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DESIGNING AN INNOVATIVE DIGITAL LEARNING MATERIAL FOR ARABIC VOCABULARY IN MADRASAH TSANAWIYYAH

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Abstract

This study aims to design an innovative Arabic–Indonesian thematic digital dictionary tailored to the pedagogical needs of Madrasah Tsanawiyah (MTs) students. Existing digital dictionaries, such as Google Translate and Al-Ma'any, function mainly as general translation tools and do not align with curriculum requirements. Using a descriptive qualitative approach, this research involved needs analysis, conceptual design, and expert validation. Findings show a very high need for thematic digital vocabulary tools among students (85.83%) and teachers (90.91%). The proposed Q.S Dictionary integrates two core features: a Word Search feature for independent and efficient access to meanings, and a Word Example feature to support contextual understanding. UI/UX design was prioritised to enhance learners' motivation and engagement. Expert validation results indicated high feasibility, with 91.67% from material experts and 97.5% from IT experts. The study provides a validated conceptual framework for developing pedagogically aligned digital vocabulary materials for MTs students.

Keywords: Application Design; Arabic Digital Dictionary; Vocabulary Learning.

ملخص

تهدف هذه الدراسة إلى تصميم قاموس رقمي موضوعي عربي إندونيسي مبتكر مصمم خصيصًا لتلبية الاحتياجات التربوية لطلاب المدارس الإعدادية. تعمل القواميس الرقمية الحالية مثل ترجمة جوجل و المعاني بشكل أساسي كأدوات ترجمة عامة ولا تتوافق مع متطلبات المناهج الدراسية. باستخدام نهج وصفية نوعية، تضمنت هذه الدراسة تحليل الاحتياجات والتصميم المفاهيمي والتحقق من صحة النتائج من قبل الخبراء. تظهر النتائج حاجة كبيرة لأدوات المفردات الرقمية المواضيعية بين الطلاب (٨٥،٨٣٪) والمعلمين (٩٠،٩١٪). يدمج قاموس ق.س ميزتين أساسيتين: ميزة البحث عن الكلمات للوصول المستقل والفعال إلى المعاني، وميزة أمثلة الكلمات لدعم الفهم السياقي. تم إعطاء الأولوية لتصميم واجهة المستخدم/تجربة المستخدم لتعزيز دافعية المتعلمين ومشاركتهم. أشارت نتائج التحقق من الخبراء إلى جدوى عالية، حيث بلغت النسبة ٩١،٦٧٪ من خبراء المواد و ٩٧،٥٪ من خبراء تكنولوجيا المعلومات. توفر الدراسة إطارًا مفاهيميًا تم التحقق من صحته لتطوير مواد مفردات رقمية متوافقة تربويًا لطلاب اللغات الوسيطة.

كلمات أساسية: التصميم التطبيق؛ معجم عربي رقمي؛ تعليم المفردات.

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Introduction

The growth of Arabic vocabulary learning from 1987 to 2024 has shown a significant shift from traditional memorization methods to tech-based learning.[1] Whereas instruction previously relied heavily on textbooks, now digital media like apps, websites, and interactive platforms are the main tools for enhancing the learning experience.[2] The integration of advanced technologies such as Virtual Reality (VR), Augmented Reality (AR), Internet of Things (IoT), and Artificial Intelligence (AI) has expanded from the industrial sector to various aspects of life, including transforming the landscape of education and knowledge production.[3] While this evolution offers crucial opportunities for personalisation and collaborative learning, its effectiveness depends heavily on addressing issues of pedagogical relevance and readiness among educators.[4]

One of the fastest-growing areas of learning is mobile learning, commonly referred to as m-learning. Mobile learning is an effective and popular method in education thanks to the widespread use of mobile devices.[5] M-learning is defined as a multifaceted process that includes theory-based pedagogical approaches to address various educational demands.[6] A derivation of this concept, Mobile-Assisted Language Learning (MALL), is specifically designed for second language learning using similar devices, with a wide variety of implementations ranging from the use of applications to the utilisation of services such as SMS-based vocabulary delivery.[7] In the context of application design, the pedagogical effectiveness of MALL is often constrained by the lack of a strong theoretical or

[1] Rosyawati Ab Rahim et al., "Arabic Vocabulary Applications Bibliometric Analysis from 1987 to 2024," *Environment-Behaviour Proceedings Journal* 10, no. SI24 (2025): 79–86, https://doi.org/10.21834/e-bpj.v10iSI24.6367.

[2] Abid Haleem et al., "Understanding the Role of Digital Technologies in Education: A Review," *Sustainable Operations and Computers* 3 (2022): 275–85, https://doi.org/10.1016/j.susoc.2022.05.004.

