

Assessing the Extent of AI Implementations in Arabic L2 Courses

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Abstract:

The present study aimed to identify the extent of AI implementations in the "Follow me in Arabic" course at the intermediate level B1. Using a descriptive and analytical approach based on content analysis, a list of 12 items was used to analyze the content of Arabic learning and teaching center for non-native speakers (ALTCNS) courses at Mansoura University, Egypt. The results of the content analysis highlighted diverse levels of AI implementation. While some areas, such as multimodal learning and machine translation, exhibited moderate inclusion (22%-23%), others like Chabot conversations and AI-driven assessments were rated low (7%-13%). Critical components like pronunciation practice and text analysis with NLP showed no occurrence. The total ratio of AI implementations across all items analyzed was calculated to be 7%, indicating a relatively low overall inclusion of AI technologies within the course content. The minimal implementation is attributed to challenges specific to both the Arabic language—such as its complex morphology, dialectal variations, and digitization issues—and AI technologies, including a lack of tailored resources, difficulties in addressing cultural and linguistic nuances, and instructors' limited familiarity with AI tools. The study underscores the need for a comprehensive strategy to enhance AI integration in Arabic L2 courses, aiming to enrich the learning experience.

keywords:

AI implementations - Arabic L2 courses - content analysis.

I. INTRODUCTION:

Learning Arabic poses numerous challenges due to its intricate grammar, diverse dialects, unfamiliar script, and substantial deviations from many other languages in terms of structure and vocabulary. These hurdles can render the language acquisition process demanding for learners [1].

Given the evolving global landscape, there is a pressing need to modernize Arabic language learning and teaching as a second language (L2) to meet the requirements of contemporary learners striving to attain communicative competence swiftly, accurately, and fluently [2].

In the present era, a plethora of media and learning tools are available to enhance L2 acquisition. Among these tools are artificial intelligence (AI)-based applications. Integrating AI-based applications into L2 Arabic textbooks holds the potential to significantly enrich the learning journey by offering personalized, interactive, and captivating L2 practice. Through the incorporation of these AI-based activities, Arabic L2 textbooks can furnish learners with a comprehensive and stimulating learning experience, facilitating the development of effective listening skills via personalized, interactive, and culturally immersive content [3].

Hence, the primary objective of this research is to assess the extent to which AI implementations are included into Arabic L2 courses. Furthermore, the study aims to scrutinize how these implementations are woven into the pedagogy of Arabic L2 courses for non-native speakers.

II. RELATED LITERATURE

A. AI Role in language Instruction:

Contemporary research underscores the potential of artificial intelligence (AI) to address the challenges inherent in language learning and to enhance the overall learning experience [4,5,6,7]. Scholars argue that within the realm of language education, AI offers a myriad of tools, technologies, implications, and implementations aimed at enriching the educational journey. These include machine translation, speech technology, chatbots, virtual assistants, and AI-generated content, all of which contribute to language learning through personalized, interactive, and flexible solutions. Such tools empower language learners with personalized guidance, interactive engagement, progress tracking, and accessible learning experiences. However, it is imperative to acknowledge and address potential challenges and drawbacks associated with AI inclusion, such as reduced human interaction, risks to student autonomy, issues with contextual understanding, and potential impacts on the role of language teachers. Striking a balance between leveraging AI's advantages and preserving the invaluable role of human interaction is crucial for optimizing language education [8,9]. This framework is also relevant to the context of Arabic language learning.

AI offers personalized learning experiences, providing learners with tailored resources and feedback to improve their language skills continuously. By creating a supportive learning environment where learners can experiment without fear of judgment, AI contributes to a more effective and efficient language acquisition process. Additionally, AI redefines the traditional role of teachers, shifting them towards facilitation and guidance rather than mere instruction [1].

The application of AI in education, as highlighted by Niemi [10], encompasses various aspects such as student assessment, personalized learning, and adaptive learning. This integration of AI technologies not only enhances the learning experience but also provides a safe space for learners to make mistakes and learn from them. This transformative potential of AI in education is essential, considering the increasing global demand for accessible and effective learning opportunities [11, 12, 13, 14].

