instruments in educational research. (Cohen, 1988)

Table.4. Cronbach's Alpha Coefficient for Questionnaire Reliability

scale	Number of items	Reliability Coefficient
ICT in the Educational Process	18	0.877

Source: (Prepared by the researchers).

The table indicates that the overall Cronbach's Alpha coefficient for the questionnaire was 0.877, deemed high by established norms in educational research. A coefficient of 0.70 is regarded as acceptable, while one surpassing 0.80 is deemed extremely good. This verifies that the study instrument exhibits a high degree of reliability, indicating robust internal consistency among the items and affirming the instrument's appropriateness for statistical analysis and inference.

2-5-Normality Test:

The normal distribution is a symmetric probability distribution frequently employed in statistics. It presents a bell-shaped curve that illustrates the distribution of values around the mean and serves as a fundamental assumption for most statistical tests. (Field, 2013)

Table.5. Normality of the ICT Effectiveness Scale in the Educational Process Source: (Prepared by the researchers)

Scale	Kolmogorov-Smirnov Value	Degrees of Freedom	Significance Level
ICT in the Educational Process	0.391	60	0.000

Source: (Prepared by the researchers)

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The Kolmogorov–Smirnov test results for the ICT scale indicated a value of 0.391, with 60 degrees of freedom and a significance level of 0.000. The p-value, being less than 0.05, signifies that the data deviates from a normal distribution in a statistically significant manner.

Consequently, non-parametric statistical methods were chosen for variable analysis to guarantee the validity and reliability of the results, due to the inability to satisfy the normalcy assumption.

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3. Results

3.1 Presentation and Interpretation of the First Hypothesis

Table.6. Wilcoxon Signed-Rank Test for a Single Sample Measuring the Use of ICT in Learning among Participants

Measure	Sample Size	Hypothetical Median	Calculated Median	Wilcoxon Test
ICT Use	290	36	40	33571.50

Std. Error	Z-value	Sig.	Decision
1383.376	9.641	0.000	Statistically significant

Source: (Prepared by the researchers)

The findings indicate that the computed median (40.00) exceeds the theoretical median (36.00), which signifies the neutral position on the three-point Likert scale employed in the survey. The elevated median signifies a prevailing inclination among respondents to assess the application of ICT in education favorably.

The Wilcoxon signed-rank test for a single sample was employed to assess the disparity between the observed and expected medians. The test statistic ($W = 33571.50$) and the elevated Z-value (9.641) signify a substantial positive divergence from the theoretical median. The p-value (0.000) is significantly lower than the threshold of 0.05, signifying that the observed difference is statistically significant.

Consequently, the null hypothesis is dismissed in support of the alternative hypothesis, indicating a statistically significant difference favoring the observed median. This indicates a favorable view among students toward the utilization of ICT in their educational process

3.2-Presentation and Interpretation of the Second Hypothesis

Table.7. Ranking of ICT Usage Dimensions in Learning Among Participants (Educational Videos, Platforms, Smartphone Apps)

Measure	Gender	N	Mean Rank	Mann-Whitney U
ICT Use	Male	126	131.25	12127.00
	Female	164	156.45	

Source: (Prepared by the researchers)

Table (07) demonstrates that the aspects of ICT utilization among high school students vary regarding choice and dependence in facilitating the learning process.

Educational videos had the highest ranking, with a mean of 2.37 and a standard deviation of 0.34, signifying a consensus among students regarding their efficacy in improving understanding and self-assessment. This may result from the visual and auditory elements that facilitate comprehension, as highlighted in prior research (e.g., Fayda-Kinik & Cetin, 2023).

Smartphone applications ranked second with a mean score of 2.31, classified within the neutral category. This indicates moderate utilization, perhaps for research and communication, however not fully incorporated pedagogically.

Educational platforms were placed third, exhibiting a mean of 2.09 and a standard deviation of 0.39, both falling within the neutral range. This may indicate restricted utilization, access difficulties, or inadequate instructional support in properly employing such platforms.

Table.8. Gender Differences in the Use of ICT in Learning Based on the Mann-Whitney U Test

ICT Mode	Mean	Std. Deviation	Category	Rank
Educational Platforms	2.09	0.39	Neutral	Third
Smartphone Applications	2.31	0.34	Neutral	Second
Educational Videos	2.37	0.34	Agree	First

Source: (Prepared by the researchers)

3.3 Presentation and Interpretation of the Third Hypothesis

The findings in Table (08) reveal statistically significant disparities in the utilization of ICT in education between male and female students, as demonstrated by the Mann-Whitney U test.

Female students (N=164) exhibited a higher mean rank (156.45) compared to male students (N=126), who recorded a mean rank of 131.25, indicating that females are more inclined to utilize ICT resources in their educational pursuits.

The distinction is further corroborated by a Z-value of 2.542 and a p-value of 0.011, which is beneath the conventional significance threshold of 0.05. This signifies that the disparity is not attributable to chance, but rather demonstrates a genuine trend within the sample, underscoring a heightened propensity among female students to include ICT tools into their scholastic pursuits.

