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ACHIEVEMENT TEST IN ARABIC LANGUAGE USING PAPER-BASED AND ELECTRONIC TESTING FORMATS: THE CASE OF FIRST-YEAR STUDENTS OF SECONDARY EDUCATION, HUMANITIES COMMON CORE

الاختبار التّحصيليّ في مادّة اللّغة العربيّة بين النّمطين الورقيّ والإلكترونيّ
السّنة الأولى من التّعليم الثّانويّ جذع مشترك آداب نموذجا

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ملخّص:

في ظلّ التّطوّر الرّقميّ المتسارع في مجال التّعليم، تهدف هذه الدّراسة إلى تسليط الضّوء على الاختبار الإلكترونيّ، باعتباره من أبرز الوسائل وأحدثها في عمليّة التّقويم. تُعنى هذه الدّراسة بتجربة هذا النّمط من الاختبار في مادّة اللّغة العربيّة بمرحلة التّعليم الثّانويّ، من أجل مقارنته بالاختبار الورقيّ؛ لتحديد إيجابيّاته وسلبيّاته وكذا فاعليّته في عمليّة التّقويم. واقتضت طبيعة الموضوع أن نتّبع المنهجين: الوصفيّ؛ لإيضاح خطوات إعداد الاختبار الإلكترونيّ، والتّجريبيّ؛ لتطبيق الدّراسة الميدانيّة، والّتي أُجريت على عيّنة قوامها أربعون متعلّما من السّنة الأولى من مرحلة التّعليم الثّانويّ جذع مشترك آداب، قُسّمت إلى مجموعتين: مجموعة تجريبيّة أدّت الاختبار الإلكترونيّ، ومجموعة ضابطة أجرت الاختبار الورقيّ، وذلك قصد التّحقّق ميدانيّا من مدى فاعليّة الاختبار الإلكترونيّ، من خلال مقارنة نتائجه بنتائج الاختبار الورقيّ.

ومن أهمّ النّتائج الّتي خلصت إليها الدّراسة: أنّ تنوّع الأسئلة والوسائط في الاختبار الإلكترونيّ يُسهم في تسهيل تقويم مهارات اللّغة العربيّة المتعدّدة، وأنّ الاختبارات الإلكترونيّة تحظى بتفاعل إيجابيّ من قبل المتعلّمين. كما سُجّل تحسّن نسبيّ في نتائج المتعلّمين الّذين أدّوا الاختبار الإلكترونيّ مقارنة بالّذين أدّوا الاختبار الورقيّ، غير أنّ الفرق بين نتائج المجموعتين لم يبلغ مستوى الدّلالة الإحصائيّة. وإلى جانب ذلك رصدت الدّراسة جملة من التّحدّيات الّتي تواجه استخدام هذا النّمط من الاختبارات في مرحلة التّعليم الثّانويّ.

الكلمات المفتاحيّة:

الاختبار الإلكترونيّ؛ اللّغة العربيّة؛ مرحلة التّعليم الثّانويّ.

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Abstract:

Electronic testing is becoming increasingly common in education due to rapid technological advancements. This study aimed to compare electronic testing with paper-based testing in the Arabic language subject at the secondary education level in order to identify the advantages, disadvantages, and effectiveness of electronic testing as a modern assessment tool. The nature of the study required the adoption of both descriptive and experimental methods. The descriptive method was used to explain the procedures for preparing the electronic test, whereas the experimental method was employed to conduct the field study. A sample of 40 first-year secondary school students in the Humanities Common Core participated in the study. The sample was divided into an experimental group of 20 students, who took the electronic test, and a control group of 20 students, who took the equivalent paper-based test.

The results of the two groups were then compared to determine the effectiveness of electronic testing and examine its effect on students' academic achievement. The findings showed that the variety of question formats, media options, and capabilities present in electronic assessments is conducive to assessing numerous Arabic language abilities. Students demonstrated enthusiasm toward using electronic assessments; additionally, a relative improvement was observed in their results compared with those of students who used paper-based testing. However, the difference in performance between the two groups was not statistically significant. The study identified barriers that can potentially limit the widespread implementation of electronic assessments in secondary education.

Keywords:

Arabic language; electronic testing; secondary education.

1. INTRODUCTION

The importance of technology in our current era is increasing across various fields of human activity, due to the advanced digital tools and techniques it provides. It has become essential to integrate modern technological tools into the teaching and learning process to enhance its effectiveness and make it better suited to the demands of the contemporary era. This trend became particularly evident during the COVID-19 pandemic, when distance learning was imposed as a necessary alternative to ensure the continuity of education. This shift led to a qualitative transformation in pedagogical practices, reflected in the expanded use of digital platforms, virtual classrooms, and electronic assessment tools.