[3] Shan Wang et al., "Artificial Intelligence in Education: A Systematic Literature Review," *Expert Systems with Applications* 252 (October 2024): 124167, https://doi.org/10.1016/j.eswa.2024.124167; Khairul Hafezad Abdullah et al., "Internet of Things IoT) in Education: A Bibliometric Review," *International Journal of Information Science and Management (IJISM)* 22, no. 1 (2024), https://doi.org/10.22034/ijism.2023.1977600.0; Murat Sümer and David Vaněček, "A Systematic Review of Virtual and Augmented Realities in Higher Education: Trends and Issues," *Innovations in Education and Teaching International* 62, no. 3 (2025): 811–22, https://doi.org/10.1080/14703297.2024.2382854.

[4] Andrés F. Mena-Guacas et al., "Educational Transformation Through Emerging Technologies: Critical Review of Scientific Impact on Learning," *Education Sciences* 15, no. 3 (2025): 368, https://doi.org/10.3390/educsci15030368.

[5] Quadri Noorulhasan Naveed et al., "Mobile Learning in Higher Education: A Systematic Literature Review," *Sustainability* 15, no. 18 (2023): 13566, https://doi.org/10.3390/su151813566.

[6] Gizeh Rangel-de Lazaro and Josep M. Duart, "Moving Learning: A Systematic Review of Mobile Learning Applications for Online Higher Education," *Journal of New Approaches in Educational Research* 12, no. 2 (2023): 198–224, https://doi.org/10.7821/naer.2023.7.1287.

[7] Mariela Mihaylova et al., "A Meta-Analysis on Mobile-Assisted Language Learning Applications: Benefits and Risks," *Psychologica Belgica* 62, no. 1 (2022): 252, https://doi.org/10.5334/pb.1146.

operational framework.[8] In addition, designers must contend with device quality limitations, where low-capability handheld devices can only provide limited graphics and displays. This situation can affect student motivation and interest, demanding User Interface and User Experience (UI/UX) design solutions that remain attractive and optimal even with minimal technical specifications.[9]

Despite the proliferation of digital dictionary applications, most existing tools continue to function primarily as translation aids that present word equivalents without sufficient attention to pedagogical principles of vocabulary acquisition, particularly for beginner learners. The vocabulary presented is often not structured thematically in accordance with the Madrasah Tsanawiyah (MTs) curriculum, lacks examples of use in real contexts for communicative learning, and its interactive features are rarely optimised to support student engagement and independent learning. This gap is further compounded by the lack of research literature focusing on the development of design guidelines for Mobile Learning Applications in general.[10]

In response to these challenges, this study presents an innovative contribution through the initial design of Q.S Dictionary, a thematic Arabic-Indonesian digital dictionary specifically designed for Madrasah Tsanawiyah (MTs) students. The novelty of this design lies in its integration of pedagogical principles for beginner learners, where the material is arranged thematically to align with the applicable curriculum and is supplemented with contextual usage examples to support understanding of meaning and simple communication skills. In addition, this design emphasises interactive features intended to stimulate student motivation and independence in learning. At this stage, the main focus of the research is to finalise a design concept that is relevant to the characteristics and learning needs of the digital generation in the madrasah educational environment.

Method

This research used a descriptive qualitative approach to produce a design for the Q.S. Dictionary as an innovative digital teaching material in learning Arabic vocabulary at the Madrasah Tsanawiyah level. The qualitative approach was chosen because it allows for an in-depth exploration of the learners' needs, learning experiences, and user perceptions that form the basis for designing learning media. Needs analysis was conducted through interviews and

[8] Xianyun Wang et al., "Designing a Pedagogical Framework for Mobile-Assisted Language Learning," *Heliyon* 10, no. 7 (2024): e28102, https://doi.org/10.1016/j.heliyon.2024.e28102.

[9] Aiden Rose F. Domingo et al., "Are Future Teachers 'Tech-Savvy'? A Correlational Study on Attitudes and Perceptions of Mobile-Assisted Language Learning in the Era of Digitalized Education," *Procedia Computer Science* 263 (2025): 147–55, https://doi.org/10.1016/j.procs.2025.07.019.

[10] Alex Sander Clemente De Souza and Luciana Debs, "Concepts, Innovative Technologies, Learning Approaches and Trend Topics in Education 4.0: A Scoping Literature Review," *Social Sciences & Humanities Open* 9 (2024): 100902, https://doi.org/10.1016/j.ssaho.2024.100902.

questionnaires with students and Arabic teachers to explore difficulties in vocabulary acquisition as well as preferences for the use of devices, teaching materials, and digital media in learning. Exploratory data obtained from interviews and observations served as the main foundation for formulating design specifications and application features. Design validation was conducted using expert judgement involving two Arabic language lecturers and one Arabic language teacher as material experts, and one media/IT expert. The assessment included aspects of content suitability, visual appearance, ease of use, media innovation, and pedagogical feasibility.

