

The Effect of an AI-based Digital Learning Module on Motivation and Achievement in a Linguistic Training (Arabic Grammar) Course at Kuwait University

Amani A. Shaheen *, Almothana Mustafa Gasaymeh, and Sahar Reyadh Hamza

Department of Digital Education, Arabian Gulf University, Manama, Bahrain

Email: 20241331as@agu.edu.bh (A.A.S.); almothanamag@agu.edu.bh (A.M.G.); tsaharrh@agu.edu.bh (S.R.H.)

*Corresponding author

Abstract—This work-in-progress developmental study designs and evaluates an Artificial Intelligence (AI)-based digital learning module for the linguistic training (Arabic grammar) course at Kuwait University. The study addresses persistent difficulties in applying grammatical rules and low engagement associated with conventional instruction characterized by limited interactivity and delayed feedback. The module integrates generative AI through NotebookLM and standardized prompt templates to provide adaptive explanations, scaffolded practice, immediate formative feedback, and self-paced review aligned with course learning outcomes. To account for Arabic linguistic complexity and potential inconsistencies in automated outputs, the module incorporates verification steps and instructor checkpoints to support responsible use. The study includes two phases: (1) a design and validation phase that analyzes course content, selects priority concepts and skills, and develops the module following a systematic instructional design model with an aligned assessment and feedback workflow; and (2) a quasi-experimental pretest–posttest phase in Semester 1 of the 2026–2027 academic year, comparing an experimental class using the module with a control class receiving conventional instruction. Data will be collected using a researcher-developed academic achievement test and a learning-motivation questionnaire administered before and after the intervention. Group differences will be analyzed at $\alpha = 0.05$ using appropriate inferential statistics, and effect sizes will be reported to estimate practical impact. It is expected that the module will improve post-test achievement and motivation and will yield context-sensitive guidelines for responsible AI integration in Arabic grammar instruction, including academic integrity, data privacy, and instructor support considerations.

Keywords—linguistic training, Arabic grammar, Artificial Intelligence (AI)-based digital learning module, generative AI, NotebookLM, learning motivation, academic achievement

I. INTRODUCTION

Arabic grammar accuracy is essential for academic

writing and effective communication in Arabic-medium higher education. Nevertheless, many university students continue to experience difficulties in applying grammatical rules reliably in writing and analysis, and grammar-focused courses are often perceived as demanding and insufficiently engaging when instruction remains predominantly conventional with limited interaction and delayed feedback.

Recent Arabic scholarship increasingly highlights that artificial intelligence can support Arabic language learning by enriching explanations, expanding practice opportunities, and developing language skills when integrated with clear pedagogical goals and teacher guidance [1–4]. At the same time, researchers caution that Arabic presents distinctive linguistic and computational complexities (e.g., morphology, syntax, and orthography) that can reduce the consistency of automated outputs, making verification procedures and human oversight necessary in educational use [5, 6]. These opportunities and constraints indicate that Artificial Intelligence (AI) should be embedded within a structured instructional design rather than used as an ad-hoc tool.

To respond to this need, the present developmental study designs and evaluates an AI-based digital learning module for the Linguistic Training (Arabic grammar) course at Kuwait University. The module is designed as a guided learning cycle that provides adaptive explanation, scaffolded practice, and immediate formative feedback to support grammar application and learner engagement aligned with course learning outcomes. The study examines the expected effect of the module on two key outcomes: academic achievement and learning motivation.

To mitigate common threats in technology-based interventions (e.g., novelty effects and instructor enthusiasm), the study uses a quasi-experimental pretest–posttest control-group design with standardized instructional conditions across groups. In addition to statistical significance ($\alpha = 0.05$), effect sizes will be

reported to estimate the practical impact on achievement and motivation.