Table.9.Kruskal Wallis Test for Differences in ICT Use Across Grade Levels

	Grade Level	N	Mean Rank
ICT Use	1st Year	97	145.62
	2nd Year	103	155.80
	3rd Year	90	133.59
	Total	290	
df	Chi-square (χ^2)	Sig.	
2	3.386	0.184	

The Kruskal–Wallis test was employed to assess variations in ICT utilization among three high school grade levels.

Despite obvious changes in mean rankings, with 2nd-year students achieving the highest score (155.80), followed by 1st-year students (145.62), and 3rd-year students earning the lowest (133.59), these differences lacked statistical significance.

The chi-square statistic ($\chi^2 = 3.386$) with 2 degrees of freedom produced a p-value of 0.184, surpassing the 0.05 significance level. This suggests that the observed discrepancies may result from random variation, and no statistically significant differences in ICT usage attributable to grade level were identified.

3.4 Discussion:

The initial hypothesis revealed that the Wilcoxon signed-rank test findings for a single sample indicated that the computed median (40) exceeded the theoretical median (36), accompanied by a highly significant p-value (0.000). This unequivocally demonstrates a favorable disposition among students about the

utilization of Information and Communication Technology (ICT) to enhance their learning.

This discovery can be understood in the context of the research conducted by Fayda-Kinik & Cetin (2023), which established that students' favorable dispositions towards educational technology correlate with improved understanding and performance, particularly when content is presented via multimedia formats. This is consistent with the findings of Qazi et al. (2021) and Courtney et al. (2023), which emphasized that learners' perceived efficacy of technology significantly influences their involvement in digital learning.

Conversely, notwithstanding the challenges identified by Ammouden (2022) concerning the restricted application of technology in educational settings, the present findings indicate an increasing recognition among students of the significance of digital tools, signifying a gradual cultural transformation in education towards enhanced receptivity to digital media.

The incorporation of ICT in education has transitioned from being a luxury or an optional trend to an essential requirement imposed by both global and local educational circumstances. As reliance on digital media grows, it is crucial to examine the level of engagement among high school students in this digital transition and the amount to which they utilize these resources to develop knowledge and enhance academic performance.

The statistics indicate that students increasingly view technology tools as

effective instruments for enhancing their academic progress. This is seen in their pronounced preference for utilizing applications, educational videos, and digital platforms as alternatives or enhancements to conventional teaching techniques.

This increasing engagement is not solely a reaction to the pandemic or academic pressure; it appears to signify a transformation in students' cognitive frameworks, as technology is now regarded as a valid educational medium with significant effects on comprehension, revision, and time management.

This overarching perspective, bolstered by trends in digital pedagogy, emphasizes the necessity of perceiving students not solely as passive recipients of digital resources, but as engaged collaborators in their effective utilization. This facilitates a reevaluation of conventional educational roles and a reassessment of the equilibrium among instructor, student, and technology medium.

The results of the mean scores for the second hypothesis reveal that educational videos rated first, followed by smartphone applications, with educational platforms in the lowest position. This indicates a distinct student inclination for audiovisual media.

This discovery aligns with Fayda-Kinik & Cetin (2023), who highlighted the efficacy of instructional videos in elucidating concepts and facilitating self-directed learning, especially for visual and auditory learners. This corresponds with local trends identified by Ammouden (2022), who indicated that films are the predominant technology tool utilized in

Algerian secondary schools due to their accessibility and user-friendliness.

The low ranking of educational platforms may be attributed to several challenges, including access issues, limited interactivity, and unclear instructional strategies, as noted by Guemide & Benachaiba, who emphasized the inadequate training of teachers in effectively employing digital platforms.

The results indicate an immediate necessity to reevaluate tactics for engaging educational platforms and to provide teachers with retraining for their successful and interactive utilization, while also considering students' preferences for certain formats and technologies.

Contemporary trends, corroborated by educational literature, indicate that certain digital media are more appealing to pupils than others. This attraction may arise from psychological elements like as visual stimulation or pragmatic considerations like user-friendliness and the capacity to review and reiterate information.

A certain structure, commonly linked to visual and aural information, is clearly favored by students, likely due to its compatibility with their contemporary learning preferences, which are marked by swift pacing and immediate involvement. Conversely, alternative digital tools may remain available but are utilized to a diminished extent, potentially owing to intricate access or inadequate infrastructure.

This variety in preferences not only reflects learner inclinations but also offers critical insights into how the characteristics of each media influence its perceived efficacy. It urges instructors to implement selected and adaptable techniques for

incorporating these technologies into the classroom.

The third hypothesis yielded findings from the Mann–Whitney test indicating statistically significant differences favoring female students, with a mean rank of 156.45 versus 131.25 for males, and a p-value of 0.011.