The validation instrument used a four-level Likert scale questionnaire, namely (1) not suitable, (2) less suitable, (3) suitable, and (4) very suitable. Expert scores were summed and compared to the maximum score to determine the percentage of design feasibility. The feasibility percentages were interpreted using the following criteria: ≥76% (very feasible), 56–75% (feasible), 40–55% (quite feasible), and <40% (not feasible). This quantification of expert judgments was intended to enhance the objectivity of the feasibility assessment, ensuring that the validation results were not only descriptive but also methodologically measurable.

Data were analysed using the Miles and Huberman interactive analysis model which includes three stages: data reduction through selection and categorisation of relevant information, data presentation in the form of a narrative description of the application design, and conclusion drawing related to the contribution of Q.S Dictionary as an innovative digital teaching material that is contextual, interactive, and according to the characteristics of Madrasah Tsanawiyah students.

Result and Discussion

Need Analysis

Arabic plays a vital role as a means of daily communication for more than 400 million speakers, confirming its status as one of the six official languages of the United Nations.[11] In Arabic language learning, vocabulary acquisition is the main foundation for the development of students' language skills.[12] Vocabulary is a fundamental element in second language acquisition as it supports both receptive (listening, reading) and productive (speaking, writing) skills.[13] In response to these challenges, digital dictionaries come as an innovation that not only expands the basic functions of translation but also fundamentally supports the pedagogical aspects of vocabulary learning.

[11] Hassan Izzeddin Sarsak, "Developing the First Digital Occupational Therapy Dictionary Worldwide: A Promising Mobile Application Model for Occupational Therapy Service Providers and Recipients," *INQUIRY: The Journal of Health Care Organization, Provision, and Financing* 61 (January 2024): 00469580241282060, https://doi.org/10.1177/00469580241282060.

[12] Aisah Hasmam et al., "Word Selection in Teaching Arabic Vocabulary for Lower Secondary Level," *Creative Education* 07, no. 03 (2016): 387–95, https://doi.org/10.4236/ce.2016.73038.

[13] I. S. P. Nation, *Learning Vocabulary in Another Language* (Cambridge University Press, 2001).

As vocabulary learning is often the starting point in L2 learning, educators and researchers continue to explore which instructional methods lead to the most effective vocabulary acquisition.[14] In the 21st century, learners are required to master a range of abilities that enable them to respond to practical challenges within a rapidly changing environment. Among these important competencies is technological skills, as the use of technology encourages student-centred learning (SCL) by providing space for them to learn in a more creative, interactive, and flexible manner.[15] The integration of digital technology also reduces limitations of time and space, supports more authentic learning processes, and encourages collaborative learning practices.[16]

Technological advancement has further stimulated the birth of various applications that help students master vocabulary independently through interactive features that can be accessed at any time. One rapidly growing innovation in this area is the digital dictionaries, which are now more popular than printed dictionaries because they offer effectiveness, efficiency, and ease of use. This trend is in line with the characteristics of today's digital generation, such as the Millennial, Z, and Alpha Generations, who are familiar with technology and are used to learning through digital environments.[17] Mobile devices have become popular language learning tools thanks to their wide reach.[18] To meet the needs of the on-demand generation who want 'everything, anywhere, anytime', mobile applications provide various benefits because they are easy to use, convenient, efficient, flexible tools for collaboration, coordination and communication.[19]

[14] Caihui Zhang et al., "Effectiveness of L1 and Pictures in Multimedia Conditions on Learning Second-Language Vocabulary: A Meta-Analysis," *Educational Research Review* 47 (May 2025): 100681, https://doi.org/10.1016/j.edurev.2025.100681.

[15] Seoyeon Choi et al., "Analyzing Teacher–AI Interaction Patterns across Teacher Experience and AI Proficiency in Student-Centered Lesson Design," *Teaching and Teacher Education* 169 (January 2026): 105266, https://doi.org/10.1016/j.tate.2025.105266.

[16] Qian Xu et al., "Using a Mobile Vocabulary Application to Enhance L2 Learners' Vocabulary Acquisition: Possibilities and Challenges," *Online Learning* 29, no. 3 (2025), https://doi.org/10.24059/olj.v29i3.4918.

[17] R. Taufiqurrochman and Dewi Suci, "Student's Perception of E-Dictionary Arabic Indonesian in IR 4.0 Era," *Proceedings of the 2nd International Conference on Quran and Hadith Studies Information Technology and Media in Conjunction with the 1st International Conference on Islam, Science and Technology, ICONQUHAS & ICONIST* (Bandung, Indonesia), EAI, 2020, https://doi.org/10.4108/eai.2-10-2018.2295473.