B. AI Implementations in Enhancing Arabic L2 courses:

AI technologies, such as adaptive learning platforms and intelligent tutoring systems, offer significant potential for enhancing Arabic L2 instruction [12]. For instance, recent studies have demonstrated the effectiveness of AI in providing

personalized feedback and creating immersive learning experiences [13]. Despite challenges related to cultural nuances and data quality, successful implementations in other language contexts provide valuable insights for Arabic L2 education [14]. Innovations such as AR for vocabulary acquisition and AI-driven chatbots offer promising avenues for improving language learning [15, 16]. This study aims to contextualize the integration of these technologies within the specific needs and challenges of Arabic L2 learners.

In Arabic L2 instruction, AI revolutionizes learning by providing personalized experiences tailored to individual learners. AI offers customized resources and feedback, fostering a supportive environment that encourages experimentation and facilitates efficient language acquisition. Furthermore, AI transforms teachers into facilitators and guides, adapting to learners' evolving needs [15].

In Arabic L2 instruction, AI implementation encompasses various aspects, including script, pronunciation, grammar, vocabulary, and cultural nuances. Intelligent tutoring systems, for instance, adapt to each student's requirements, providing personalized and interactive learning experiences. Despite challenges related to data quality and cultural nuances, successful case studies and theoretical frameworks demonstrate AI's potential to significantly enhance Arabic language teaching [16, 17, 18].

Embracing AI in Arabic L2 instruction is crucial due to its transformative capabilities and its capacity to meet the changing demands of learners in an increasingly digital world. By integrating AI technologies, educators can optimize the learning experience and address the diverse needs of Arabic language learners effectively [3]. Key AI implementations for learning Arabic were extracted as follows [15, 16, 18, 19, 20, 21, 22]:

1. **Multimodal Learning:** Uses various media forms (text, audio, video) to enhance comprehension through diverse materials.
2. **AR Vocabulary Acquisition:** Overlays digital information on the physical environment using AR to boost vocabulary learning with interactive experiences.
3. **Machine Translation:** Employs AI for automatic text translation to aid comprehension and provide instant translation support.
4. **Chatbot Conversations:** Uses AI chatbots for simulated human conversations to offer authentic language practice and immediate feedback.

5. Pronunciation Practice: Analyzes and provides feedback on pronunciation using speech recognition to improve oral proficiency.
 6. Gamification: Integrates game elements into learning activities to increase motivation and engagement through gamification.
 7. Writing with AI Assistants: Provides grammar suggestions and corrections using AI tools to improve writing skills with immediate feedback.
 8. Text Analysis with NLP Tools: Analyzes text using natural language processing (NLP) algorithms to develop reading comprehension and interpret complex texts.
 9. AI Assessments: Uses AI to evaluate proficiency and provide personalized feedback to offer detailed progress insights and adaptive learning recommendations.
 10. Interactive Cultural Exploration: Creates immersive cultural experiences with AI to foster cross-cultural understanding and appreciation.
 11. Real-time Practice: Provides real-time language practice scenarios to enhance fluency through practical, simulated interactions.
 12. Adaptive Learning: Creates personalized learning paths using AI to tailor content to individual needs for efficient learning.
2. Demonstration of the potential of AI to enrich language learning experiences through personalized and interactive solutions.
 3. Provision of recommendations to curriculum developers for effectively incorporating AI-implementation.
 4. Provision of insights for teacher professional development programs on inclusion AI implementation into teaching practices.
 5. Contribution of valuable data and insights to the field of AI in education, particularly in the context of Arabic L2 learning.
 6. Emphasis on the role of AI in making language learning more accessible and inclusive for learners with diverse needs.

E. Limits of the Study:

The study's limits are as follows:

Course: This study specifically examined the "Follow me in Arabic" course at the Arabic Learning and Teaching Center for Non-Native Speakers (ALTCNS) at Mansoura University, Egypt. This course was chosen due to its significance in keeping abreast of the latest developments in educational techniques for teaching Arabic as a second language.

Level: Focused on courses designed for intermediate B1 level learners. This level represents a critical stage in language acquisition, where students possess foundational Arabic skills but encounter particular challenges on their journey towards fluency.

