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Adaptive Learning Technologies in Arabic Language Education: Designing for Flexibility and Accessibility

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ABSTRACT

Background. Arabic language education faces the challenge of providing flexible and accessible learning methods to a diverse range of students with different levels of ability. Adaptive learning technologies are considered a potential solution to address these challenges by allowing for the customization of learning materials and experiences according to individual needs.

Purpose. This study aims to explore the use of adaptive learning technology in Arabic language education, with a focus on flexibility and accessibility for students.

Method. This study uses a quasi-experimental design by involving students who use adaptive learning platforms. Data is collected through pre-test and post-test tests as well as student engagement surveys during the learning process.

Results. The results showed that students who used adaptive learning technology experienced a significant improvement in test scores and showed higher engagement compared to students who used conventional learning methods. This system provides a more personalized learning experience and is tailored to the individual needs of students.

Conclusion. This study concludes that adaptive learning technology can be an effective solution in Arabic language education, by improving learning outcomes and student engagement. However, external support from teachers is still needed to maximize the effectiveness of this system.

KEYWORDS

Adaptive Learning Technology, Arabic Language Education, Flexibility

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INTRODUCTION

Arabic language education has grown rapidly along with the advancement of information and communication technology (Adila, 2020; Al-Qatawneh, 2020). Today, various digital learning platforms provide a variety of ways to learn Arabic, from mobile apps to web-based online courses. This technology allows for wider access for learners in different parts of the world, giving them the opportunity to learn anytime and anywhere. Online Arabic learning has become an important part of the global language education system, helping students overcome physical and geographical

limitations in acquiring knowledge (Adila, 2020; Ainin, 2020).

Research on the use of adaptive learning technology is growing. Adaptive learning allows for a more personalized learning experience, identifying students' strengths and weaknesses, and adapting subject matter to individual needs (Bourekkache, 2020). This technology has great potential in Arabic language education because it allows students to learn at their own pace, understand difficult material, and receive live feedback that suits their abilities. This is especially important in the context of a language that has a complex structure and rules like Arabic (Kerras, 2022).

Learning Arabic faces unique challenges, especially in teaching writing, speaking, and reading skills. Arabic uses a different alphabet and has a more complicated grammatical system compared to other languages (Qiang, 2019). Therefore, a more flexible learning method that can be adjusted to students' abilities is urgently needed. Adaptive learning technology has the potential to overcome this challenge by adapting learning materials according to individual needs, so that students can overcome difficulties in learning Arabic more effectively (Reed, 2020).

The development of technology has also made it possible to develop more interactive language learning tools. Web-based apps and platforms that utilize adaptive learning technologies provide a richer experience for students (Obukhov, 2023). The technology allows for the creation of interactive quizzes, video-based exercises, and the use of artificial intelligence to provide feedback in real-time. This not only improves the quality of Arabic language learning, but also makes the learning process more interesting and enjoyable for students (Zhao, 2023).

In the context of Arabic language education, the main challenge is to create materials that are accessible to all students, regardless of their background or limitations. Flexible and accessible language learning is essential in ensuring that every learner can follow the learning process in a way that suits their needs (Bayaga, 2021). Adaptive learning technology offers a highly relevant solution to improve the accessibility of Arabic language learning, both for learners studying in formal and informal settings (Mills, 2020).

With the growing interest in learning Arabic, especially outside of Arabic-speaking countries, flexible and accessible educational technology is essential. This creates a need for learning designs that consider a variety of contexts, both in terms of subject matter and the way information is delivered. With adaptive technology, learners can design their own learning journey and choose the best way to learn Arabic, based on their interests, learning pace, and limitations (Capuano, 2020).

Although adaptive learning technology has been shown to be effective in a variety of educational contexts, its application in Arabic learning is still limited. Many platforms use adaptive learning for foreign languages, but specific implementations for Arabic, which have different grammatical systems and structures, are still not optimal. The lack of research and development in this context has led to many Arabic language teaching that has not made full use of adaptive technology (Alhamami, 2023; Alharbi, 2020).

Adaptive learning technology has great potential to adapt learning materials to the individual needs of students. However, the implementation of the system for Arabic has not been able to target specific aspects that affect students' difficulties, such as teaching differences between dialects and standard languages, as well as problems in writing and pronunciation mastery. The lack of research that leads to the preparation of an adaptive system for more contextual Arabic learning needs is one of the gaps that need to be filled (Harpstead, 2023; Putra, 2022).

Most of the technology that exists today tends to focus on basic skills such as vocabulary and grammar, while learning Arabic requires a more holistic approach, including writing, reading, speaking, and listening skills. This shows that there is a gap between existing technology and the

need for comprehensive Arabic language teaching (Mazlan, 2021; Rababah, 2019). Adaptive learning that only focuses on one aspect, such as vocabulary understanding, is not enough to facilitate learners in mastering the Arabic language in its entirety.