[18] Petra Poláková, "Use of a Mobile Learning Application in the Process of Foreign Vocabulary Learning," *Procedia Computer Science* 207 (2022): 64–70, https://doi.org/10.1016/j.procs.2022.09.038.

[19] Ana Ibáñez Moreno and Anna Vermeulen, "Using VISP (VIdeos for SPeaking), a Mobile App Based on Audio Description, to Promote English Language Learning among Spanish Students: A Case Study," *Procedia - Social and Behavioral Sciences* 178 (April 2015): 132–38, https://doi.org/10.1016/j.sbspro.2015.03.169.

Alhaifdz's findings reveal that 61% of students use both types of dictionaries, 29% only use digital dictionaries, and 10% continue to use printed dictionaries.[20] These data confirm the increasing reliance on digital devices in Arabic language learning, as well as showing the importance of learning innovations that are relevant to technological developments and the characteristics of the modern generation. However, several popular Arabic digital dictionaries, such as Google Translate, Al-Ma'any, and Arabic–Indonesian dictionaries available on digital platforms like the Play Store, generally function as translation tools and are not aligned with the curriculum or pedagogical needs of Madrasah Tsanawiyah students. This condition highlights a significant gap for developing a digital dictionary that not only provides translation but also supports vocabulary learning through structured thematic content, contextual usage, and features that encourage independent learning.

Smartphone apps effectively mark the democratisation of access to language education, surpassing physical and time barriers and providing great flexibility for learners to customise their study sessions.[21] Data shows that the number of downloads of the Arabic-Indonesian Dictionary in app form reached around 1,000,000 in 2020, a figure that far surpasses the distribution of the printed version.[22] This data confirms that digital dictionaries are a possible learning innovation to effectively support the development of students' pedagogical aspects.

However, to turn this potential into a functional pedagogical solution, empirical validation of user needs is required. A needs analysis is crucial to gather specific data that will guide the design of this digital dictionary.

Table 1. Categories of Need Levels

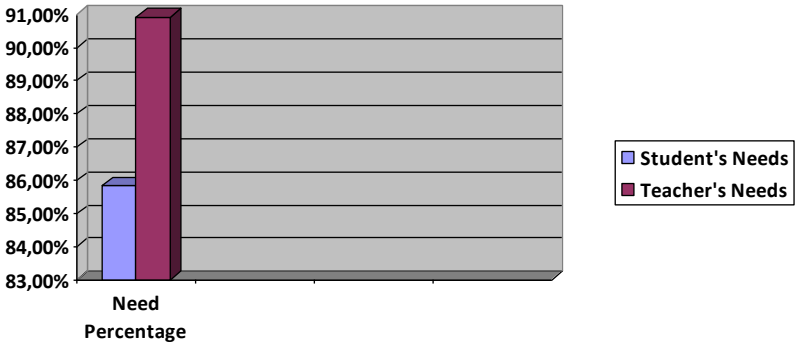
No	Percentage	Category
1	81-100%	Very High Need
2	61-80%	High Need
3	41-60%	Moderate Need
4	21-40%	Low Need
5	1-20	Very Low Need

[20] Ahmad Zaki Alhafidz, "The Existence of Arabic Print Dictionaries in the Digital Age/ Eksistensi Kamus Cetak Bahasa Arab Di Era Digital," *Ijaz Arabi Journal of Arabic Learning* 6, no. 1 (2023), https://doi.org/10.18860/ijazarabi.v6i1.19044.

[21] Rosyawati Ab.Rahim et al., "Arabic Vocabulary Learning through Smartphone Application: A Bibliometric Analysis," *International Journal of Modern Education* 6, no. 22 (2024): 409–27, https://doi.org/10.35631/IJMOE.622029.

[22] Asa Qubaila Sitta Zidna Rizqia et al., "Arabic-Indonesian Dictionary: Comparison of Digital Dictionary and Printed Dictionary," *Al-Ma'rifah* 19, no. 1 (2022): 41–52, https://doi.org/10.21009/almakrifah.19.01.04.

Analysis of the needs questionnaire explicitly confirmed a very high demand for the development of a digital thematic dictionary to support Arabic vocabulary learning. The students' level of need reached 85.83%, while the teachers' level of need was recorded higher at 90.91%; both results were categorised as 'Very High Need'.



This data provides strong empirical evidence that thematic digital dictionaries are not merely a preference, but an urgent necessity (Very High Need) to support Arabic vocabulary learning at the MTs level.The results strongly justify the need for instructional innovation to address existing gaps in vocabulary learning, particularly the lack of pedagogically oriented digital resources. Consequently, the development of a thematic digital dictionary is essential to ensure alignment with the curriculum, enhance contextual vocabulary understanding, and support students' systematic and independent vocabulary development.