F. Procedural Definitions:

AI Implementations: In language learning, AI implementations involve integrating artificial intelligence technologies and tools like machine learning, natural language processing (NLP), and speech recognition which provide personalized, interactive, and adaptive learning experiences, enhancing language acquisition.

Content Analysis: Content analysis is a research method used to systematically analyze and interpret textual, visual, or audio materials. It identifies patterns, themes, or relationships within the data, guiding researchers to draw insights and conclusions.

Course: A course is a structured educational program designed to teach specific subjects or skills over a defined period. It encompasses curriculum design, delivery, instruction, assessment, and completion, guiding learners toward predetermined learning objectives.

G. Problem of the Study:

The study addresses the need to evaluate Arabic L2 courses for their inclusion of AI implementations.

C. Purpose of the Study:

The primary goal of is to assess how extensively artificial intelligence (AI) implementations are integrated into the "Follow me in Arabic" course at the intermediate level. By using a descriptive and analytical approach based on content analysis, the study aims to determine the presence and level of inclusion of various AI-implementations within the course content. The findings are intended to highlight areas where AI is underutilized and provide recommendations for enhancing the use of AI to improve the overall language learning experience for non-native Arabic speakers.

D. Significance of the Study:

The significance of this study is clear and impactful:

1. Identification of specific areas where AI inclusion is lacking in Arabic L2 courses.

Recognizing the potential of AI to enhance language learning, the study seeks to identify opportunities to optimize these courses for better support and outcomes for L2 students.

H. Study Questions:

Main Question:

To what extent are artificial intelligence implementations included in Arabic L2 courses?

Sub-Questions:

1. What are the essential AI implementations that should be integrated into Arabic L2 courses?
2. How extensively are AI implementations currently integrated into Arabic L2 courses at Mansoura University?

These questions aim to delve into the current landscape and potential enhancements in the incorporation of AI technologies within Arabic language learning programs, with a specific focus on second language learners (L2) and a targeted assessment at Mansoura University.

III. Study Method and Procedures

A. Study Methodology:

The nature of this research requires the researcher to use descriptive and analytical methods to complete this study and reach the required results. To meet the objectives of the study, primary and secondary data were used. Generally, the research is done under a qualitative approach.

B. Tool of the Study:

The study tools consist of the following components:

1. A List of AI Implementations Necessary for L2 Instruction
 - This list identifies the AI technologies and implementations that are essential for effective Arabic L2 teaching and learning. It includes tools for automated assessment, personalized learning, speech recognition, and adaptive learning systems.
2. A Content Analysis Tool Derived from the List of Necessary AI Implementations for L2 Instruction
 - This tool is designed to evaluate the current inclusion of AI implementations within Arabic L2 courses. It assesses course materials based on the identified list of necessary AI implementations.

C. Validity of the Tools:

To establish the validity of the tools, the researchers subjected them to an initial review by a

panel of 12 experts. The panel assessed the tools' content for alignment with the study's objectives and the extent to which the items accurately represented the intended AI implementations. Feedback from the experts was used to refine and optimize the tools, including potential deletions, additions, or modifications.

D. Content Analysis Tool Reliability

Assessment:

To gauge the reliability of the Content Analysis Tool, the researchers employed an inter-rater reliability method. They randomly selected one unit of the textbook, which was then analyzed by one researcher and cross-checked by another researcher. The reliability of the content analysis tool was computed using the Cobber Equation $\text{Reliability} = \frac{\text{Agreements}}{\text{Total}}$. The following table shows the results of this analysis, comparing the times of agreements and disagreements between the two analyses by the two researchers. The average reliability score was within the acceptable range, with a score of 0.88.

