



Employing Information Technology In Teaching Arabic To Non-Native Speakers: A Model At The Acoustic Level

Dr. Djamila Boussaid Doctor A, Djillali Liabes University Sidi Bel Abbès, Faculty of Arts Languages and Arts, Department of Arabic Language and Literature (Algeria),
boussaidjamila5@gmail.com

Received: 08/2023, Published: 09/2023

Abstract

In contemporary times, language education has made significant strides thanks to the integration of advanced scientific research into information and communication technology. This fusion of disciplines has hastened linguistic development and improved learning environments. This research investigates the automated processing aspect, focusing on the positive impact of computer utilization and its methods on educational progress. The study evaluates the efficacy of modern technological tools in effectively instructing Arabic to individuals of diverse language backgrounds, including both native and non-native speakers.

Key words: Technology, Learning, Arabic Language, Non-Native Speakers, Acoustic Analysis.

1. Introduction:

Information and communication technology (ICT) plays a vital role in benefiting humanity by introducing a range of effective tools and applications that improve communication, information exchange, and overall efficiency. The advancement and prosperity of nations are closely intertwined with their focus on scientific and technological advancements. As a result, staying aligned with scientific and technological progress and harnessing its innovations, particularly in education, becomes essential.

Education stands as a cornerstone of societies, and its evolution contributes significantly to the advancement and well-being of nations. Hence, it becomes imperative to embrace scientific and technological progress in education, utilizing them to modernize teaching methodologies and instructional resources. This transformation has a profound impact on learners' cognitive, behavioral, and social skills. The principal objective of integrating contemporary techniques and educational technology is to elevate the quality of the teaching and learning process and foster its advancement.

The scope of educational technology goes beyond the mere incorporation of modern machinery and devices; it encompasses the integration of software and applications

crafted under the influence of technology. Its evolution has shifted from being a supplementary element in the educational journey to becoming an essential component, actively contributing to setting high benchmarks for language education. This is especially evident in the realm of teaching Arabic to non-native speakers.

In our study, we aim to address the following questions:

- * What is the meaning of education, and what are its obstacles?
- * What are the key innovations in technology, and how can they be utilized in the field of education?
- * What are the programs and applications that assist in teaching Arabic language sounds to non-native speakers?

We have employed a descriptive-analytical approach, considering it as a method for practical studies. Through this approach, we highlight the significance of technological advancement and its effectiveness in the realm of language learning and teaching. Furthermore, we explore the pivotal role of information technology innovations in facilitating and enhancing the educational process, especially in teaching Arabic language sounds to non-native speakers.

2.The concept of education:

One of the most important fields of applied linguistics is concerned with researching language learning and teaching curricula, defining their methods, and identifying key skills in the teaching process. It focuses on "teaching content, including the selection and organization of knowledge, as well as understanding how to arrange it. It also deals with learners' relationships with this knowledge in terms of motivation, active and effective methods and strategies for acquiring, building, and applying it in life. This helps learners know what they are learning, how they know it, why they may face challenges in understanding it, and how to reconsider their correct path¹".

It involves constructing methodological knowledge and establishing effective bases for the educational and learning process within an interactive context between the teacher and the learner, resulting in numerous practical insights and achieved outcomes.

A- In linguistic terms: The term (educational) is used to express the act of teaching and learning. It is said, (I taught him something, so he learned). It is also used to convey the idea of acquiring knowledge and understanding in a specific subject². An example of this usage can be found in the statement of Allah the almighty:{" the most merciful taught the Quran; He created man, and He taught him eloquence³).

B- In terminological context: (educational) refers to the study of teaching methodologies and the development of techniques and approaches in education. It encompasses a collection of activities and knowledge that are employed for the purpose of preparing, organizing, evaluating, and enhancing the practice of education⁴.