Conceptual Design of Q.S Dictionary

The design of the Q.S Dictionary application is based on empirical validation of student and teacher needs analysis, to produce effective and relevant digital teaching materials for Arabic vocabulary acquisition. The results of the analysis confirm that this application must be able to support independent learning and the effectiveness of the teaching and learning process. These findings are in line with the views of Kübra Okumuş Dağdeler, who states that maximum efficiency in vocabulary learning can be achieved by learners through a combination of the use of relevant technical features and the application of appropriate pedagogical approaches.[23]

Based on this need, two core features were designed as the main pedagogical solution, Word Search Feature and the Word Example Feature (See Table 2). The Word Search feature is implemented to facilitate quick and accurate access to meaning, thus enhancing students' independent understanding and reducing

[23] Kübra Okumuş Dağdeler, "A Systematic Review of Mobile-Assisted Vocabulary Learning Research," *Smart Learning Environments* 10, no. 1 (2023): 19, https://doi.org/10.1186/s40561-023-00235-z.

dependence on teachers. Furthermore, the Word Examples feature is aimed at helping students understand vocabulary in its natural context (practical comprehension), which is an important aspect of linguistic competence.

Table 2. Features of the Q.S Dictionary App

Feature	Description
Search feature	This feature is intended to help students access word meanings quickly and accurately, thereby enhancing independent comprehension and reducing reliance on teachers.
Word's example feature	This feature is designed to help students understand the meanings of words accurately within their natural context, thereby fostering practical comprehension and usage skills.

The implementation of features in Q.S Dictionary is grounded in the fundamental role of vocabulary as the foundation of language skills. Vocabulary is a very important element in language learning, and this is in line with Wilkins' view that: "without grammar very little can be conveyed, but without vocabulary nothing can be conveyed."[24] Due to this crucial role, adequate vocabulary mastery is essential as it underpins the development of all students' language skills, both receptive (listening and reading) and productive (speaking and writing).[25] The Word Search and Word Examples features were designed to respond to the crucial need of strengthening students' cognitive aspects. This justification is reinforced by study findings, which show that EFL learners who utilise mobile dictionaries have a more significant improvement in language skills compared to those who rely solely on printed dictionaries.[26]

A good digital dictionary should be able to guide students and facilitate independent learning. Learner autonomy is closely associated with students'self-efficacy, because self-efficacy is a significant indicator of academic success in foreign languages, which also influences students' cognitive and behavioural engagement.[27] This indicates that innovation in designing digital dictionaries must place user needs, especially students at the Madrasah Tsanawiyah level as the main consideration to achieve optimal learning outcomes.

[24] Yanfang Zeng et al., "Vocabulary Instruction for English Learners: A Systematic Review Connecting Theories, Research, and Practices," *Education Sciences* 15, no. 3 (2025): 262, https://doi.org/10.3390/educsci15030262.

[25] Mahtab Mohammadi et al., "University Students' Academic Vocabulary Development through Mobile-Assisted Learning: Exploring the Impacts on Receptive and Productive Knowledge," *Heliyon* 10, no. 7 (2024): e28103, https://doi.org/10.1016/j.heliyon.2024.e28103.

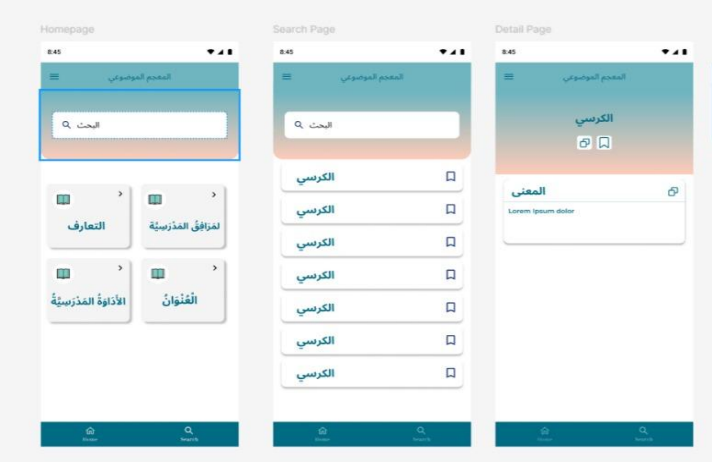
[26] Mehrak Rahimi and Seyed Shahab Miri, "The Impact of Mobile Dictionary Use on Language Learning," *Procedia - Social and Behavioral Sciences* 98 (May 2014): 1469–74, https://doi.org/10.1016/j.sbspro.2014.03.567.