TABLE 1. RELIABILITY ANALYSIS RESULTS

AI implementations	Agre.	Disage.	Reliab. Score
1. Multimodal Learning.	5	3	0.71
1. Multimodal Learning.	6	2	0.86
2. AR Vocabulary Acquisition.	8	0	1.0
3. Machine Translation.	8	0	1.0
4. Chatbot Conversations.	5	3	0.71
5. Pronunciation Practice.	6	2	0.86
6. Gamification.	6	2	0.86
7. Writing with AI Assistants.	8	0	1.0
8. Text Analysis with NLP.	5	3	0.71
9. AI Assessments.	8	0	1.0
10. Cultural Exploration.	6	2	0.86
11. Real-time Practice.	8	0	1.0
12. Adaptive Learning.	79	17	10.57
Mean	6.58	1.42	0.88

E. Content Analysis Procedures:

The content analysis followed the procedures outlined below to achieve the objectives of the current study:

1. Definition of the Study Population: The study population encompasses all materials utilized at the Arabic Learning and Teaching Center for Non-native Students (ALTCNS), located at Mansoura University, Egypt. Specifically, this includes: "Follow me in

Arabic" textbook and activity book. The activity book is an integral component of the course materials and is supported by an educational platform designed to augment learning through interactive activities and exercises.

2. Selection of Content Analysis Unit: According to Taimah [23], five primary units for content analysis are recognized: word, idea or theme, character, paragraph, and space-time measure. For this study, the researchers opted for the idea unit due to its alignment with the nature and objectives of the current research. This unit of analysis facilitates a more detailed and comprehensive assessment of the extent of AI implementations in Arabic L2 courses.

3. Development of Study Tools and Validation of Reliability: The study tools were meticulously developed, and rigorous efforts were undertaken to ascertain their validity and reliability.

4. Examination of Arabic L2 Materials Content: A thorough analysis of the content of Arabic L2 materials was conducted.

5. Conversion of Analysis into Frequencies: The analysis findings underwent transformation into frequencies to quantify the occurrences of AI implementations in digital format.

6. Interpretation of Results from Digital Frequencies and Ratios: Conclusions were derived based on the digital frequencies and ratios derived from the analysis.

IV. STUDY RESULTS AND DISCUSSION:

To answer the second question of the study, the researchers analyzed The content analysis of the "Follow me in Arabic" course at the Arabic Learning and Teaching Center for Non-native Speakers (ALTCNS) at Mansoura University, and the results of the analysis were as follows:

TABLE 2. CONTENT ANALYSIS RESULTS

AI implementations	Frequency	Indicators	Ratio	Extent of occur.
1. Multimodal Learning.	22	95	23%	Moderate
2. AR Vocabulary Acquisition.	12	90	13%	Low
3. Machine Translation.	19	86	22%	Moderate
4. Chatbot Conversations.	7	80	9%	Low
5. Pronunciation Practice.	-	75	0%	Absent
6. Gamification	9	74	12%	Low

7. Writing with AI Assistants.	-	88	0%	Absent
8. Text Analysis with NLP.	-	92	0%	Absent
9. AI Assessments	4	68	6%	Low
10. Cultural Exploration.	-	75	0%	Absent
11. Real-time Practice.	-	86	0%	Absent
12. Adaptive Learning.	-	75	0%	Absent
Mean	6.1	82	7%	Low

The results of the content analysis for the "Follow me in Arabic" course at Mansoura University highlighted diverse levels of AI implementation. While some areas, such as multimodal learning and machine translation, exhibited moderate inclusion, others like Chatbot conversations and AI-driven assessments were rated low. Critical components like pronunciation practice and text analysis with NLP showed no occurrence. The range of occurrence ratios varied widely, from 0% for certain implementations to 23%. The findings indicate significant gaps in the inclusion of AI implementations within the "Follow me in Arabic" course, suggesting that current efforts to include AI in Arabic L2 courses at ALTCNS are insufficient. The study suggests that a more comprehensive approach to AI inclusion is necessary to enhance the learning experience for non-native Arabic speakers.

DISCUSSION:

The study findings underscore both strengths and areas for improvement in the integration of AI into Arabic L2 courses. These results suggest opportunities to enhance the learning experience for non-native Arabic speakers as follows:

1. The moderate frequency of both multimodal learning and machine translation (ranging from 22% to 23% in ratio) suggests a somewhat included approach within the course content. While multimodal learning offers diverse resources to engage learners effectively, ensuring the accuracy and appropriateness of machine translation remains crucial for its effectiveness in educational settings.
2. The low frequency of AR vocabulary acquisition, Chatbot conversations, gamification, and AI assessments (ranging from 7% to 13% in ratio) indicates underutilization and limited included within the course content. Incorporating these AI

implementations could enhance vocabulary acquisition, provide authentic language practice, increase motivation, and offer personalized feedback, thereby improving the overall learning experience.