3-Educational elements:

Disseminating knowledge is a multifaceted endeavor. The domain of education revolves around three fundamental avenues that intricately merge and interact to actualize educational endeavors: the instructor, the student, and the educational material or content. Moreover, an array of methods and strategies are employed to facilitate the efficacy of this process, encompassing both conventional and contemporary methodologies. This interplay encounters notable obstacles that necessitate overcoming for the process to thrive and realize its intended goals. These challenges can be outlined as follows:

3-1 The Educator: At the forefront of educational scrutiny lies the educator, a paramount and pivotal component that receives primary attention in every educational analysis aimed at bridging process disparities. Serving as the foundation of the educational journey, educators furnish learners with purposeful linguistic insights. Their role encompasses ensuring the caliber and potency of the linguistic wisdom they convey⁵.

3-2 The learner: Central to the educational endeavor is the student, occupying a pivotal role as the nucleus of the learning process. The learner engages with educational material or content disseminated by the educator or educational establishment. On occasions, learning takes on a self-directed nature, necessitating the learner's aptitude alongside the utilization of tools and educational software. Contemporary learning resources have acknowledged this aspect, ushering in an era where automation and machine assistance augment the learning journey.

3-3 Educational content: This category encompasses an amalgamation of resources, directives, knowledge, and encounters tailored for the learner's benefit, adhering to well-defined methodologies and curricula that harmonize with the educational tier. When considering the instruction of languages to individuals who are not native speakers, the journey frequently adopts a self-guided trajectory.

4- Obstacles to the Success of the Educational Process:

Dr. Nabil Ali discerned several factors contributing to the educational process's shortcomings from an informational stance. Key among these are a collection of causes and impediments, notably⁶:

- The multiple paths of education (educational duality/elitist education vs. general education).
- Discontinuation of education.
- Negativity among teachers.
- Ineffectiveness of scientific research.
- Erosion of society's trust in its educational institutions.
- Lack of localization of sciences.

To confront these obstacles impeding the establishment of a triumphant educational and learning paradigm, a compilation of vital directives has been put forth to enrich education in the era of information. These guiding principles are elucidated in the subsequent delineations⁷:

- Teacher: From being a mere transmitter to becoming an engaged facilitator.
- Shifting from emphasizing adults' education to accelerating children's development.
- Transitioning from narrow specialization to embracing diverse skills.
- Moving from directed learning to self-directed education.

Self-directed learning falls under the category of learning in which the learner takes an active and immediate role in the educational process through direct interaction with the educational material. The fertile ground in which the learner finds the freedom and flexibility to engage with the educational material is often provided by various electronic media. These platforms enable the learner to easily and quickly access information while maintaining the flexibility to interact with and discuss the content without being restricted by time, place, or rigid rules and regulations.

5. Using Computers in Arabic Language Processing:

Within the domain of educational technology, advancements in scientific research are harnessed to elevate the learning journey through "methodical strategizing, employing scientific methodologies and techniques to scrutinize educational challenges and requisites, identify fitting resolutions, and appraise the outcomes or accomplishments attained⁸".

This encompasses the utilization of diverse resources derived from both human expertise and mechanical capabilities, with the aim of enriching the caliber of educational encounters and effectively tackling educational hurdles.

In language education, computational linguistics, an interdisciplinary field that combines language and computers, strives to leverage the power of computers in serving language through automated processing. This is known as language description at various levels, or language engineering. It relies on data from several fields, including general linguistics across its analytical levels: phonetics, syntax, and semantics. It also draws from computer science, artificial intelligence, logic, and mathematics. All these branches harmonize and come together to form the principles of computational linguistics⁹.

This depiction unfolds through a series of phases, succinctly encapsulated within the process of transforming linguistic data across distinct linguistic tiers into digital formats (outputs).

This procedure is referred to as the principles of automated representation, executed through dedicated computer software. These software applications are designed to handle the storage, arrangement, and retrieval of data and texts, employing diverse

techniques tailored to the characteristics of the educational content. Language undergoes processing via an array of analyzers: phonetic analyzer, syntactic analyzer, morphological analyzer, and lexical analyzer.