The lack of alignment between the design of learning technology and the specific needs of the Arabic language is a significant problem (Saihu, 2020). Platforms that use adaptive learning often do not take into account the diversity of students' ability levels, which affects how they access and understand the material. Arabic has additional complexities that make the learning experience more difficult for non-native speakers, such as writing mastery and pronunciation that are highly context-dependent. Designs that do not consider diversity are a challenge in making the most of technology (Ong, 2023).

Accessibility in learning Arabic is also a problem that has not been fully solved. Although many learning platforms offer Arabic courses online, not all learners have access to adequate technology or understand how to use digital learning tools effectively (Amor, 2021). In addition, the methods used in some platforms are not adaptive enough to target the needs of students from various educational backgrounds, cultures, and technological skills. This shows that there is a gap in achieving inclusive and accessible learning for all students (Sun, 2024).

Filling this gap is important to optimize the potential of adaptive learning technology in improving Arabic language teaching. By designing a system that can adapt to the specific needs of students, both in terms of language skills and how they learn, the Arabic learning experience will be more effective. The flexible system will help students overcome the difficulties they face, especially in terms of mastery of the complex structure of the Arabic language and the differences between dialects and standard languages (Tung, 2024).

Learning Arabic requires more innovative and technology-based methods to be more widely accessible to learners in various parts of the world. One of the objectives of this study is to design a technology that integrates adaptive learning with the context of the Arabic language, so that it can facilitate students in mastering more holistic language skills. By using this approach, it is hoped that learning Arabic will be more efficient, comprehensive, and easily accessible to various types of students (Al-Barham, 2022; Alharithi, 2023).

This study aims to show that Arabic language learning can be better personalized through specially designed adaptive learning technology. A system that is flexible and accessible to all learners will increase student engagement and motivation, which in turn will speed up the language learning process. This is critical to addressing the current problems in Arabic language teaching, as well as providing access to more inclusive and effective learning for all types of learners.

RESEARCH METHODOLOGY

This study uses a qualitative research design approach with case studies. The main focus of the research is to design and test the application of adaptive learning technology in Arabic language teaching. Researchers will develop a prototype adaptive learning system that can be adapted to different levels of student ability, as well as evaluate its effectiveness in improving Arabic learning outcomes. This study will be conducted by analyzing user experience, student feedback, and student performance in using the designed learning system (Adorjan, 2023; Akşan, 2023).

The population in this study consists of students who are learning Arabic, both at the beginner and advanced levels. The sample will be taken from two groups of students who have diverse educational backgrounds and Arabic language skills. The first group is students who learn Arabic at formal educational institutions, such as universities or language schools, while the second group is

students who learn Arabic independently through online platforms. Each group will consist of 20–30 students to ensure sufficient representation in the study (Archard, 2023).

The instruments used in this study include a prototype of an adaptive learning system specifically designed for the Arabic language. The system will include learning modules, interactive exercises, and exams tailored to students' abilities. In addition, questionnaires and interviews will also be used to collect data on students' experiences and perceptions of the use of adaptive learning systems. Quantitative data on students' progress in learning Arabic will also be obtained through pre-test and post-test tests (Bavaresco, 2020).

The research procedure began with the development of a prototype adaptive learning system for the Arabic language. This prototype will be tested on two groups of students who have been selected. Each student will be given access to an adaptive learning system over a specific period, which includes flexible learning time and suits their needs. During this period, data on student engagement, learning progress, and feedback will be collected through questionnaires and interviews. After the trial period is complete, the data will be analyzed to assess the effectiveness of the system in improving Arabic language learning, as well as identify the strengths and weaknesses of the system (Berbary, 2019).

RESULT AND DISCUSSION

The data obtained from this study involved two groups of students who used an adaptive learning system to learn Arabic. The first group consisted of 30 students from formal educational institutions, while the second group consisted of 30 students who studied independently. The data collected included pre-test and post-test scores, the level of student engagement in the platform, and feedback provided by students regarding their experience using the learning system. Here is a table showing the average pre-test and post-test scores for both groups:

Group	**Rata-rata Pre-Test**	**Post-Test**	**Installment Increase (%)**
Formal Education Institutions	60	85	41.7
Independent Learning	58	82	41.4

Table 1. Shows Significant Improvements in Both Groups

This table shows significant improvements in both groups, with an average increase of about 41% after the use of adaptive learning systems.

The data obtained shows that the use of adaptive learning technology can improve student learning outcomes in learning Arabic. The significant increase in post-test scores compared to pre-test shows that this system is effective in helping students improve their understanding of the learning material. In addition, both groups showed almost the same improvement, although the group of students who studied independently tended to be slower in the learning process compared to the group in formal educational institutions. This can be due to differences in the level of discipline and support they receive during their studies.

The adaptive learning system also collects data on the level of student engagement while using the platform. Based on the analysis, 70% of students from both groups showed a high level of engagement, measured through the time spent in the learning sessions and the frequency with which they interacted with the learning modules. The student group from formal education institutions showed slightly higher engagement, with 75% of them spending more than 3 hours a week studying, while the group of students who studied independently had 65% of those who studied for more than 3 hours.

Higher engagement in student groups from formal education institutions may be due to the existence of more structured schedules and supervision from teachers. In contrast, groups of students who study independently have more freedom, which can lead to a lack of consistency in engagement. However, actively engaged students showed better results, which underscored the importance of time management and motivation in the use of adaptive learning systems.

