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DESIGNING DIGITAL ARABIC GRAMMAR TEACHING MATERIALS THROUGH INTERACTIVE MULTIMEDIA AND SELF-REGULATED LEARNING FOR BEGINNERS

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ABSTRACT

Teaching Arabic grammar to beginner-level university students can be challenging because grammatical concepts are often abstract, and learners may struggle to apply rules in context. This study aimed to develop a preliminary conceptual design for interactive, multimedia-based digital Arabic grammar teaching materials oriented toward Self-Regulated Learning (SRL). Using an Educational Design Research (EDR) approach, the study focused on needs analysis and preliminary design. Data were collected from 55 first-semester students in the Arabic Language Education Study Program at Universitas Negeri Jakarta through classroom observations, interviews, and a 20-item questionnaire using a five-point response scale. Questionnaire data were analyzed descriptively, while observation and interview findings were used to contextualize students' reported needs. The findings indicated three main design requirements: simplified, systematic grammar explanations supported by formulas, keywords, contextual examples, and varied exercises; accessible digital materials with purposeful multimedia, interactive quizzes, and immediate feedback; and features that support self-assessment and progress monitoring. These findings informed the proposed content structure, multimedia features, and six preliminary design principles: simplification with conceptual accuracy, sequential and contextualized learning, purposeful visualization, interactive application and feedback, embedded SRL opportunities, and accessible and consistent navigation. The principles were formulated by synthesizing the identified learner needs with corresponding instructional design responses; however, they have not yet undergone expert validation or empirical testing. The study therefore offers a needs-informed design proposal for developing digital Arabic grammar teaching materials, rather than a validated or demonstrably transferable design framework. Further research is needed to develop the proposed materials, assess their content and instructional quality, and evaluate their usability and learning outcomes.

Keywords: Arabic Grammar; Digital Teaching Materials; Educational Design Research; Interactive Multimedia; Self-Regulated Learning

ABSTRAK

Pembelajaran tata bahasa Arab bagi mahasiswa tingkat pemula di perguruan tinggi menghadapi tantangan karena konsep-konsep gramatikal sering kali bersifat abstrak dan mahasiswa mengalami kesulitan dalam menerapkan kaidah dalam konteks kalimat. Penelitian ini bertujuan merumuskan desain konseptual awal bahan ajar digital tata bahasa Arab berbasis multimedia interaktif yang berorientasi pada *Self-Regulated Learning* (SRL). Dengan menggunakan pendekatan *Educational Design Research* (EDR), penelitian ini berfokus pada tahap analisis kebutuhan dan desain awal. Data dikumpulkan dari 55 mahasiswa semester pertama Program Studi Pendidikan Bahasa Arab, Universitas Negeri Jakarta, melalui observasi kelas, wawancara, dan kuesioner yang terdiri atas 20 butir dengan skala respons lima poin. Data kuesioner dianalisis secara deskriptif, sedangkan hasil observasi dan wawancara digunakan untuk memberikan konteks terhadap kebutuhan belajar yang dilaporkan mahasiswa. Temuan penelitian menunjukkan tiga kebutuhan utama sebagai dasar perancangan, yaitu penyederhanaan dan penyajian kaidah tata bahasa Arab secara sistematis melalui rumus, kata kunci, contoh kontekstual, dan latihan yang bervariasi; penyediaan bahan ajar digital yang mudah diakses dengan dukungan multimedia yang terarah, kuis interaktif, dan umpan balik langsung; serta penyediaan fitur yang mendukung regulasi belajar mandiri melalui penilaian diri dan pemantauan kemajuan belajar. Temuan

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tersebut menjadi dasar penyusunan struktur materi, fitur multimedia, dan enam prinsip desain awal yang diusulkan, yaitu penyederhanaan dengan tetap menjaga ketepatan konsep, pembelajaran yang berurutan dan kontekstual, visualisasi yang terarah, penerapan kaidah secara interaktif dan pemberian umpan balik, integrasi kesempatan untuk menerapkan SRL, serta navigasi yang mudah diakses dan konsisten. Prinsip-prinsip tersebut dirumuskan melalui sintesis antara kebutuhan belajar yang teridentifikasi dan respons desain instruksional yang sesuai. Namun, prinsip-prinsip tersebut belum melalui validasi ahli maupun pengujian empiris. Oleh karena itu, penelitian ini menghasilkan usulan desain yang didasarkan pada analisis kebutuhan sebagai landasan pengembangan bahan ajar digital tata bahasa Arab, bukan kerangka desain yang telah tervalidasi atau terbukti dapat diterapkan secara luas. Penelitian selanjutnya perlu mengembangkan bahan ajar yang diusulkan, menilai kualitas isi dan instruksionalnya, serta mengevaluasi kemudahan penggunaannya dan hasil belajar mahasiswa.