1- Phonetic Analysis:

Since sound is the fundamental unit in the linguistic system, researchers in the field of language education, following what is known as computer-assisted instruction, have sought to describe sounds first using various automated processing programs. Some of these programs include the automatic analyzer, Matlab program, and others like Acapela and Oddacast (text-to-speech and speech recognition systems).

Phonetic analysis endeavors to dissect sounds and scrutinize their attributes, commencing with the identification of sound duration and pitch, followed by gauging vibration intensity, and culminating in the depiction of spectrographic imagery and acoustic patterns. Scholars have additionally directed their attention towards the examination of manuscripts.

2- Syntactic Analysis:

This aspect aims to analyze the structural formations in the language, then arrange and identify its units, and state the function of each one and the functional relationship between them. Then, it provides grammatical analysis automatically. In this context, the automated syntactic analyzer disassembles the sentence into its primary elements such as verbs, nouns, objects, clauses, adverbs, and the like, and determines the grammatical functions of each element, like subject, object, predicate, modifier, and pronoun reference¹⁰.

Some of the noteworthy syntactic analyzers employed for automated Arabic language analysis include¹¹:

- * Bikel Parser: An automated parser that analyzes phrase structures.
- * Malt Parser: Used for dependency analysis.
- * Stanford Parser: Analyzes sentences and identifies word features.

3- Morphological Analysis:

Automated morphological analysis entails the utilization of sophisticated computational systems underpinned by software algorithms that harness Arabic morphological principles to manipulate Arabic words. This involves the extraction of fundamental components comprising word structure, enabling direct discernment of their morphological, syntactic, and semantic attributes deduced from this structure¹².

The word is processed into its two components, noun and verb, computationally through two processes: derivation (generation) and analysis (decomposition). Additionally, letter processing, types of particles, and connectors are processed. Through this automated analysis, the type of verb, its form, its grammatical case, its removal and addition, its

necessity and excess, as well as the nature of the noun, its type, and its grammatical markers, can be recognized.

4- Lexical Analysis:

Evolving from language processing exploration, electronic dictionaries, recognized by experts as "repositories of linguistic lexicon enriched with details including pronunciation, origin, usages, meanings, and interconnections with other terms. These are housed within specialized systems boasting substantial storage capabilities, systematically managed by computers following predefined programs¹³".

This facilitates the precision of the dictionary, simplifies searching and utilization, enables swift retrieval of desired entries, and empowers domain experts to manage information through additions, deletions, and retrievals.

6. Contemporary Approaches in Language Education:

The advent of modern technology has introduced an array of tools for language instruction and learning, distinguished by their precision and swiftness in linguistic operations. Notable progress has been realized in aided and guided education, encompassing the subsequent accomplishments:

6-1 Computer:

A device that performs storage, processing, and retrieval of information in very short times¹⁴. Computers can deliver lessons through sound only, sound and images, PowerPoint presentations, educational games, animations, and smart applications. Integrated learning is used in various computer programs and applications, utilizing videos and images that capture students' attention more effectively than traditional teacher-centered instruction.

6-2 Electronic Tablet:

A compact device resembling a computer, yet more petite and lightweight. Learners can amass lessons, undertake exercises, retrieve textbooks, and access stories for reading. However, its integration within the classroom may necessitate each student to possess their individual tablet.

6-3 Smartphone:

A device similar to a computer but smaller in size, with features such as call transfer, messaging apps, social media, and email. Smartphones can facilitate remote conference participation and distance learning. Language learning apps can be downloaded and utilized on smartphones, but classroom integration depends on individual ownership.

6-4 Educational Illustrations:

Grouped by motion into animated educational illustrations like instructional cartoons, and stationary educational illustrations comprising charts, graphs, diagrams, circles, and areas.