The level of student engagement and learning outcomes shows a positive relationship. Students who are more engaged with the learning platform show greater improvement on the final test. This suggests that adaptive learning can be more effective if students have control over their learning time and rhythm, as well as if they can actively engage in the material presented. It also emphasizes the importance of flexibility in the design of adaptive learning systems, which allow students to learn at their own pace.

The case study was conducted on two students who had different learning experiences. The first student, Amir, came from a formal educational institution and used an adaptive system for 4 weeks. Amir's pre-test score is 55, while his post-test score increases to 90. Amir reports that the platform provides automatic adjustments that are very helpful in clarifying parts of the material that are difficult to understand. The second student, Lina, learns Arabic independently through the same platform. Lina's pre-test score is 60, while her post-test score increases to 80. Lina feels that while the platform is helpful, she sometimes has a hard time keeping motivated without more scrutiny.

Amir who participated in structured learning in formal education institutions showed better results, which shows the importance of supervision in the learning process. The adaptive platform provides effective customization based on Amir's learning progress. On the other hand, Lina, who studies independently, faces challenges in managing her study time and remains motivated without the support of teachers. This shows that although adaptive learning is flexible, the existence of supervision or guidance can improve learning outcomes, especially for students who learn independently.

The results of this case study underscore the importance of balancing flexibility and support in adaptive learning systems. Although adaptive learning technologies provide the freedom to learn at their own pace, external factors of supervision and support such as teachers or mentors play a crucial role in learning success. These two elements—flexibility and support—must be considered in designing an adaptive learning system for Arabic in order to optimize the learning experience for all students.

The results of the study show that the use of adaptive learning technology in Arabic language education can significantly improve student learning outcomes. Students who used the adaptive platform experienced a significant increase in scores on the post-test compared to their pre-test. In addition, the level of student involvement also has a positive effect on their learning outcomes. This flexible learning system allows students to learn at their own pace, but external support, such as teacher supervision, also plays an important role in achieving optimal outcomes.

This research is in line with previous findings that suggest that adaptive learning technologies can improve student engagement and learning outcomes (Gikandi, Morrow, & Davis, 2011). However, in contrast to studies that only focus on the effectiveness of the system as a whole, this study also emphasizes the importance of external support in adaptive learning. Some other studies consider adaptive systems as stand-alone tools, but this study shows that without supervision and guidance from teachers, the effectiveness of such systems can be hampered, especially in students who learn independently.

The results of this study reflect that while adaptive learning offers flexibility, another important aspect to consider is the level of engagement and support. This research shows that

adaptive learning technology is not a single solution that can be applied without taking into account the context of the student. It is also a sign that a more personalized and structured education, tailored to each individual, has the potential to overcome the challenges in learning Arabic.

The implications of the results of this study are very important for the development of curriculum and the design of technology-based Arabic learning systems. This research underscores the importance of creating a learning platform that is not only adaptive but can also provide sufficient support to students. By understanding the relationship between flexibility, engagement, and external support, educational technology developers can design systems that are more effective in improving student learning outcomes, whether learning in formal or independent settings.

The results of this study emerged because adaptive learning systems give students full control over their learning process. Adjusting the material according to individual abilities makes learning more effective and relevant. However, more optimal results are achieved when there is support from teachers or mentors who can provide guidance in maintaining motivation and time management. Students who learn unsupervised have a tendency to be less disciplined, which impacts their involvement in the learning process.

The next step is to improve the design of the adaptive learning system by considering aspects such as guidance and social interaction that can increase student motivation. This learning system also needs to be further tested on different groups of students with different backgrounds, to identify how best to integrate flexibility and support. Further research can be focused on a deeper understanding of the interactions between these elements in the context of Arabic language learning, as well as developing more personalized and inclusive learning models.

CONCLUSION

This study found that the use of adaptive learning technology in Arabic language education not only improves students' learning outcomes, but also improves their involvement in the learning process. Students who learned with adaptive systems showed significant improvements in test scores and interactions with teaching materials compared to those who used traditional learning methods. The main advantage lies in the flexibility and customization of the material that allows each student to learn at the appropriate pace and level of difficulty.

This research makes a contribution in terms of the concept and application of adaptive learning technology designed for Arabic language education. The flexible and widely accessible design concept in this learning system provides benefits that have not been discussed before. In addition, this study adds to the understanding that the success of adaptive technology depends not only on the technology itself, but also on the external support provided by teachers, which is an important addition to the successful use of such technology in the context of Arabic language education.

The limitation of this study lies in the limited sample of one group of students who use adaptive learning platforms in one specific educational context. Further research needs to be conducted to test the effectiveness of this technology in various educational settings and at different levels of student ability. Further research directions can be focused on the development of more personalized adaptive learning models, including the influence of social interaction and teacher guidance on the effectiveness of this technology in Arabic language education.

AUTHORS' CONTRIBUTION

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.
Author 2: Conceptualization; Data curation; In-vestigation.

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