II. LITERATURE REVIEW

Recent Arabic scholarship has increasingly examined the integration of artificial intelligence into Arabic language education, highlighting both pedagogical opportunities and implementation constraints. Several studies report that AI applications can support Arabic learning by enriching explanations, providing interactive practice, and facilitating skill development when aligned with clear learning objectives and instructional support [1–4]. At the same time, researchers emphasize that Arabic presents distinctive linguistic and computational complexities (e.g., morphology, syntax, and orthography), which may lead to inconsistent automated outputs and require systematic verification and human oversight in educational contexts [5, 6].

A parallel line of work focuses on practical AI-supported functions relevant to language courses, particularly automated language checking and proofreading. Evidence suggests that AI-based proofreading tools may enhance linguistic accuracy; however, effectiveness varies depending on task type and the linguistic features targeted, reinforcing the need for guided use and rubric-based evaluation rather than blind acceptance of AI suggestions [7]. Moreover, studies examining educators' perceptions indicate that successful adoption depends not only on tool availability but also on teachers' readiness, institutional support, and clarity of pedagogical purpose; reported barriers include limited training, uncertainty about best practices, and concerns about educational ethics and misuse [8, 9].

Overall, while the literature supports the potential value of AI in Arabic language teaching, a key gap remains: many studies emphasize general impacts, perceptions, or isolated applications rather than evaluating AI as part of a systematically designed instructional unit with controlled implementation and measurable outcomes. This gap justifies the present study, which develops an AI-based digital learning module for a university-level Linguistic Training course and examines its expected effects on academic achievement and learning motivation through a pretest–posttest quasi-experimental design.

III. MATERIALS AND METHODS

A. Research Design

This study adopts a developmental research approach that integrates two phases: (1) a development and validation phase to design an AI-based digital learning module for the Linguistic Training course, and (2) a quasi-experimental phase to evaluate its expected impact on academic achievement and learning motivation. The quasi-experimental component follows a pretest–posttest control-group design.

B. Setting and Participants

The study will be conducted at the College of Arts, Kuwait University, targeting students enrolled in the

Linguistic Training (Arabic grammar) course. The implementation is planned for Semester 1 of the academic year 2026–2027. A purposive sample (approximately 40–50 students, depending on course enrollment) will participate and be assigned by intact sections or practical scheduling into two groups: an experimental group using the AI-based module and a control group receiving conventional instruction.

C. Intervention (AI-Based Digital Learning Module)

The intervention is a structured digital learning module designed to support prioritized grammatical concepts and skills in the Linguistic Training course. The module integrates generative AI support within a guided workflow (e.g., adaptive explanation, scaffolded practice items, immediate formative feedback, and revision prompts). To ensure pedagogical consistency, the module will use standardized activity formats and prompt templates aligned with learning outcomes and assessment criteria. Students in the experimental group will complete module-based learning tasks throughout the intervention period as part of their course learning activities.

D. Control Condition

The control group will study the same course content during the same period using conventional teaching procedures. Instructional time, content coverage, and assessment conditions will be standardized as closely as possible across groups.

E. Instruments

Two instruments will be used in pretest and posttest forms:

- (1) Academic Achievement Test: A researcher-developed test measuring targeted grammar knowledge and application in the Linguistic Training course.
- (2) Learning Motivation Questionnaire: A questionnaire measuring students' motivation toward learning in the course.

Both instruments will undergo expert review to establish content validity and will be piloted to refine items and estimate reliability (e.g., Cronbach's alpha for the questionnaire and an appropriate reliability estimate for the achievement test depending on item type).

F. Procedure

Phase 1 (Development and Validation): Course content will be analyzed to select target concepts and skills; the module will be designed and developed; and expert review/piloting will be conducted to refine both the module and instruments.

Phase 2 (Quasi-Experimental Implementation): The achievement test and motivation questionnaire will be administered as pretests to both groups. The experimental group will then use the AI-based module during the intervention period, while the control group receives conventional instruction. After completion, both groups will complete the posttests using the same instruments.