3. The absence of indicated frequency for pronunciation practice with AI and writing enhancement with AI assistants suggests that these aspects are not explicitly addressed in the course content. However, incorporating speech recognition technology and AI-powered writing tools could benefit learners by improving oral proficiency and writing skills, respectively. Additionally, the potential presence of NLP-based text analysis tools could support learners in developing reading comprehension skills and understanding complex texts more effectively.
4. The total ratio of AI implementations across all items analyzed in the "Follow me in Arabic" course at Mansoura University was calculated to be 7%, indicating a relatively low overall inclusion of AI technologies within the course content.

The researcher can demonstrate minimal implementation results when integrating AI in Arabic L2 courses due to specific considerations related to both the Arabic language and AI technologies. The following considerations illustrate these factors:

Arabic Language Considerations:

- **Complex Morphological System:** Arabic's rich morphology, based on root formation, complicates AI's ability to process and generate accurate text. This challenge is highlighted by [24], which discusses the unique difficulties posed by Arabic's morphology, syntax, and contextual nuances.
- **Dialectal Variations:** Significant dialectal differences and the diglossic nature of Arabic create challenges for AI systems, leading to inconsistencies in language instruction.
- **Digitization Challenges:** The unique characteristics of Arabic, including its digitization difficulties, further complicate AI integration. This aligns with the findings of [25], which addresses the complexities of digitizing Arabic.

AI Technology Considerations:

- **Lack of Tailored Resources:** AI tools are often designed for languages like English, resulting in a shortage of resources for Arabic. This issue is consistent with [27], which discusses the slow progress in adopting AI in university learning and teaching.

- **Cultural and Linguistic Nuances:** AI systems struggle with Arabic's linguistic and cultural nuances, potentially leading to inaccuracies. This challenge aligns with [28], which identifies barriers to AI implementation in learning environments.
- **Instructor Familiarity and Integration:** Many Arabic instructors face challenges in understanding and integrating AI technologies, leading to resistance or underutilization. This is supported by research in [29] and [30], which addresses weaknesses in faculty skills, lack of resources, underdeveloped curricula, and inadequate use of modern teaching strategies and evaluation methods.

CONCLUSION:

The analysis of AI implementations in the "Follow me in Arabic" course at Mansoura University revealed varying levels of inclusion. While some aspects showed moderate inclusion, such as multimodal learning and machine translation, others like chatbot conversations and AI-driven assessments were low. Critical components like pronunciation practice and text analysis with NLP were absent. The total ratio of AI implementations was relatively low at 7%. These results underscore the need for a more comprehensive approach to AI inclusion in Arabic L2 courses to optimize learning outcomes. By combining AI technology with traditional teaching methods, educators can better address challenges in teaching Arabic to non-native speakers and enhance the overall learning experience. As technology advances, AI's inclusion into Arabic language education will play a crucial role in making learning more accessible, effective, and engaging worldwide.

V. RECOMMENDATIONS:

1. **AI Grammar and Syntax Tools:** Develop AI tools to detect and correct common MSA writing mistakes, providing explanations in the learner's native language and adapting exercises to the learner's proficiency.
2. **AI Writing Assistants for Arabic Script:** Use AI to automatically insert diacritics and suggest context-appropriate vocabulary in Arabic writing, addressing unique script features.
3. **Real-Time Pronunciation Feedback:** Create an AI application offering real-time pronunciation feedback in various Arabic dialects to improve both MSA and colloquial Arabic skills.

4. AR Vocabulary Learning: Utilize Augmented Reality (AR) for immersive vocabulary learning that integrates cultural and historical contexts.
5. Enhanced Machine Translation: Improve machine translation tools with an educational mode that includes grammatical explanations and cultural notes, ensuring accurate translations for Arabic L2 learners.
6. Adaptive Learning Pathways: Implement a platform that assesses proficiency through tests and recommends personalized modules, adjusting content difficulty based on learner progress.

By following these recommendations, the "Follow me in Arabic" course can better integrate AI, improving learning outcomes and making the course more engaging and effective for non-native Arabic speakers.

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