Distance learning is no longer associated solely with exceptional circumstances; it has become a strategic educational option that complements and supports face-to-face instruction, due to its flexibility and ability to accommodate individual differences and meet students' diverse needs. In this context, educational assessment has evolved significantly alongside advances in educational technology, particularly artificial intelligence. Numerous programs and platforms have emerged that allow the creation, management, and automated grading of electronic tests according to well-defined criteria, providing immediate feedback and enabling more precise analysis of students' performance and results. This makes electronic testing a suitable option that aligns with the characteristics of the contemporary educational environment.

Building on this context, the present study examines the extent to which electronic testing is effective in the assessment process for the Arabic language subject, given the importance of this subject within the Algerian educational system, particularly at the secondary level in literary streams. The first year of secondary education, Humanities Common Core, was selected as the model for the study because a considerable proportion of students at this level experience difficulties with paper-based achievement tests in Arabic, as observed in classroom practice. Moreover, this subject has the highest coefficient among the subjects they study. This level is also considered suitable for the use of electronic testing, given students' ability to interact with the digital environment.

Based on the above, this study aims to address a central question: Does electronic testing contribute to improving the assessment process in the Arabic language for first-year secondary students in the Humanities Common Core, compared to paper-based testing? This question raises the following sub-questions:

-How can the transition from paper-based to electronic testing be implemented in the Arabic language subject for first-year secondary students in the Humanities Common Core?

-What are the advantages and disadvantages of electronic testing compared to paper-based testing in the subject of Arabic at the secondary education level?

-What is the effect of electronic testing, compared with paper-based testing, on students' academic achievement outcomes in the Arabic language subject in the first year of secondary education, Humanities Common Core?

-Does electronic testing contribute to reducing the level of test-related anxiety among students?

The significance of this study lies in its theoretical and practical dimensions. From a theoretical perspective, it contributes to enriching the literature on electronic assessment at the secondary education level, particularly in the subject of Arabic. From a practical perspective, its findings offer concrete indicators that may assist teachers in developing their assessment practices and support educational institutions in making evidence-based decisions regarding the adoption of electronic testing alongside paper-based examinations.

This study aims to present the necessary steps for designing and implementing an electronic test in secondary education institutions. It also seeks to highlight the advantages of electronic testing in the Arabic language for first-year secondary students, as well as to identify the challenges facing the implementation of electronic testing systems at the institutional level. Furthermore, the study extends to

examining the effect of test mode (electronic vs. paper-based) on the academic achievement outcomes of first-year secondary students in Arabic, and exploring the extent of their acceptance of electronic testing compared with paper-based testing, with the aim of determining the effect of electronic testing on the quality of the assessment process.

To achieve these objectives, the study was conducted within the framework of two complementary approaches. The first is the descriptive approach, which was used to present the stages of designing both paper-based and electronic tests, while highlighting the main advantages and disadvantages of electronic testing. The second is the experimental approach, which was adopted to examine the effect of test mode (electronic vs. paper-based) on academic achievement outcomes among first-year secondary students in the Humanities Common Core in the subject of Arabic.

Based on this, the study is organized into an introduction and two main parts: a theoretical part and a practical part. The theoretical part examines the concept of assessment and the procedures for developing an achievement test in Arabic for first-year secondary students in the Humanities Common Core. It further explores the concept of electronic testing, including its characteristics, design stages, advantages, and the major challenges associated with its implementation. The practical part, in turn, outlines the procedures of the field study aimed at measuring the effect of test mode (electronic vs. paper-based) on students' academic achievement outcomes. It also presents and analyzes the findings. The study concludes with the main results and recommendations.

2. Literature Review

2.1- Electronic Testing Studies

This section reviews studies that compared electronic and paper-based tests and discusses their findings to clarify the contribution that the present study seeks to make.

Some studies have reported improved attitudes toward electronic testing after students experienced it (Alkhezzi and Zakari, 2011) and high levels of satisfaction, particularly because of immediate feedback (Nardi and Ranieri, 2019). In the same context, another study showed positive attitudes among students toward electronic testing; however, they reported some problems related to the structure of the electronic test, including errors in writing equations and limited time (Dammas, 2016). These findings highlight the importance of considering technical and pedagogical aspects when designing electronic tests and addressing difficulties associated with their use.