[27] Kefah A. Barham and Rachel Clarke, "'When We See Strange Words': Student-Centered Experiences Using Dictionary Apps Within and Beyond the English Language Classroom in Palestine," *Sage Open* 12, no. 4 (2022): 21582440221141697, https://doi.org/10.1177/21582440221141697.

Good user interface design (UID) is achieved through the design and implementation of a proven design framework.[28] Effective interface design serves a dual purpose: enhancing visual appeal through layout, colour, illustrations, and typography, while simultaneously ensuring that learning activities remain interactive and pedagogically meaningful. Therefore, the aesthetic aspect of design is crucial, as it is defined as design that enhances the appeal and beauty of objects in the user's visual.[29] Although its definition varies, aesthetic elements (such as colour or visual complexity) have been proven to influence visual appeal, resulting in an instantly pleasant subjective experience.[30]

Besides focusing on the cognitive domain, the design of the Q.S Dictionary App also crucially considered the learners' affective domain. Electronic dictionaries are credited for their multifaceted appeal, as their accuracy, time-saving features, and accessibility are well-suited to the demands of the fast-paced era. Research shows that user-friendliness and high accessibility make students find digital dictionaries enjoyable.[31] Thus, the intuitive interface design and navigation flow in Q.S Dictionary serve as a pedagogical strategy to increase students' interest, motivation, and positive attitude towards learning Arabic vocabulary.

Figure 1. User Interface Design



[28] Masyura Ahmad Faudzi et al., "User Interface Design in Mobile Learning Applications: Developing and Evaluating a Questionnaire for Measuring Learners' Extraneous Cognitive Load," *Heliyon* 10, no. 18 (2024): e37494, https://doi.org/10.1016/j.heliyon.2024.e37494.

[29] Alessia Ruf et al., "Aesthetic Design of App Interfaces and Their Impact on Secondary Students' Interest and Learning," *Computers and Education Open* 3 (December 2022): 100075, https://doi.org/10.1016/j.caeo.2022.100075.

[30] Irene Reppa and Siné McDougall, "Aesthetic Appeal Influences Visual Search Performance," *Attention, Perception, & Psychophysics* 84, no. 8 (2022): 2483–506, https://doi.org/10.3758/s13414-022-02567-3; Sebastian A. C. Perrig et al., "Smartphone App Aesthetics Influence Users' Experience and Performance," *Frontiers in Psychology* 14 (June 2023): 1113842, https://doi.org/10.3389/fpsyg.2023.1113842.

[31] Imran Alrashdan et al., "Attitudes of Jordanian School Students toward Dictionaries," *Heliyon* 10, no. 21 (2024): e39499, https://doi.org/10.1016/j.heliyon.2024.e39499.

User Interface Design (UID) is a crucial component of mobile learning applications, including the Q.S Dictionary application. Design failures such as unattractive, confusing, or boring interfaces can directly reduce student interest and lead to failure in supporting learning objectives. Miya & Govender for example examined the relationship between the UI/UX design of e-learning platforms and the overall learning environment in higher education. The study concluded that paying attention to interface design and user experience is a crucial factor in ensuring the success of the learning process in e-learning systems.[32]

The effectiveness of an educational innovation lies in its design. Previous studies consistently demonstrate that well-designed digital learning tools, which offer positive user experiences, play a vital role in meeting user expectations and encouraging acceptance of new technologies.[33] Thus, UI/UX design quality in Q.S Dictionary is a fundamental endeavour to maintain student engagement and strategically support the affective domain of learning.

Expert Validation Results

Validation from the content experts, which involved two lecturers and one teacher, showed that the design of Q.S Dictionary was considered very suitable to be developed with a percentage of 91.67% acceptability, where two experts stated 'accepted without revision,' while one suggested minor revision. This finding confirms that the design of vocabulary content, alignment with curriculum competencies, and clarity of learning objectives have been appropriately addressed. Furthermore, the IT expert validation from a software developer also showed a very high result of 97.5%, with the status of 'accepted with revision'. This reflects that the UI/UX design, application navigation, and feature structure have strong feasibility as digital-based learning media. The recommended revisions are mainly related to improving the interface structure to make student interaction more intuitive and support a fun and sustainable learning experience.

Overall, the two validation results confirmed that the conceptual design of Q.S Dictionary has reached the academic and technological eligibility standards to enter the product development stage. This high level of pedagogical and technological feasibility indicates that this digital dictionary has the potential to be an effective innovation in Arabic vocabulary learning, especially in strengthening students' cognitive, affective, and psychomotor domains.

[32] Jehad Saad Alqurni, "Evaluating the User Interface and Usability Approaches for E-Learning Systems:," *International Journal of Information Technology and Web Engineering* 18, no. 1 (2023): 1–25, https://doi.org/10.4018/IJITWE.333638.