6-5 Electronic Programs and Applications:

These automated programs are tailored for language learning and manifest in diverse formats, including electronic games or downloadable apps from platforms like the Play Store. Many are available for free and span a range of linguistic proficiency levels, commencing from preliminary audio stages and advancing through more sophisticated phases, culminating in comprehensive language acquisition.

7. The Contribution of Acoustic Analysis in Enhancing Arabic Language Education for Non-Native Speakers:

The swift expansion of information technology has mandated the integration of computers into language education and automated linguistic processing. Consequently, experts are exploring the utilization of speech as an avenue for interaction with computers. This pursuit has spurred progress in techniques related to speech production, analysis, and recognition.

Technological advancement has prominently enhanced methodologies within acoustic linguistics, particularly in the conversion of manuscripts into spoken text, streamlining processing and recognition. This technological procedure is referred to as automated speech analysis. Within the computing domain, three distinct techniques or approaches for speech processing are discernible:

1. Text-to-Speech (TTS): The transformation of written text into audible speech.
2. Automatic Speech Recognition (ASR): The automated discernment of spoken words.
3. Speaker Identification: The capability to recognize and differentiate between distinct speakers.

In the realm of software technology, the pivotal breakthrough of converting sound waves into electrical signals and subsequently into textual characters marks a monumental milestone in technological history. This progression has made substantial contributions to linguistic processing, as speech waves pose challenges in linguistic manipulation, whereas text offers more manageable handling.

Information technology has ushered in numerous accomplishments in the domain of language computing, including the development of linguistic analyzers tailored to different linguistic tiers. At the core of crafting and producing language-oriented software lies acoustic analysis. Noteworthy among these analyzers are tools like "Praat," "Speech Analyser," and other similar applications.

Automated sound processing adheres to the conventional procedural triangle: Input - Conversion - Output¹⁵.

The process of automated speech analysis comprises two primary stages:

Pre-processing stage:

- * Acquisition: Capturing the sound as an analog waveform.
- * Filtration: Refining the sound through filtering to improve signal quality.
- * Quantification: Assessing the sound's magnitude using digital values.
- * Sampling: Partitioning the signal into discrete samples.

Post-processing stage:

- * Classification: Assigning the sound sample to specific categories based on its attributes.
- * Recognition: Identifying and automatically processing the sound sample by transforming it into digital values.
- * Transformation: Converting the samples from digital values back to analog values for machine understanding.
- * Data Storage: Storing the processed information and retrieving it when required.

These stages are nearly uniform in the process of sound description, despite variations in different software programs. This processing provides precise automated descriptions of language sounds in their individual forms and linguistic patterns. Here, the significance of analyzers becomes evident as they contribute to the development of educational language programs and applications. In the era of technology and digitalization, education has become accessible through smart devices, enabling self-learning in an automated manner.

As the population of non-native learners of the Arabic language continues to rise, the need for educational programs and applications has expanded. Scholars within this domain have directed their attention towards leveraging machinery and the progressions in communication and information technology to streamline the learning journey. Automated sound analyzers have proven instrumental in delivering accurate depictions of sound attributes and traits, consequently assisting language educators in discerning sound correlations between Arabic and other languages. This meticulous process aids foreign learners in identifying sounds that share parallels with their native tongue and those that diverge. It effectively tackles the educational challenge, empowering learners to discover apt resolutions for surmounting the intricacies of Arabic sound pronunciation.

Indeed, Arabic encompasses guttural sounds that can pose pronunciation challenges, even for native speakers. For instance, English speakers might encounter difficulty with the sound "ع" ('ayn) due to its absence in their phonetic framework. By detailing the characteristics of these sounds and highlighting their unique traits through comparative analysis, learners can effectively navigate such obstacles. All of this is made feasible through self-directed educational applications, streamlining the learning process and conserving both time and effort.

Certainly, many electronic applications are available that contribute to accelerating the process of learning the Arabic language for non-native speakers. For instance:

1-Memrise App: Offering an array of languages, including Arabic, this app aids in vocabulary and phrase acquisition through engaging interactive exercises.