The positive findings also extended to academic achievement, as some studies reported better performance among students who took electronic tests than among those who took paper-based tests (Nardi and Ranieri, 2019). Statistically significant differences were also found in favor of the groups that used electronic tests (Abed, 2023; Tannoubi et al., 2026).

In contrast, no statistically significant differences in students' achievement were found between the paper-based and electronic tests when the two tests were similar in terms of content, presentation, and question organization (Millsap, 2000). Likewise, comparable achievement outcomes were reported despite improvements in students' attitudes toward electronic testing (Alkhezzi and Zakari, 2011), indicating that students' acceptance of this mode is not necessarily accompanied by higher scores.

Some studies add another dimension to the comparison. German ninth-grade students reported investing less effort in computer-based tests than in paper-based tests (Weirich et al., 2024). In another study in the university context, no statistically significant differences in performance were found, although students taking electronic exams perceived them as less difficult and reported investing less effort (Hoch et al., 2025). Thus, examining the effectiveness of electronic testing involves not only achievement outcomes but also students' experiences during assessment.

It is evident from this comparison that electronic tests may offer advantages that students value compared with paper-based tests and may be associated with improved academic achievement in some contexts, whereas no statistically significant differences in academic achievement were observed in other contexts. This highlights the need to examine the effectiveness of electronic testing in light of the nature of the academic subjects, educational levels, and the contexts in which it is implemented. Since the studies reviewed do not address the effect of test mode (electronic versus paper-based) on Arabic language academic achievement outcomes among first-year secondary students in the Humanities Common Core in Algeria, the present study addresses this issue and explores students' attitudes toward electronic testing. It also explains the procedures for converting a paper-based test into an electronic format, thereby combining experimental comparison with practical application.

2.2- The Concept of Assessment in the Arabic Language Curriculum for the First Year of Secondary Education

Assessment in the Arabic language curriculum is defined as a process aimed at determining the value of something, in addition to correcting or adjusting any of its deficiencies. Accordingly, the concept of assessment is broader and more comprehensive than that of evaluation. While evaluation involves assigning a value to something, assessment goes beyond merely determining its value; it also requires correcting and improving it after judgment. Assessment is generally categorized into three types (Curriculum Authoring Committee, 2005, pp. 37–40):

- Diagnostic assessment: This is conducted by the teacher at the beginning of the academic year or at the start of the teaching process in order to gather information about students' prior competencies and abilities, which serves as a basis for designing new learning experiences.
- Formative assessment: This is defined as the assessment process carried out by the teacher during instruction, aimed at monitoring students' progress, identifying their level of achievement, and determining their strengths and weaknesses in learning, thereby allowing for adjustments to the teaching process at all stages.
- Achievement assessment: This type of assessment takes place at the end of a lesson, a unit, a semester, or a learning stage. Its objectives include evaluating students' achievement and assessing curriculum efficacy and effectiveness.

The test is considered one of the most important tools in the assessment process. It is defined as a set of questions that the student is asked to answer, either in writing or orally (Gharib, 2006, p.937). It is an organized procedure to determine how much students have learned about a particular topic in light of specified objectives, and it is always associated with a specific subject that has been taught (Abu Aqil,2021,p.55). In some educational references, this type of test is referred to as an achievement test.

2.3- Steps for Preparing a Paper-Based Achievement Test in the Arabic Language for the First Year of Secondary Education, Humanities Common Core

This type of paper-based test, in which the student answers questions using paper and pen, is prepared through the following steps (Bissar, 2025):

2.3.1- Determining the Purpose of the Test

The purpose of the test is determined at the beginning of its preparation, whether it aims to identify students' areas of weakness to address them or to measure their academic achievement at the end of a semester or academic year (Bissar,2025,p.72).

2.3.2- Preparing the Test Specification Table

The test specification table is prepared to determine the number of test questions and the duration of the test based on the content of the subject to be assessed, as well as the objectives and competencies the teacher aims to evaluate. Bloom's Taxonomy of the cognitive domain can be used to design questions according to cognitive levels (e.g., remembering, understanding, applying, analyzing) (Bissar, 2025, pp. 77–81). The curriculum should also be consulted. Among the key specifications of a test according to the curriculum are that it measures competency indicators and that it encompasses different levels of competency within an integrated context.