Kata Kunci: tata bahasa Arab; bahan ajar digital; Educational Design Research; multimedia interaktif; Self-Regulated Learning

INTRODUCTION

Arabic language learning in higher education aims to develop students' proficiency in listening, speaking, reading, and writing, supported by adequate mastery of Arabic grammar (*qawāʿid*), particularly *nahwu* (syntax) and *sharaf* (morphology). Grammatical knowledge helps learners understand syntactic relationships, morphological changes (*taṣrīf*), and meanings conveyed through linguistic structures (Maimuna et al., 2022; Rufaiqoh et al., 2023). However, Arabic grammar remains challenging for beginner-level university students because of its complex rules, varied patterns and exceptions, and the abstract nature of some concepts. Instructional practices that overemphasize theoretical explanations and memorization may further limit students' ability to apply grammatical knowledge in meaningful linguistic contexts (M. Hamid, 2024; Thohir, 2020; Wahab, 2022). These challenges are particularly relevant in higher education, where students enter Arabic language programs with diverse educational backgrounds and varying levels of prior proficiency. Consequently, students may need to master fundamental concepts of *nahwu* and *sharaf* within a relatively limited period, while some continue to struggle to understand grammatical rules, build confidence, and apply them in authentic linguistic contexts (Huda et al., 2023; Masyitoh et al., 2026; Syarifah et al., 2026).

These learning challenges were also reflected in a needs analysis involving 55 first-semester students in the Arabic Language Education Study Program at Universitas Negeri Jakarta. The findings showed that 78.18% of respondents preferred instructional materials that presented grammatical concepts through simplified formulas, patterns, or keywords to facilitate understanding. In comparison, 87.27% said they needed contextual examples and varied practice activities. In addition, 41.82% reported difficulties remembering and applying grammatical rules when completing exercises and constructing Arabic sentences. Responses to open-ended questions also indicated difficulty determining *iʿrāb*, understanding *taṣrīf*, identifying the syntactic functions of sentence elements, and connecting different grammatical rules. Students also expressed a need for visual illustrations, concept maps, tables, videos, animations, interactive exercises, and immediate feedback. These findings suggest that the learning challenge concerns not only the availability of digital learning resources but also how grammatical content is organized and presented to make complex concepts more comprehensible and to support independent learning.

Advances in information technology have created opportunities to design more flexible and learner-centered digital teaching materials (Fauzia et al., 2024; Haniefa et al., 2025). Digital materials can integrate text, images, audio, video, animation, and interactive activities within a learning environment. The Cognitive Theory of Multimedia Learning suggests that well-designed verbal and visual representations can support information processing and help learners

understand complex concepts (Masaeli et al., 2024; R. E. Mayer, 2009). In Arabic grammar instruction, interactive multimedia can be used to visualize sentence structures, morphological changes, the contextual use of grammatical rules, and practice activities accompanied by immediate feedback (Al-ghifari et al., 2025; Rufaiqoh et al., 2023). Nevertheless, using technology or adding multimedia elements alone does not guarantee improved comprehension. The selection of media and the organization of instructional content need to be aligned with the characteristics of grammatical concepts, instructional objectives, and students' learning needs.

Beyond content presentation, Arabic grammar learning requires support that helps students actively manage their learning processes. In this regard, Self-Regulated Learning (SRL) provides a relevant pedagogical foundation because it emphasizes learners' ability to set goals, monitor their understanding and progress, evaluate learning outcomes, and reflect on their learning processes (Zimmerman, 2002). SRL principles can inform the design of features that facilitate goal setting, self-check activities, progressive practice, feedback, self-assessment, reflection, and progress monitoring. Integrating SRL into digital teaching materials may provide students with opportunities to take a more active role in regulating their learning rather than merely following explanations and completing exercises. Although previous studies have discussed the role of SRL in learning (Rusdiah, 2021; Utami & Syihabuddin, 2023), integrating these principles into digital Arabic grammar teaching materials requires further design consideration, particularly for beginner-level university students.