G. Data Analysis

Data will be analyzed at $\alpha = 0.05$. Group differences will

be examined using appropriate inferential statistics; where feasible, ANCOVA will be used to compare posttest scores while controlling for pretest performance. In addition to p -values, effect sizes (e.g., Cohen's d and/or partial η^2) will be reported to estimate practical impact.

H. Ethical Considerations

Ethical approval will be obtained from the relevant institutional body. Participation will be voluntary with informed consent. Data will be handled confidentially and reported in aggregate form. Guidance for responsible AI use will be communicated to students to support academic integrity and appropriate reliance on AI assistance.

IV. RESULT AND DISCUSSION

A. Expected Results

Based on the study hypotheses, it is expected that the experimental group (AI-based digital module) will obtain higher post-test academic achievement and higher post-test learning motivation than the control group at $\alpha = 0.05$. These expectations are consistent with recent Arabic scholarship indicating that AI-supported approaches can enhance Arabic language learning by enriching explanations and expanding practice opportunities when implemented with clear pedagogical goals and guidance [1–4]. Practical significance will also be examined through effect sizes to estimate the magnitude of impact.

More specifically, the module is designed to strengthen grammar application through adaptive explanation, scaffolded practice, and immediate formative feedback. Therefore, measurable achievement gains are anticipated for the experimental group relative to conventional instruction. Motivation is likewise expected to improve because structured AI-supported activities can increase perceived competence and engagement by shortening the error–feedback–revision cycle and supporting individual differences [1, 2, 4, 9].

B. Discussion and Implications

If the expected pattern is observed, the findings would suggest that integrating generative AI within a structured instructional unit (rather than ad-hoc tool use) can improve both cognitive outcomes (achievement) and affective outcomes (motivation) in university Arabic grammar learning. However, the Arabic language presents distinctive linguistic and computational complexities that may reduce the consistency of automated outputs, which implies that any observed benefits are conditional on verification procedures and human oversight [5, 6]. This is particularly relevant when AI is used for correction and proofreading tasks, where effectiveness may vary depending on the targeted linguistic features [7].

Accordingly, the study is expected to yield context-sensitive implementation guidance for Arabic grammar courses in higher education, focusing on: (i) designing structured AI-supported workflows (prompt templates, rubrics, and justification requirements), (ii) strengthening instructor oversight to reduce overreliance

and ensure academic integrity, and (iii) addressing adoption conditions reported in teacher-perception research such as training and practical classroom use-cases [8]. These considerations are not peripheral; they are conditions for defensible and scalable AI integration in Arabic language instruction.

V. CONCLUSION AND FUTURE WORK

A. Conclusion

This work-in-progress paper proposed a developmental research study to design and evaluate an AI-based digital learning module for the Linguistic Training (Arabic grammar) course at Kuwait University. In line with recent Arabic scholarship, the module is designed to enhance grammar learning by expanding practice opportunities and supporting feedback-rich learning when AI is integrated with clear pedagogical goals and instructor guidance [1–4]. Once implemented, the study is expected to provide (i) an implementable model for embedding generative AI within a structured instructional unit and (ii) empirical evidence on its anticipated effects on academic achievement and learning motivation.

The proposed integration is framed as responsible use rather than automation. The literature emphasizes that Arabic's linguistic and computational complexities can yield inconsistent automated outputs, particularly in correction- and proofreading-related functions, which requires verification procedures and human oversight in educational settings [5–7]. Therefore, any expected benefits depend not only on tool capability but also on design choices that require learners to justify answers and revise errors rather than copy AI outputs.

B. Limitations

This study is limited to one course and one institutional context. The use of a purposive sample and intact sections may constrain randomization; pretesting and statistical controls are planned to address baseline differences. In addition, outcomes are measured using an achievement test and a motivation questionnaire, which may not fully capture long-term transfer to authentic academic writing. Finally, variability in AI output quality and student prompting behavior may influence results in Arabic learning contexts [5, 6].