2.3.3- Choosing the Types of Test Questions

The types of questions and their formulation are selected according to the objectives and competencies to be assessed (Bissar, 2025, p. 81). Accordingly, test questions should not focus solely on knowledge; the test should include a complex and meaningful situation for the student that takes into account their interests and enables them to apply their knowledge, skills, and various abilities. The questions should be able to distinguish between students who have met the competency indicators and those who have not (Curriculum Authoring Committee, 2005, pp. 39–40). Since Arabic language teaching at the secondary education level is conducted according to the text-based approach, the test must include a poetic or prose text, followed by a set of questions, such as short-answer and essay questions, as follows:

a) Questions for Studying the Intellectual Structure of the Text

These are precise, progressively structured questions related to the text, designed to assess the student's understanding of the text's intellectual and literary dimensions.

b) Questions for Studying the Linguistic Structure of the Text

These questions cover cohesion and coherence, grammatical and morphological features in relation to the text's intellectual structure, rhetorical devices in terms of their functions and aesthetic value, as well as prosodic features in poetic texts.

c) Integrative Situation

In this situation, the student is required to write a text on a given topic, following a set of instructions, with the aim of assessing a specific competency.

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2.3.4- Arrangement of Test Questions

Test questions are arranged according to a logical progression that takes into account the degree of difficulty and the level of competence. This progression begins with questions assessing the level of knowledge, followed by comprehension questions, then application questions, before advancing to higher-order cognitive levels such as analysis, synthesis, and evaluation (Bissar, 2025, pp. 81–82).

2.3.5- Formulation of Test Instructions

Clear test instructions are formulated, specifying the purpose of the test, the institution responsible for its preparation, the time allocated for completion, the method of answering, and the distribution of marks (Bissar, 2025, p. 82).

2.3.6- Preparing the Test Answer Key

The answer key specifies the correct responses and marks allocated to each response, and a separate response sheet is prepared when needed (Bissar, 2025,p.83).

2.3.7- Drafting the Test in Its Initial Form and Submitting It to Specialists

The test is printed in its preliminary form to verify its clarity, linguistic accuracy, and alignment with the objectives and competencies, and is then submitted to Arabic language specialists for review before implementation (Bissar, 2025, p.83).

2.3.8- Finalizing the Test

The test is printed for administration to students, with the print quality carefully ensured so that they can read it easily (Bissar, 2025, p. 84).

2.4- Electronic Test: Concept and Characteristics

2.4.1- Concept of the Electronic Test

An electronic test is one that is administered using a computer or any other electronic device. It may include various questions, such as multiple-choice, true/false, fill-in-the-blank, and essay questions. The scoring of this type of test may be automated or manual, depending on the nature of the questions (Chatzipetrou et al., 2023, p.70).

2.4.2- Characteristics of the Electronic Test

The electronic test is characterized by several features, the most important of which are ease and flexibility in design, implementation, and grading. It allows for a variety of questions and the use of multimedia. It also enables precise control over response time، provides feedback to students, stores results, analyzes performance, and can be administered anytime and anywhere (Al-Fakhri, 2018, p. 136).

2.5- Stages of Designing an Electronic Test According to the ADDIE Model

To transform a paper-based test into an electronic one, it is necessary to rely on one of the instructional design models, as they are systematic frameworks used in planning, implementing, and evaluating the teaching–learning process, ensuring the organized and effective integration of digital technologies. Instructional design models vary; among the most prominent are the Dick and Carey Model, Gagné's Model, the Kemp Model, the ASSURE Model, and the SAM Model (Almekhlafi, 2022, pp. 22–32). However, the ADDIE model is considered one of the most common and widely used models in the field of designing electronic educational resources and tools (Ameen and Abdel-Azim, 2018, pp. 117–123).

In light of this, the ADDIE model was adopted in this study for designing the electronic test due to its simplicity, comprehensiveness, and flexibility, which make it suitable for constructing assessment and evaluation tools. Accordingly, the summative test was initially developed in its paper-based form following the standard steps for constructing achievement tests in educational measurement and evaluation, while the ADDIE model was used as an organizational framework for the stages of constructing and implementing the electronic test, maintaining the same assessment principles and standards used in constructing the paper-based test.

The stages followed in designing the electronic test are outlined below:

2.5.1- Analysis Stage

In this stage, the characteristics of the students are analyzed, including their academic level and their ability to use computers, while ensuring the availability of necessary technical resources, particularly a computer-equipped room and a reliable internet connection. This stage also involves defining the purpose of the test and formulating the educational objectives and competencies to be assessed. Additionally, an analysis of the course content is conducted to identify the topics or instructional units on which the test will be based.