Previous studies have explored various forms of digital media for Arabic language learning, including electronic modules (Hamid et.al, 2024), booklets (Fadhil, 2025), interactive multimedia (El Hanif, 2022; Ilmiani et al., 2024), Android-based applications (Magda & Anwar, 2023; Wijaksono, 2020), and digital learning platforms (Febriana & Iswari, 2023; Nufus et al., 2022). Other studies have examined the use of mind maps and game-based activities in teaching *qawāʿid*. Research has also discussed how interactive multimedia and SRL contribute to students' motivation and learning outcomes (Ghafar & Noor, 2026; Nurmahanani, 2025). Collectively, these studies illustrate the range of possibilities for using digital resources in Arabic language instruction. However, the availability of digital media does not necessarily ensure that grammatical content is simplified systematically, multimedia elements are aligned with instructional objectives, or students receive structured support for monitoring and evaluating their learning. Further design work is therefore needed to articulate how the organization of *nahwu* and *sharaf* content, interactive multimedia presentation, and SRL-oriented learning activities can be integrated in response to the needs of beginner-level university students.

Using an Educational Design Research (EDR) perspective, this study proposes Shortcut Qawāʿid, a preliminary conceptual design for digital Arabic grammar (*nahwu* and *sharaf*) teaching materials for beginner-level university students that integrates content simplification (concise formulas, concept maps, and visualized patterns), interactive multimedia, and Self-Regulated Learning (SRL) activities to support independent practice. Rather than simply digitizing print texts or introducing a new linguistic theory, the study addresses a key research gap by translating identified student needs into a coherent framework that links instructional design decisions directly to learner regulation and content organization. At this stage, these preliminary design principles serve as foundational specifications for future application development and validation, without claiming full product completion or proven learning outcomes.

Accordingly, this study employs an Educational Design Research (EDR) approach, focusing on needs analysis and the preliminary design of *Shortcut Qawāʿid*. It aims to (1) identify the learning needs and difficulties of beginner-level university students in learning Arabic

grammar, (2) formulate a preliminary design framework that integrates grammatical content simplification, interactive multimedia, and SRL principles, and (3) specify preliminary instructional design principles to guide subsequent application development. The expected outcome is a needs-informed conceptual framework for digital Arabic grammar teaching materials that connects content organization, multimedia presentation, and support for learner regulation within a coherent instructional design. This framework is intended to provide a basis for subsequent product development, expert review, usability evaluation, and learning-outcome assessment.

METHOD

This study employed an Educational Design Research (EDR) approach to inform the design of digital Arabic grammar teaching materials based on theoretical foundations, learner needs, and instructional considerations (McKenney & Reeves, 2019). The research was conducted in the Arabic Language Education Study Program, Faculty of Languages and Arts, Universitas Negeri Jakarta, Indonesia. Following the EDR framework of Analysis and Exploration, Design and Construction, and Evaluation and Reflection (McKenney & Reeves, 2019; Plomp, 2013), this study focused on needs analysis and instructional design and did not proceed to expert validation or empirical evaluation.

The participants were 55 first-semester students recruited through convenience sampling. Data were collected through a literature review, classroom observations across 14 meetings of the *Nahwu Awwal* and *Sharaf Awwal* courses, a needs analysis questionnaire, and interviews with selected students from the same respondent group. The observations examined instructional practices, the presentation of grammatical concepts, student engagement, and learning difficulties. The questionnaire included 20 items on a five-point response scale. It addressed students' difficulties learning Arabic grammar, needs for digital teaching materials, preferences for interactive multimedia, and learning practices related to Self-Regulated Learning (SRL). Student interviews provided additional insights into their learning experiences and expectations regarding digital teaching materials. The questionnaire underwent a review process before administration; however, no formal statistical reliability testing was conducted.