C. Future Work

Future studies should replicate the intervention across larger cohorts, multiple instructors, and additional institutions, and include delayed post-tests to examine retention and transfer. Given documented challenges in Arabic AI outputs, future work should compare scaffolding and verification strategies (e.g., rubric-based justification, error-classification prompts, and teacher checkpoints) to maximize learning while minimizing overreliance and inaccuracies [5–7]. Finally, because adoption is shaped by teacher readiness and implementation barriers, research should examine how training and institutional support mediate effective classroom integration of AI in Arabic instruction [8],

alongside broader analyses of opportunities and challenges in AI-enabled education [9].

APPENDIX

Illustrative AI-Supported Task Examples:

Task 1 (Correction with justification): Students revise a sentence, identify the relevant grammatical rule, and justify the correction using a short rubric.

Task 2 (Scaffolded practice): Students complete graduated items (easy–medium–hard) and revise answers based on immediate feedback.

Task 3 (Standard prompt template): Explain the rule briefly, provide two examples, generate one practice item, then evaluate the student’s answer and explain the error.

CONFLICT OF INTEREST

The author declares no conflict of interest.

AUTHOR CONTRIBUTIONS

A.A.S. conceived and designed the study, developed the AI-based digital learning module, prepared the research instruments, planned the quasi-experimental procedures and data analysis, and wrote and revised the manuscript. A.M.G. contributed to the theoretical framework, reviewed the literature, and provided critical feedback on the research design and manuscript drafts. S.R.H. assisted in instrument development, supported the instructional design process, and reviewed and approved the final manuscript. All authors have read and approved the final version.

ACKNOWLEDGMENT

The author thanks Kuwait University and the Department of Digital Education at the Arabian Gulf University for their support of this research direction.

REFERENCES

- [1] K. H. Madani, “Employing artificial intelligence in teaching Arabic language: Audiovisual programs as a model,” *Journal of Scientific Development for Studies and Research*, no. 21, pp. 122–136, 2025. doi.org/10.61212/jsd/296 (in Arabic)
- [2] S. A. ‘Aisha, “The effect of artificial intelligence applications on teaching Arabic language,” *Arab Journal of Specific Education*, no. 36, pp. 801–818, 2025. (in Arabic)
- [3] S. Z. Al-Mujayidah, “The effect of using artificial intelligence on improving Arabic language skills,” *Al-Quds Open University Journal for Humanities and Social Sciences*, no. 66, pp. 180–198, 2025. (in Arabic)
- [4] M. H. Al-Dhafiri, “Leveraging artificial intelligence applications in developing Arabic language skills: A developmental vision,” *Educational Sciences*, vol. 33, no. 2, pp. 391–405, 2025.
- [5] S. A. Hussein, A. H. Hamza, and F. A. Abd Al-Hassan, “Addressing the complexities of the Arabic language using artificial intelligence techniques: Challenges and future solutions,” *Journal of Scientific Development for Studies and Research*, no. 22, pp. 128–150, 2025. doi.org/10.61212/jsd/375 (in Arabic)
- [6] M. A. Al-Haq, “Using artificial intelligence in teaching Arabic language between possibilities and problems,” *Arab Journal of Scientific Publishing*, no. 79, pp. 173–188, 2025. (in Arabic)
- [7] S. Rahal, “The effectiveness of artificial intelligence applications in Arabic language proofreading,” *Zaytounah International University Journal*, no. 32, pp. 137–163, 2025. (in Arabic)
- [8] S. S. Al-Haydan, “Teachers’ perceptions towards artificial intelligence applications and obstacles to their use in teaching and learning Arabic language in Bisha Governorate,” *King Khalid University Journal of Educational Sciences*, vol. 12, no. 2, pp. 50–71, 2025. (in Arabic)
- [9] W. Gh. Al-Omari, “The future of education in light of artificial intelligence and its applications: Opportunities and challenges,” *Arab Journal of Specific Education*, no. 37, pp. 1007–1020, 2025. (in Arabic)

Copyright © 2026 by the authors. This is an open access article distributed under the Creative Commons Attribution License which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited ([CC BY 4.0](#)).