2.5.2- Design Stage

This stage involves planning the structure of the test, during which a test specification table is prepared, linking the course content to the targeted competencies and their indicators, while considering the distribution of questions across different cognitive levels based on Bloom's Taxonomy and the curriculum requirements, thereby ensuring that the test measures the extent to which students have achieved these competencies. At this stage, the types and number of test questions and the time allotted for completion are determined, the media to be used are identified, and the test scenario is designed. Additionally, the appropriate

software or platform for creating the test is chosen, such as Moodle, an open-source learning management system that provides advanced tools for creating electronic tests (Zayed, 2022, pp. 245–248).

Table 1. Method for Converting Arabic Language Test Questions from Paper-Based to Electronic Format for First-Year Secondary Education, Humanities Common Core.

Paper-Based Test Questions	***Electronic Test Questions***
Starting from the Text in the Test	Starting from the Text: The text is presented in the electronic test using an essay question.
Questions on Intellectual and Linguistic Structure: These are short-answer questions, and each can be answered with one or more sentences.	Questions on intellectual and linguistic structure are converted into various formats supported by the electronic testing environment, including multiple-choice questions, true/false questions, fill-in-the-blank questions, short-answer questions, drag-and-drop questions, matching questions, missing-word questions, as well as essay questions and questions incorporating images, audio, and video.
Integrative Situation	The integrative situation is presented in the electronic test as an essay-type question.

Source: Prepared by the authors.

2.5.3- Development Stage

This stage is concerned with implementing the approved test design and producing it in its final form. Test questions are formulated and entered into the Moodle platform according to the specified plan, with the inclusion of multimedia elements, such as images, to enhance question clarity. This stage also involves configuring the technical settings of the test, including specifying its title, administration date, and the time allotted for completion (Al al-Bayt University, E-Learning Center, n.d.). Font size and legibility should also be considered. Additionally, it is essential to ensure that the electronic test is equivalent to its paper-based counterpart in terms of content and difficulty level, to guarantee fair assessment and accurate results.

2.5.4- Implementation Stage

This stage involves conducting a pilot administration of the electronic test to familiarize students with the procedures for this type of test and to ensure their full understanding of its instructions. At this stage, computer-equipped testing facilities are also prepared to enable the electronic test to be administered.

2.5.5- Evaluation Stage

This stage aims to verify the quality and effectiveness of the electronic test and includes formative evaluation during the design and development stages to review the wording and presentation of the questions and revise them based on feedback from subject-matter and educational assessment experts. Summative evaluation is conducted after field administration of the test and is based on statistical analysis of the results and the views of students and experts.

2.6- Comparison Between the Electronic Test and the Paper-Based Test in the Arabic Language for First-Year Secondary Education, Humanities Common Core

This comparison is based on test characteristics and field observations.

2.6.1- Advantages of the Electronic Test Compared to the Paper-Based Test

Some of the key advantages of the electronic test are outlined below:

- Questions in the paper-based test are less varied, whereas the electronic test allows a wide range of question types, including true/false, multiple-choice, matching, and essay questions. It also allows the use of multimedia such as images, video, and audio. This makes the electronic test better suited to assessing Arabic language skills in secondary education than the paper-based test.
- Paper-based tests are conducted on paper, whereas electronic tests require the use of electronic devices such as computers, tablets, and smartphones, which helps students develop the skills needed to interact with modern technology.
- Taking the paper-based test entails physical presence at a specific time and place, as does the electronic test administered in computer-equipped institutions under teachers' supervision. However, electronic tests may also be taken remotely from any location and at any time using internet-connected devices, with students monitored via cameras to prevent cheating.
- Paper-based tests require manual grading, which is time-consuming and labor-intensive for teachers. In contrast, digital platforms such as Google Forms and Moodle allow electronic tests to be created and graded automatically and students' results to be analyzed. Although essay questions are generally not graded automatically, some AI-enabled programs now make this possible.

- Whole-class correction of the paper-based test with students is important, but overcrowding may prevent teachers from identifying all students' errors. Electronic grading provides immediate results and feedback, helping students address weaknesses and improve academic performance.

2.6.2- Challenges Faced by the Electronic Test Compared to the Paper-Based Test

The electronic test faces several challenges that may be regarded as drawbacks and limit its effectiveness, the most prominent of which are outlined below:

- Electronic tests require adequate digital devices, such as computers or tablets, and often require a stable internet connection, yet insufficient equipment and unstable connectivity may limit the possibility of conducting electronic tests.
- Compared to paper-based tests, electronic tests, particularly remote ones, carry a higher risk of cheating, which may affect the credibility of test results.
- Unlike paper-based tests, electronic tests may be difficult to adopt as achievement tests at the secondary education level because some teachers lack the competencies required to use modern digital technologies; in addition, students may encounter technical problems, such as hardware or software malfunctions (Mostafa, 2022, p. 294) and internet connectivity interruptions.