Quantitative data were analyzed using descriptive statistics, particularly response frequencies and percentages. The results were interpreted based on response distributions, without assigning categorical labels such as *high demand* or *very high demand* unless supported by a predefined classification framework. Qualitative data from classroom observations and interviews were examined to identify relevant patterns in instructional practices, learning difficulties, and learner expectations. The findings from the questionnaire, observations, interviews, and literature review were considered together to inform the design process.

The findings informed the preliminary design of the digital Arabic grammar teaching materials, including the instructional content structure, storyboard, user interface, interactive multimedia features, and integration of SRL principles. The Shortcut *Qawā'id* strategy was incorporated to organize grammatical concepts through concise explanations, key formulas, keywords, and visual representations. The resulting design is a preliminary, needs-informed instructional proposal that requires subsequent expert review and evaluation before claims about its validity, usability, or learning effectiveness can be made.

RESULTS AND DISCUSSION

Results

Needs Analysis of Arabic Grammar Learning

Comprehensive classroom observations were conducted across 14 sessions of the *Nahwu Awwal* and *Sharaf Awwal* courses within the Arabic Language Education Study Program at Universitas Negeri Jakarta to examine instructional practices, the delivery of grammatical concepts, media utilization, student engagement, and learning impediments. These observations were corroborated by in-depth interviews with selected students drawn from a pool of 55 survey respondents, thereby providing a nuanced understanding of their pedagogical experiences and expectations.

The observational data revealed that instructional delivery remained predominantly reliant on theoretical expositions, whiteboard notations, presentation slides, and text-based media, which collectively prioritized the systematic explanation and memorization of rules. Consequently, students encountered substantial difficulties in applying abstract grammatical constructs to practical sentence analysis, particularly concerning *iʿrāb*, syntactic relationships, and morphological paradigms. Although sporadic visual representations demonstrably enhanced student engagement, diagrammatic and structured visual aids were not systematically integrated into the standard instructional workflow.

Interview findings substantiated the cognitive burden imposed on students by complex technical terminology, extensive rule sets, and intricate morphological patterns. To mitigate these challenges, students expressed a strong preference for streamlined content representations such as concise formulas, keywords, concept maps, visual patterns, and contextual exemplars augmented by interactive assessments, immediate corrective feedback, flexible content access, and self-monitoring mechanisms. Collectively, these empirical insights underscore that current pedagogical limitations stem from both knowledge representation and learning activity design, thereby establishing the preliminary design specifications for Shortcut *Qawāʿid* centered on structured content simplification, visual scaffolding, and self-regulated learning principles.

Needs Analysis Questionnaire Results

The needs analysis questionnaire was administered to 55 first-semester students and included 20 items rated on a five-point scale. The results were analyzed descriptively to identify students' reported difficulties and preferences concerning digital teaching materials, interactive multimedia, and Self-Regulated Learning (SRL). The findings are organized into four dimensions.

Table 1. Students' Difficulties in Learning Arabic Grammar

Evaluated Aspect	SD (%)	D (%)	N (%)	A (%)	SA (%)
Difficulty understanding Arabic grammar	3.6	21.8	43.6	16.4	14.5
Need for explanations using formulas/keywords	0	1.8	20.0	27.3	50.9
Need for contextual examples	0	3.6	9.1	32.7	54.5
Need for more varied exercises	0	1.8	10.9	29.1	58.2
Difficulty remembering and applying grammatical rules	1.8	20.0	36.4	18.2	23.6

Note. SD = strongly disagree; D = disagree; N = neutral; A = agree; SA = strongly agree.

As shown in Table 1, 78.2% of respondents agreed or strongly agreed that they needed explanations using formulas or keywords. The corresponding proportions were 87.3% for contextual examples and 87.3% for more varied exercises. Meanwhile, 41.8% agreed or strongly agreed that they had difficulty remembering and applying grammatical rules, while 30.9% reported difficulty understanding Arabic grammar in general.

These results indicate that students' reported needs extend beyond simplifying explanations. The strong demand for contextual examples and varied exercises suggests the importance of connecting concise grammatical explanations with opportunities to recognize and apply rules. Accordingly, the preliminary design of *Shortcut Qawāʿid* emphasizes formulas and keywords alongside visualized grammatical patterns, contextual examples, and practice activities. Simplification is not intended to remove grammatical complexity or disregard exceptions. Rather, it aims to organize information into manageable representations while preserving the grammatical relationships and distinctions necessary for accurate understanding.