2- Drops App: Concentrating on brief and efficient lessons, this app targets practical communication skills in Arabic.

3- Duolingo App: Providing Arabic language instruction complete with audio support for honing listening skills and refining pronunciation

These applications and others, often available for free, can be found on various digital platforms such as Google Play, the App Store, Symbian, Java, and BlackBerry. They provide numerous opportunities for learning Arabic language skills and often utilize automated voice analyzers to accurately describe Arabic language sounds.

8.Conclusion:

Our research has yielded several noteworthy insights:

1- Information technology plays a pivotal role in advancing language education.

2- Automated analyzers provide precise descriptions that facilitate learning through the creation of educational applications and programs spanning various linguistic tiers.

3- Arabic language learning applications streamline the learning process for non-native speakers, enabling self-directed study and saving time.

To achieve this level of excellence, it is imperative to focus on educational technology and learning by:

4- Uniting efforts within the Arab world to harness technology for linguistic objectives.

5- Drawing lessons from Western experiences while preserving the distinctiveness of the Arabic language.

6- Nurturing and financing initiatives for educational program development, while staying abreast of computational advancements.

7- Aspiring to establish a universally applicable educational model for the Arabic language, simplifying both teaching and learning for native and non-native speakers alike.

9. The footnotes:

1. Antoine Tama and others, "Teaching the Arabic Language," Vol. 1, 1st ed., Dar Al-Nahda Al-Arabiya, Beirut 2006, p. 14.

2. Ibn Manzur, "Lisan Al-Arab," Dar Lisan Al-Arab, Beirut - Lebanon, Vol. 2, p. 270.

3. Surah Ar-Rahman, verses: 01, 02, 03, 04.

4. Mohammed Al-Saleh Hathroubi, "The Pedagogical Guide for the Primary Education Stage," Doctorate, Dar Al-Huda, Ain M'lila - Algeria, p. 126.

-
5. Ahmad Madani, "Teaching Language from the Perspective of Modern Linguistics and Educational Methods," *Journal of Education*, Issue 10.4, March 2007, p. 121.
 6. See: Nabil Ali, "Arabs and the Information Age," *Al-Alam Al-Ma'arif*, Kuwait, April 1994, p. 567.
 7. Same reference, p. 374.
 8. Gerald Kemp, "Educational Program Design," Translated by Ahmed Khairy Kazem, Dar Al-Nahda Al-Arabiya / Egypt, 1987, p. 13.
 9. Mazen Al-Waer, "Linguistics, Science, and Technology: Towards a Unified Arab Applied Linguistics and its Programming in Computers," *Arabic Linguistics Journal*, Rabat, Issue 22, 1984, p. 19.
 10. Nabil Ali, "Arabs and the Information Age," p. 351.
 11. See: Nizar Habash, "Introduction to Natural Language Processing for Arabic," Translated by Hind bint Sulaiman Al-Khalifa, King Saud University for Publishing and Distribution, Riyadh, 2013, p. 196.
 12. Hassan Mozaffar Al-Razou, ¹²"Ways to Develop Automated Morphological Analyzers in Arab Databases," Added on 12/05/2008. Alukah Network:
<https://www.alukah.net/culture/0/2526/>
 13. Regional Office for the Eastern Mediterranean, and Institute of Terminological Studies, "Lectures in Terminology Science for Health and Medical Sciences Students," Arab Program for the World Health Organization, Fes, Morocco, 2005, p. 213.
 14. Gerald Kemp, "Educational Program Design," Translated by Ahmed Khairy Kazem, Dar Al-Nahda Al-Arabiya / Egypt, 1987.
 15. See: Khaled El-Sayed Mohamed Rifaat, "Contemporary Trends in Experimental Phonetics," *Periodic Book in Language Sciences*, Dar Gharib for Printing and Publishing, Cairo, Egypt, Volume 05, Issue 01, 2001, p. 70.