3. Materials and Methods

3.1- Research Design

The field study aims to determine the effect of electronic testing on the measurement of academic achievement in Arabic among first-year secondary education students in the Humanities Common Core, using an experimental method involving two groups: an experimental group and a control group. A pre-test was used. Subsequently, the results of the two groups on the post-test in its paper-based and electronic formats were compared, with the experimental group taking the electronic test and the control group taking the paper-based test. The effect size for test format was then calculated.

3.2- Research Sample

The study sample comprised 40 first-year secondary students in the Humanities Common Core who agreed to participate in the study and wrote their names on a list of participants. Based on this list, they were randomly assigned to two groups: an experimental group that took the electronic test (n = 20) and a control group that took the paper-based test (n = 20).

Table 2. Distribution of Sample Members by Gender in the Control and Experimental Groups.

Group	Males	Percentage	Females	Percentage	Total
Control Group	8	40%	12	60%	20
Experimental Group	3	15%	17	85%	20

Source: Prepared by the authors.

Females predominated in both groups, accounting for 60% of the control group and 85% of the experimental group. All students' identities remained confidential.

3.3- Data Collection Instruments

This study employed a paper-based pre-test and a post-test in two formats, paper-based and electronic, in the Arabic language subject for first-year secondary school students in the Humanities Common Core:

3.3.1- Pre-Test

The pre-test consisted of the end-of-second-semester summative assessment, designed to measure students' acquired knowledge. This test was selected because it comprehensively covers the various competencies targeted during the semester, making it a suitable tool for objectively assessing students' initial levels.

3.3.2- Post-Test in Both Paper and Electronic Formats

a) Post-Test (Paper Format)

The post-test in its paper format was used as part of the summative assessment for the second semester. It was designed according to the curriculum to measure the competencies related to the second theme of the program, entitled "Literature of the Early Islamic Period." The test included a poem from battle poetry, followed by short-answer and essay questions: six questions on the intellectual structure of the text, one on literary criticism, and seven questions on the linguistic structure of the text. The test concluded with an integrative situation requiring the student to produce a written text. The test duration was set at two hours, and the total score was set at 20 points.

b) Post-Test (Electronic Format)

The same paper-based post-test was converted into an electronic format on the Moodle platform, based on what was previously presented in the theoretical framework, to ensure comparability between the paper-based and electronic formats of the post-test. The question formats in the electronic test were varied to include multiple-choice, short-answer, missing-word, drag-and-drop, and essay questions. The electronic test also allowed the inclusion of images, the setting of a time limit, and the provision of feedback and results. After taking the electronic test, students in

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the experimental group responded to a brief evaluation questionnaire, which was used as a supplementary descriptive tool to evaluate the electronic test from the students' perspective and was not treated as an independent research instrument.

3.4- Validity and Reliability of the Instrument

Regarding the validity of the instrument, there was no need to submit the pre-test for expert review, as it was an achievement test officially adopted within the school assessment system. The post-test, however, was reviewed by a group of experienced Arabic language teachers to ensure its alignment with the targeted competencies, the clarity of its questions, and the accuracy of its content. The suggested modifications were then incorporated before the test was finalized.

To enhance procedural reliability, the administration conditions of the post-test in both paper and electronic formats were standardized in terms of duration, instructions, and scoring criteria, with the same total score applied to both formats.

3.5- Implementation Procedures

The field study was conducted at a public secondary school administered by the Directorate of Education for Algiers West, Algeria, during the final weeks of the second semester of the 2023–2024 academic year. The second-semester achievement test was used as a paper-based pre-test for both the control and experimental groups and was administered on March 4, 2024. On March 11, 2024, the experimental group attended a training session in the school's computer lab to learn how to access and use the Moodle platform. During this session, the students completed a pilot electronic test to become familiar with the testing procedures.

Subsequently, the achievement post-test was administered on March 18, 2024, in both paper-based and electronic formats. The control group took the paper-based test in the classroom, while the experimental group took the electronic test in the computer lab. Both tests began at 10:00 a.m., lasted two hours, and were administered under teachers' supervision. The content and difficulty level were standardized across the two formats of the post-test to ensure comparability between them. The students' responses were then scored, and the results were collected for statistical analysis.