This design rationale is informed by Cognitive Load Theory, which emphasizes the importance of managing the cognitive demands imposed by instructional materials (Sweller, 2011). However, the questionnaire did not directly measure cognitive load. The theory therefore provides a rationale for the proposed design decisions rather than empirical evidence that the materials reduce cognitive load. The principal finding is that students' reported needs support prioritizing structured explanations and opportunities for contextual application in the preliminary design.

Table 2. Students' Needs for Digital Teaching Materials

Evaluated Aspect	SD (%)	D (%)	N (%)	A (%)	SA (%)
Interest in digital teaching materials	10.9	18.2	41.8	16.4	12.7
Accessibility via smartphones/laptops	0	5.5	23.6	38.2	32.7
Availability for use at any time	0	1.8	27.3	23.6	47.3
Attractive and user-friendly interface	0	1.8	18.2	30.9	49.1
Immediate feedback	0	1.8	14.5	34.5	49.1

Table 2 shows a distinction between students' general interest in digital teaching materials and their preferences for specific functions. Although 29.1% of respondents agreed or strongly agreed with the general statement expressing interest in digital materials, 41.8% selected the neutral response, and 29.1% disagreed or strongly disagreed. By contrast, 70.9% supported access through smartphones or laptops, and the same proportion supported access at flexible times. Furthermore, 80.0% emphasized an attractive and user-friendly interface, while 83.6% expressed a need for immediate feedback.

This distribution suggests that the design rationale should not rest on an assumption that students uniformly prefer digital materials as a category. Instead, it should respond to the specific functions that students identified as important. Accessibility, interface usability, and feedback therefore constitute more clearly supported design priorities than general enthusiasm for digital learning materials.

These findings informed the proposed use of consistent navigation, access across relevant devices, and feedback accompanying practice activities. The intended interface should let learners navigate the instructional content, while feedback should inform them about their responses during practice. However, usability, technical accessibility, and cross-device compatibility remain to be examined during subsequent development and evaluation. The questionnaire establishes

reported preferences, not evidence that the proposed interface or feedback mechanisms will necessarily improve learning.

Table 3. Students' Needs for Interactive Multimedia

Evaluated Aspect	SD (%)	D (%)	N (%)	A (%)	SA (%)
Images/illustrations facilitate understanding	1.8	3.6	21.8	32.7	40.0
Audio supports learning	0	10.9	34.5	30.9	23.6
Videos/animations facilitate understanding	0	9.1	32.7	25.5	32.7
Integration of text, audio, video, and animation	0	5.5	27.3	29.1	38.2
Interactive quizzes increase learning motivation	0	1.8	18.2	29.1	50.9

Table 3 shows that 72.7% of respondents agreed or strongly agreed that images and illustrations facilitated understanding, while 67.3% supported integrating text, audio, video, and animation. Interactive quizzes received the highest agreement in this dimension, at 80.0%. Responses on audio, video, and animation were more varied, with 34.5% and 32.7% of respondents, respectively, selecting the neutral option.

The findings support including multimedia elements in the preliminary design, but they do not justify treating all media formats as equally necessary or effective. The comparatively high preference for illustrations and interactive quizzes suggests that visual representations and opportunities to respond deserve particular attention. Audio, video, and animation may be incorporated selectively when they serve a clear instructional purpose.

This approach aligns with the Cognitive Theory of Multimedia Learning, which emphasizes organizing verbal and visual information for instruction rather than merely accumulating media elements (R. Mayer, 2005). In Arabic grammar instruction, diagrams can represent syntactic relationships, while visualized patterns can organize morphological transformations. Interactive exercises can then provide opportunities to apply the concepts represented in these visualizations.

The resulting design decision is to align each multimedia element with a specific learning function. Multimedia is therefore treated as a means of representing grammatical relationships and supporting practice, rather than as a decorative addition to digital materials. Whether these representations actually improve comprehension will require subsequent evaluation.