This corresponds with Qazi et al. (2021), who identified gender disparities in attitudes and technology usage, but not all differences reached statistical significance. Ammouden (2022) also corroborates this, noting that females exhibited a greater propensity for utilizing digital media for educational objectives, whilst males preferred entertainment-focused usage.

This phenomenon can be attributed to the observation that female students frequently demonstrate greater academic discipline and are more inclined to utilize technology as an educational resource rather than for leisure—particularly in sociocultural environments where girls' mobility outside the home is restricted, rendering digital technology their principal access to knowledge.

These findings highlight the necessity of accounting for gender-based disparities in the design of digital learning activities. instructional resources must cater to the requirements of both genders, while fostering a harmonious combination of instructional and recreational technological applications.

The fourth hypothesis indicated that the Kruskal Wallis test revealed a variation in average rankings among grade levels, with second-year students achieving the highest score (155.80), followed by first-year (145.62) and third-year (133.59);

however, these variations were not statistically significant ($\text{Sig} = 0.184$).

This negligible variation indicates that disparities in ICT usage are not inherently determined by grade level, but may instead be affected by factors such as prior experiences, instructional quality, or teacher encouragement, as observed by Courtney et al. (2023) and Sultana & Hasan.

The comparatively limited utilization of ICT by third-year students can be ascribed to the demands of national test preparation, prompting a preference for conventional, dependable resources, while second-year students appear more inclined to engage with digital tools consistently.

This finding suggests that the utilization of ICT in education is not exclusively contingent upon age or grade, but is predominantly affected by the quality of training and institutional motivation, indicating the necessity to customize digital integration strategies to the distinct characteristics of each grade level.

4.conclusion

The data and discussions indicate that the integration of ICT in Algerian secondary education has progressed from sporadic usage to a significant trend, signifying a transformation in educational interactions and students' perceptions of digital media as effective learning instruments. Students now exhibit a heightened awareness of the use and efficacy of these technologies, signifying a transition from passive recipients to

active contributors in molding their educational experience.

Significantly, students' utilization of technology beyond simple access to gadgets; it entails deliberate, organized engagement with digital resources to improve learning outcomes and content involvement. This transition necessitates a re-evaluation of the educational system, ensuring that conventional teaching roles enhance technological capabilities, thereby fostering a more adaptable and versatile learning environment tailored to varied learner requirements and cognitive preferences.

Moreover, the documented individual variances (e.g., gender and grade level) underscore the necessity of integrating differentiation into

educational planning—encompassing digital content, interaction modalities, or learning activities. Resolving these discrepancies would enhance the efficient amalgamation of digital material and guarantee equilibrium between technical and pedagogical aspects.

Consequently, it is essential to cultivate a digital school culture rooted in the responsible and informed utilization of ICT. This necessitates equipping both students and educators with vital digital skills and supplying the requisite technical and pedagogical infrastructure to fully leverage ICT in improving the quality of teaching and learning.

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Appendices

Ministry of Higher Education and Scientific Research

University of Bouzaréah **Algeria 01**

Faculty of Social Sciences

Department of Psychology, Educational Sciences, and Speech Therapy

Study Module

As part of a study entitled "The Reality of Using Information and Communication Technologies in Supporting the Educational Process Among Secondary School Students," a field study conducted at Abu Bakr Al-Hajj Issa Secondary School in Laghouat, and in fulfillment of the requirements for obtaining a PhD in Educational Sciences, University of Bouzaréah - I am pleased, dear student, that you participate with us in this For scientific purposes, we kindly request that you answer the statements in this scale by placing an (X) next to the appropriate statement. Please note that your answers will be treated with strict scientific confidentiality and will not be used for scientific research purposes. Prepared by:

Farida Benzitouna

Questions The Reality of Using Information and Communication Technologies in Supporting the Educational Process Among Secondary School Students

First Axis: Personal Data

Gender : Male : ☐ Female : ☐

Secondary Level : First Year ☐ Second Year ☐ Third Year ☐

The second axis: Study variables

No	Axis
	Educational Platforms
1	Educational platforms give me all exercise solutions.
2	I prefer educational platforms to expensive private instruction.
3	Platforms save me time and effort in school
4	Educational platforms improved my grades.
5	I prefer my teacher's explanations over educational platforms
6	Lack of interaction and discourse in education makes emotional connection impossible.
	Smartphone Applications
7	It aids my research and communication with educators and colleagues.
8	When tired, I take pictures and download lessons
9	It makes me less interested in learning.
10	Simple and lighter than my schoolbag, which tires me
11	Its apps help me with schoolwork
12	Blackboard doodles and wall posters lack its colorful visuals.
13	Its fundamentals are simple and easy to learn.

	Educational Videos
14	Professional graphics improve scientific communication.
15	Replays important chunks, pauses, and controls watching time.
16	Durable impact helps me remember my lectures.
17	I can share it with my classmates anytime, anywhere.
18	My instructor recommends it when class time is insufficient to complete the material