3.6- Statistical Methods Used

SPSS was used to calculate arithmetic means and to perform independent-samples t-tests to identify differences between the results of the experimental and control groups in the pre-test and post-test. The effect size (η^2) was also calculated to estimate the effect of the electronic test on students' outcomes. To assess the effect of test format more precisely, analysis of covariance (ANCOVA) was conducted.

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4. Results and Discussion

4.1- Students' Pre-Test Results

Table 3. Independent-Samples t-test Results for the Pre-Test in the Control and Experimental Groups.

Group	Number	Arithmetic Mean	Standard Deviation	t-test	Sig (bilateral)
Control Group	20	7.05	1.27	-1.54	0.13
Experimental Group	20	7.93	2.20		

Source: Prepared by the authors based on SPSS output.

An independent-samples t-test was used to compare the scores of the control and experimental groups in the pre-test. The results showed that the control group had a mean score of 7.05 with a standard deviation of 1.27, while the experimental group had a mean score of 7.93 with a standard deviation of 2.20. The significance value was Sig = 0.13, which is greater than the conventional significance level ($\alpha = 0.05$). This indicates that there is no statistically significant difference between the mean scores of the control and experimental groups, suggesting comparable baseline performance.

4.2- Students' Results in the Post-Test

Table 4. Independent-Samples t-test Results Comparing the Mean Scores of the Control and Experimental Groups on the Post-Test.

Group	Number	Arithmetic Mean	Standard Deviation	t-test	Sig (bilateral)
Control Group	20	7.10	2.38	-1.92	0.06
Experimental Group	20	8.55	2.41		

Source: Prepared by the authors based on SPSS output.

Table 4 shows that the use of the electronic test did not produce a statistically significant difference in academic achievement compared to the paper-based test, despite a difference in mean scores favoring the experimental group. The control group had a mean score of 7.10 with a standard deviation of 2.38, while the experimental group had a mean score of 8.55 with a standard deviation of 2.41. The independent-samples t-test results indicate a significance value of Sig = 0.06, which is higher than the conventional significance level (0.05). This suggests that there is no statistically significant difference between the mean scores of the two groups in the post-test.

4.3- The Effect of Test Mode (Electronic vs. Paper-Based) on First-Year Secondary Students' Post-Test Results in Arabic in the Humanities Common Core and Electronic Test Takers' Perceptions of Test-Related Anxiety.

4.3.1- Effect Size of Test Mode (Electronic vs. Paper-Based) on the Post-Test Results of the Control and Experimental Groups Before Controlling for Pre-Test Scores (η^2)

To estimate the effect of test mode on the results of the control and experimental groups in the post-test, with the control group taking the paper-based post-test and the experimental group taking the electronic post-test, eta squared (η^2) was calculated as a measure of effect size using the following formula (Bouthi, 2019, pp. 278–279): $\eta^2 = \frac{t^2}{t^2+df}$ (1)، where eta squared (η^2) represents the effect size, *t* represents the independent-samples *t*-test value, and *df* represents the degrees of freedom. In the present study, the post-test *t*-value ($t = -1.92$) and $df = 38$ were substituted into Eq. (1)، yielding an eta-squared value of 0.09. This value exceeds the threshold of 0.06 and indicates that the effect size of test mode for the difference in post-test scores between the two groups was moderate before controlling for pre-test scores.

4.3.2- Effect Size of Test Mode (Electronic vs. Paper-Based) on the Post-Test Results of the Control and Experimental Groups After Controlling for Pre-Test Scores ($\eta\square^2$)

To further examine the effect of test mode on the post-test results of the control and experimental groups, while controlling for the pre-test results, an analysis of covariance (ANCOVA) was conducted using SPSS. The partial eta-squared value was $\eta\square^2 = 0.03$, which was numerically lower than the eta-squared value calculated before controlling for the pre-test results ($\eta^2 = 0.09$), indicating that the effect of test mode on students' post-test results was relatively limited after controlling for pre-test scores.

4.3.3- Discussion of the Effect of Test Mode (Electronic vs. Paper-Based) on Students' Post-Test Results and Electronic Test Takers' Perceptions of Test-Related Anxiety

The control group's mean score increased from 7.05 in the pre-test to 7.10 in the post-test, while the experimental group's mean score increased from 7.93 to 8.55. These findings suggest that the electronic mode of the post-test may have contributed to a relative improvement in students' results, although the effect size of test mode (electronic vs. paper-based) was relatively limited after controlling for pre-test

scores, as reflected by the low value ($\eta^2 = 0.03$). Although the experimental group had a higher mean score than the control group in the post-test, the difference between the two groups' results did not reach statistical significance. The closeness of the two groups' results may be attributable to the standardization of the electronic and paper-based formats of the post-test in terms of content and difficulty level.