[33] Zibin Chen and Jaehwan Lee, "The Influence of UI Design Attributes and Users' Uncertainty Avoidance on Stickiness of the Young Elderly Toward mHealth Applications," *Behavioral Sciences* 15, no. 5 (2025): 581, https://doi.org/10.3390/bs15050581.

Pedagogical Implications

The design of Q.S Dictionary represents a form of digital innovation in Arabic language learning to support teachers in overcoming vocabulary comprehension difficulties that students are frequently faced with. By providing self-access tools, teachers can facilitate the development of students' pedagogical aspects with vocabulary retention and ease of understanding. This approach is in line with the concept of authentic learning, which emphasises meaningful connections between classroom learning and real-world language use, including learners' everyday experiences and personal interests.[34] This will allow students to learn independently, integrate their autonomous learning into classroom activities, and provide opportunities for students to use the language authentically outside the control of educational institutions.[35]

Furthermore, student-centred learning has been proven to be effective in increasing active participation and independence, as autonomy has been shown to encourage greater exploration of knowledge.[36] This increase in independence is crucial, given that online learning behaviours such as motivation, engagement and attitude are the most important factors influencing learning outcomes.[37] Therefore, effective learning must be able to foster curiosity and the drive to explore. In this context, an effective UI/UX design, characterised by attractive visuals, intuitive navigation, and enjoyable interaction, becomes a determining factor in sustaining learners' motivation and engagement. Poor User Interface (UI) design demands close visual attention, thereby increasing cognitive load.[38] Therefore, effective UID design must focus learners' attention on learning, not on navigating the application.

Design factors directly influence learning, and learning in turn influences the transfer of acquired knowledge.[39] The simplicity of system operation is a critical determining factor in user experience (UE) and technology acceptance by learners. A platform that is easy to learn can significantly reduce the cognitive load on users while increasing their engagement, as it minimizes frustration during initial use.

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[34] Valentina Nachtigall and Joachim Wirth, "Perspectives on Authentic Learning," *European Journal of Psychology of Education* 39, no. 4 (2024): 3213–25, https://doi.org/10.1007/s10212-024-00897-4.

[35] David Gardner and Lindsay Miller, "Managing Self-Access Language Learning: Principles and Practice," *System* 39, no. 1 (2011): 78–89, https://doi.org/10.1016/j.system.2011.01.010.

[36] Ji Liu et al., "Student-Driven Instruction, Agency, and Curiosity: Mediation Evidence from 46,084 Subjects Across Multiple Sites," *Education Sciences* 15, no. 11 (2025): 1518, https://doi.org/10.3390/educsci15111518.

[37] Jing Li and Chi-Hui Wu, "Determinants of Learners' Self-Directed Learning and Online Learning Attitudes in Online Learning," *Sustainability* 15, no. 12 (2023): 9381, https://doi.org/10.3390/su15129381.

[38] Faudzi et al., "User Interface Design in Mobile Learning Applications."

[39] Fernanda Fauth and Juan González-Martínez, "On the Concept of Learning Transfer for Continuous and Online Training: A Literature Review," *Education Sciences* 11, no. 3 (2021): 133, https://doi.org/10.3390/educsci11030133.

Interface design with clear information architecture and structured navigation allows learners to quickly familiarise themselves with the system's functions, thereby effectively lowering barriers to use.[40]

As a digital innovation in Arabic language learning, the design of Q.S Dictionary is projected to contribute not only to the cognitive and affective aspects, but also to the development of students' psychomotor skills. Comprehensive vocabulary mastery supports both receptive and productive skills, as vocabulary understanding functionally facilitates students in reading comprehension and applying it in speaking and writing skills.[41] Therefore, the use of this digital dictionary is expected to encourage the use of vocabulary in authentic language use and increase students' confidence through more accurate and meaningful vocabulary choices.[42]

Table 3. Pedagogical Implications of Q.S Dictionary

Pedagogical Implications	Contribution to learning	The effect to be expected
Cognitive (Knowledge and understanding)	Provides contextualised vocabulary understanding	Quick and precise understanding
	Supporting independence in material access	Improved communication skills
	Supports memory enhancement and vocabulary acquisition	Higher retention rate
Affective (Motivation, interest and attitude)	Attractive interactive interface	Improve interest and participation
	Provide an engaging learning experience	Helps motivate self-learning
Psychomotor (language and technology skills)	Enable interactive activities through navigation of digital features	Improve technology skills
	Facilitate practice of vocabulary	Improve speaking and writing skills

Academically, this research contributes to addressing the innovation gap in Arabic teaching materials through the design of contextualized and purpose-specific digital materials. Q.S Dictionary is presented as an update to teaching materials, offering an alternative to simple translators, such as Google Translate, and complex professional dictionaries. The strength of its design lies in its integration with the 2020 KSKK curriculum and its thematic focus relevant to the needs of MTs students. This alignment is fundamental because learning applications must prioritise content relevance and user-friendliness. An effective

[40] Mei Wang et al., "Development and TAM-Based Validation of a User Experience Scale for Actual System Use in Online Courses," *Education Sciences* 15, no. 7 (2025): 855, https://doi.org/10.3390/educsci15070855.