Table 4. Students' Needs for Self-Regulated Learning

Evaluated Aspect	SD (%)	D (%)	N (%)	A (%)	SA (%)
Need for self-assessment	0	1.8	14.5	30.9	52.7
Motivation to monitor learning progress	0	3.6	9.2	29.1	58.2
Teaching materials support self-directed learning	0	1.8	12.7	27.3	58.2

The questionnaire results indicate that 83.6% of respondents agreed or strongly agreed that self-assessment is needed. The corresponding proportions were 87.3% for monitoring learning progress and 85.5% for teaching materials that support self-directed learning. These findings

suggest a clear preference for learning resources that extend beyond content presentation to include opportunities for learners to review and monitor their progress.

The design implication is to incorporate SRL-oriented activities into the proposed learning sequence rather than treating them as separate supplementary features. The preliminary specifications include learning objectives, self-check exercises, progressive practice, self-assessment, reflection, and progress monitoring. These elements are informed by Zimmerman's (2002) account of self-regulated learning, which emphasizes learners' active involvement in planning, monitoring, and evaluating their learning.

However, the questionnaire measures students' reported needs rather than their actual SRL competence or behavior. It therefore supports including SRL-oriented features as a design response but does not establish that students will use these features consistently or become more self-regulated as a result. Their contribution to independent learning remains an issue for subsequent evaluation.

Synthesis of Needs Analysis and Design Decisions

The findings from classroom observations, student interviews, and the questionnaire were synthesized to establish a traceable relationship between empirical needs and preliminary design decisions. The questionnaire identified the relative prominence of students' stated preferences, while observations and interviews provided contextual explanations of the instructional challenges and desired learning support. The sources were considered complementary; they were not assumed to constitute independent confirmation of every finding.

Table 5. Relationship Between Needs Analysis Findings and Preliminary Design Decisions

Identified Need	Empirical Basis	Preliminary Design Response
More structured explanations of grammatical concepts	78.2% preferred formulas or keywords; observations and interviews indicated difficulties with complex rules and terminology	Concise formulas, keywords, concept maps, and visualized grammatical patterns
Stronger connections between rules and application	87.3% requested contextual examples, and 87.3% requested varied exercises; 41.8% reported difficulty remembering and applying rules	Contextual examples and progressive exercises linked to each grammatical concept
Clear and accessible digital learning materials	70.9% supported device accessibility and flexible access; 80.0% emphasized interface usability	Consistent navigation and a proposed interface for access across relevant devices
Visual representation of abstract concepts	72.7% supported illustrations; 67.3% supported multimedia integration; observations indicated the potential value of visual diagrams	Illustrations, infographics, diagrams, and selectively used audio, video, and animation
Opportunities for active practice and response	80.0% supported interactive quizzes; 83.6% requested immediate feedback	Interactive practice activities with feedback linked to learners' responses

Identified Need	Empirical Basis	Preliminary Design Response
Support for monitoring and independent learning	83.6% requested self-assessment, 87.3% supported progress monitoring, and 85.5% supported self-directed learning	Goal setting, self-check, self-assessment, reflection, and proposed progress-monitoring features

The synthesis produced three overarching design requirements. First, grammatical content should be organized into concise but conceptually accurate representations that connect rules with examples and practice. Second, select multimedia elements based on their instructional functions, particularly visualizing grammatical relationships and supporting active practice. Third, the learning sequence should incorporate opportunities for self-assessment and monitoring to support independent learning.

These requirements emerged from interpreting questionnaire results, observations, interviews, and relevant literature. No numerical threshold was predetermined to assign a design feature to a particular percentage automatically. Instead, we established the design priorities by considering response distributions, the nature of the reported difficulties, and the instructional relevance of the proposed response. This approach makes the reasoning behind the design decisions explicit without presenting the decisions as experimentally validated principles.

Preliminary Conceptual Design of Shortcut *Qawā'id*

The second research question examines how students' learning needs can be translated into a preliminary design framework for digital Arabic grammar teaching materials integrating content simplification, interactive multimedia, and self-regulated learning (SRL). Drawing on classroom observations, student interviews, and questionnaire findings, the proposed framework translates students' reported difficulties and preferences into a structured sequence of content, multimedia representations, and learning activities. It remains a preliminary design proposal to guide subsequent development, rather than a validated instructional model.