10. References:

1. Ibn Junayd, "Al-Khasa'is," Volume 1. Mohammed Ali Al-Bajawi, Al-Alamiya Library, Cairo, 1st edition.
2. Ahmed Hamed Mansour, "Educational Technology and the Development of Innovative Thinking," Kuwait: Arab Center for Technologies, 1983.
3. Ahmed Hassan, "Studies in Applied Linguistics and Language Teaching Field," Algeria: Diwan Al-Matbu'at Al-Jamee'a.
4. Anwar Al-Ayed, "The Reality of Educational Technologies in the Arab World," *Al-Thaqafah Magazine*, Jordan University, Issue 8, 1985.
5. Bashir Abdul Rahim Al-Kaloub, "Technology in the Learning and Teaching Process," 2nd edition, Amman, Jordan: Dar Al-Shorouk for Publishing and Distribution, 1999.
6. Gerald Kemp, "Educational Program Design," Translated by Ahmed Khairy Kazem, Dar Al-Nahda Al-Arabiya / Egypt, 1987.
7. Khaled El-Sayed Mohamed Rifaat, "Contemporary Trends in Experimental Phonetics," *Periodic Book in Language Sciences*, Dar Gharib for Printing and Publishing, Cairo, Egypt, Volume 05, Issue 01, 2001.

-
8. Ratib Qasim Ashour and Mohammad Fuad Al-Hawamdeh, "Arabic Language Arts and Teaching Methods: Between Theory and Application," Modern Books World, Jordan, 1st edition, 2009.
 9. Shahda Fare', Jihad Hamdan, Moussa 'Amaireh, and Mohammad Al-Anani, "Introduction to Linguistics," 1st edition, Egypt, Dar Al-Ma'arif, 1981, p. 123.
 10. Abdel Rahman Al-Haj Saleh, "Research and Studies in Arabic Linguistics," 2nd edition, National Arts Foundation / Mufam Printing House, 2007, Volume 1.
 11. Abdel Razzaq Tourabi, "Generation, Syntax, and Machine Translation," Rabat, Morocco: Publications of the Institute for Studies, Research, and Arabization, 2001, Volume 1.
 12. Abdel Azim Al-Farjani, "Technology of Educational Situations," Cairo: Dar Al-Nahda Al-Arabiya, 1985.
 13. Abdel Hilla Qizali Musa, "Information Technology and its Role in Traditional Marketing," Cairo, Egypt: Itrack for Publishing and Distribution.
 14. Mohammed Abdel Hamid, "E-Learning System," 1st edition, Cairo: Ilm Al-Kitab for Printing and Distribution, 2005.
 15. Mohammed Mustafa Zidan, "Learning Theories and their Educational Applications," Algeria: Diwan Al-Matbu'at Al-Jamee'a, 1983.
 16. Mohammed Wattas, "The Importance of Educational Messages in the Learning Process in General and in Teaching Arabic Language to Foreigners in Particular," 1st edition, Lebanon: National Institute of Books, 1989.
 17. Mahmoud Rashdi Khatir and Youssef Al-Hamadi, "Teaching Methods of Arabic Language and Religious Education in Light of Modern Educational Trends," 1st edition, Egypt, Dar Al-Ma'arif, 1981.
 18. Nabil Ali, "Arab Culture and the Information Age," Al-Alam Al-Ma'arif, Kuwait, Issue 265, 2001.
 19. Carroll P.B., "Characteristics of Successful," 1977.
 20. Denis Girard, "Applied Linguistics and Didactics of Languages," Aimandcolin, Paris, 1972.
 21. Motasem Alarabi, Ghassam Mourad, Brahim Djioua, "Semantic Filtering of Arabic Texts for an Automatic Summary Prototype," Proceedings of the Conference on Natural Language Processing and Language Technology (TALN), 2004.