[41] Barham and Clarke, "'When We See Strange Words.'"

[42] Fachrur Rozi Suwardy and Akmal Walad Ahkas, "The Use of Digital Dictionary Applications in Improving Understanding of Arabic Vocabulary: Case Study Of Arabic Language Education Students UINSU Medan," *Alsuna: Journal of Arabic and English Language* 7, no. 2 (2024): 239–51, https://doi.org/10.31538/alsuna.v7i2.5985.

online learning system must prioritise ease of operation, an intuitive interface, and human-oriented features to provide a smooth learning experience for users.[43]

Priority on design and content relevance is important because content that is too difficult or uninteresting can reduce students' perceived value (PV).[44] Students' perceived usefulness (PU) is maximised through the successful integration of the KSKK curriculum, coupled with easy-to-use interactive features.[45] This innovative design holistically supports improvements in students' cognitive (understanding), affective (motivation and attitude), and psychomotor (language and technology skills) aspects.

The contribution of this study lies in its conceptual framework for the design of digital teaching materials grounded in empirical needs analysis. The framework shows that meaningful innovation must be based on the integration of pedagogical theory and the contextual needs of users. This is particularly relevant given that the integration of technology among teachers is a concept that must be prioritised, as incorporating technology into the curriculum is essential for increasing student exposure and meeting future demands.[46] Technology facilitates effective collaboration between teachers and students in the pedagogical process and provides access to rich and authentic online resources, which are particularly beneficial for language learners.[47]

Conclusion

This study successfully formulates and validates a conceptual framework for Q.S Dictionary, a thematic Arabic-Indonesian digital dictionary designed as a specific innovation for Madrasah Tsanawiyah (MTs) students. The study critically addresses existing pedagogical gaps, revealing that popular digital dictionaries such as Google Translate and Al-Ma'any essentially function only as general translation tools and are not yet integrated with the curriculum and specific learning needs of MTs students. Empirical findings from the needs analysis reveal a "Very High" demand for thematic digital vocabulary tools that are aligned with the

[43] Wang et al., "Development and TAM-Based Validation of a User Experience Scale for Actual System Use in Online Courses."

[44] Cristina Dimulescu, "E-Learning Platform Usage and Acceptance of Technology after the COVID-19 Pandemic: The Case of Transilvania University," *Sustainability* 15, no. 22 (2023): 16120, https://doi.org/10.3390/su152216120.

[45] Ying-Kai Liao et al., "The Integration of the Technology Acceptance Model and Value-Based Adoption Model to Study the Adoption of E-Learning: The Moderating Role of e-WOM," *Sustainability* 14, no. 2 (2022): 815, https://doi.org/10.3390/su14020815.

[46] Niyaz Panakaje et al., "Revolutionizing Pedagogy: Navigating the Integration of Technology in Higher Education for Teacher Learning and Performance Enhancement," *Cogent Education* 11, no. 1 (2024): 2308430, https://doi.org/10.1080/2331186X.2024.2308430.

[47] Ting Liu et al., "Pedagogical Design in Technology-Enhanced Language Education Research: A Scoping Review," *Sustainability* 15, no. 7 (2023): 6069, https://doi.org/10.3390/su15076069.

curriculum, as indicated by the percentage of student needs at 85.83%, and teacher needs at 90.91%.

This urgent need calls for a pedagogical solution, which is then realized in the design of Q.S Dictionary by focusing on two main features, namely the Word Search Feature for efficient and independent access to meanings, and the Word Example Feature to ensure contextual and practical understanding. Strategically, the design integrates key learning principles across three educational domains: the cognitive domain, by facilitating meaningful and contextual vocabulary acquisition; the affective domain, through the application of an intuitive and engaging UI/UX design to enhance learners' motivation and engagement; and the psychomotor domain, by encouraging active practice and repeated interaction with vocabulary items.

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Author Contribution Statement

GR was responsible for designing the research, collecting and analysing data, developing the application prototype, and drafting the scientific article. SH and R contributed by providing guidance and input in formulating the theoretical framework and research methodology, including the selection of appropriate approaches. They also offered advice on the article's structural organisation, supervised the writing process, and carried out revisions to ensure compliance with academic standards. NG an international author, contributed by providing critical insights from an international perspective, particularly in strengthening the conceptual discussion and aligning the study with current global research trends in digital language learning.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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