This finding is consistent with previous studies (Millsap, 2000; Alkhezzi & Zakari, 2011), which reported no statistically significant differences in academic achievement between students who took the electronic test and those who took the paper-based test when the two tests were standardized in terms of content and difficulty level, testing time was controlled, and stable technical infrastructure was provided. These findings suggest that differences in academic achievement between students taking paper-based tests and those taking electronic tests, when they occur, may not be attributable solely to the test format, whether electronic or paper-based, but may also be associated with other factors, including test content, level of difficulty, administration conditions, and the educational context in which the tests are administered. Among the studies that have also reported no statistically significant differences in performance between the electronic and paper-based testing formats is a recent study (Hoch et al., 2025).

Although the difference between the results of the control and experimental groups in the post-test did not reach statistical significance, the relative improvement observed in the results of the experimental group that took the electronic test may be associated with the high levels of interest and interaction demonstrated by the students while taking the electronic test compared with those observed among students who took the paper-based test. The interactive nature of the electronic test, including its digital features, multimedia elements, and variety of question formats, may also have contributed to creating a more engaging and motivating assessment environment. This interpretation is also supported by the results of the questionnaire given to the students to identify their level of satisfaction with this testing format; students expressed a preference for the electronic test and reported feeling more comfortable and less anxious when taking it. Students' perceptions suggest that the electronic test, given the advantages it offers, may contribute to reducing test-related anxiety.

5. Conclusion

This study yielded a set of findings that contributed to addressing the main research problem and its related sub-questions. The findings indicated that the electronic test may contribute, to a certain extent, to improving the assessment process in the Arabic language subject among first-year secondary school students in the Humanities Common Core compared with the paper-based test.

The transition from the paper-based test to the electronic test was carried out through a series of methodological steps, most notably the adoption of an appropriate instructional design model, such as the ADDIE model, and the selection of suitable software for creating electronic tests, such as the Moodle platform. The process also incorporated the established steps for preparing a summative achievement test and took into account the specific characteristics of electronic assessment.

The findings also indicated that the electronic test offers several advantages in the assessment process for the Arabic language subject among first-year secondary school students. It accommodates individual differences among students and responds to their preferences and interests through a variety of question types and multimedia elements. Additionally, it provides immediate feedback on their responses. However, the use of the electronic test faces several challenges, foremost among which is inadequate technical infrastructure, which may limit its use as a complete alternative to paper-based testing in secondary education.

The results of the field study showed that the effect of test mode (electronic vs. paper-based) on first-year secondary students' post-test results in Arabic in the Humanities Common Core was relatively limited, as reflected by the low partial eta-squared value ($\eta^2 = 0.03$). In addition, the difference between the results of the group that took the paper-based post-test and those of the group that took the electronic post-test did not reach statistical significance, despite the relative improvement in the electronic test group's results. Alongside this, students expressed appreciation for the electronic test after experiencing it and reported feeling less anxious while taking it. These findings highlight the importance of electronic tests and the need to use them effectively and benefit from their advantages in the teaching and learning process, although this testing mode had a relatively limited effect on students' achievement.

Recommendations:

In light of the study findings, a set of recommendations is proposed to address the challenges associated with implementing electronic testing in secondary education, as follows:

- Providing internet access and electronic devices in educational institutions, enabling students to take electronic tests and promoting e-learning practices.
- Training teachers to design electronic tests and training students to use educational platforms and take this type of test.
- Conducting electronic tests within educational institutions while continuing to develop more efficient mechanisms to monitor and secure online assessments.
- Developing monitoring tools for electronic tests to enable these tests to be used as achievement tests characterized by reliability and accuracy.
- Using electronic tests as an additional support tool for learning Arabic among secondary education students, given the opportunities these tests provide for developing Arabic language skills.
- Designing paper-based tests using the electronic system, then scanning the answer sheets and uploading them back to the system for grading.

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Appendices

- ❒ URL for consulting the paper-based pre-test
  https://drive.google.com/file/d/19Q5LH0GfIu1sVAvNBbQyWtTRDWzXPEXr/view?usp=sharing
- ❒ URL for consulting the electronic post-test
  https://drive.google.com/file/d/1YxpsgOz8V4eHF3wyrQTvhukhk6PVTB68/view?usp=sharing
- ❒ URL for consulting the paper-based post-test
  https://drive.google.com/file/d/1PUXbZGnNMnj6oNQXf_S9FdHm2cDXKfmr/view?usp=sharing