Organization and Simplification of Nahwu and Sharaf Content

The proposed content follows a progressive sequence from word classification to morphological formation and sentence structures, organized across nine units: basic word types (*isim*, *fiʿil*, *ḥarf*), noun and verb classifications, *taṣrif al-afʿāl*, roots and patterns (*al-jidhr wa al-wazn*), *kalām* and *jumlah*, nominal and verbal sentences (*jumlah ismiyyah* and *jumlah fiʿliyyah*), and a final evaluation unit. This arrangement underscores the distinct yet complementary roles of *Nahwu* (sentence structure and syntactic relationships) and *Sharaf* (word formation and conjugation). Content simplification is achieved by selecting essential concepts and presenting them through concise explanations, keywords, formulas, and contextual examples, providing a preliminary structural framework that remains subject to further validation against learning outcomes and student readiness.

Table 6. Proposed Structure of the Digital Arabic Grammar Teaching Materials

Unit	Main Topic	Proposed Content Representation	Proposed Multimedia	SRL-Oriented Activity
1	*Isim*, *Fiʿil*, and *Harf*	Overview and classification of the three main word categories	Introductory video and	Goal setting

Unit	Main Topic	Proposed Content Representation	Proposed Multimedia	SRL-Oriented Activity
			classification infographic	
2	*Isim* and Its Classifications	Classification by definiteness, gender, and number	Classification diagrams and interactive examples	Self-check
3	*Fiʿil* and Its Basic Classifications	Introduction to *māḍī*, *muḍāriʿ*, and *amr*	Visual examples and selected animations	Guided practice
4	Introduction to *Taṣrīf al-Afʿāl*	Comparison of basic verb forms and selected conjugation patterns	Comparative tables and interactive exercises	Progress monitoring
5	Arabic Roots and Patterns (*Al-Jidhr wa al-Wazn*)	Relationships between roots, patterns, and selected derived words	Root-pattern diagrams and visual word comparisons	Self-assessment
6	*Kalām* and *Jumlah*	Basic concepts and examples of meaningful expressions and sentence structures	Concept map and sentence-construction visualization	Guided practice
7	*Jumlah Ismiyyah*	Identification of mubtadaʾ and khabar	Sentence diagrams and interactive examples	Immediate feedback
8	*Jumlah Fiʿliyyah*	Identification of *fiʿil* and *fāʿil*, with an introduction to *mafʿūl* bih where appropriate	Sentence-pattern visualization and interactive exercises	Progress monitoring
9	Review and Evaluation	Review of the principal *Nahwu* and *Sharaf* concepts covered in the materials	Interactive quiz and summary infographic	Self-assessment and reflection



Figure 1. Example of Content Structure

Proposed Interactive Multimedia and SRL Features

The proposed digital learning environment synthesizes content representation, interactive multimedia, user interface design, targeted feedback, and self-regulated learning (SRL) mechanisms, grounded in Mayer's (2009) Cognitive Theory of Multimedia Learning and Zimmerman's (2015) SRL framework. Needs analysis data revealed a strong student preference for immediate feedback (83.6%), intuitive interface design (80.0%), interactive quizzes (80.0%), and illustrative materials (72.7%). In contrast, lower consensus on audio (54.5%) and video/animation (58.2%) warrants the selective, pedagogically driven application of dynamic media. To avoid cognitive overload, core grammatical concepts such as *taṣrīf al-afʿāl* and *jumlah ismiyyah* are clarified via concise formulas, keywords, concept diagrams, visual comparisons, and targeted contextual exercises featuring response-specific feedback.

Furthermore, responding to high student demand for progress tracking (87.3%), self-directed materials (85.5%), and self-assessment tools (83.6%), the architecture systematically integrates SRL-oriented functionalities including goal setting, progressive self-check tasks, reflective activities, and transparent navigation mechanisms. Ultimately, the defining contribution of Shortcut *Qawāʿid* lies in the deliberate coordination of these structural components: simplified grammatical organization, instructional multimedia representation, interactive application, and integrated self-regulatory scaffolding into a cohesive learning framework. The distinguishing feature of the proposed design is the planned coordination of these elements. Grammatical concepts are organized through the *Shortcut Qawāʿid* approach, represented through appropriate visual or multimedia elements, practiced through interactive exercises, and linked to opportunities for self-checking and reflection. Table 7 summarizes the proposed features and their intended instructional functions.

Table 7. Proposed Interactive Multimedia and SRL Design Specifications

Component	Proposed features	Intended instructional function
User interface	Home page, navigation menus, icons, and navigation buttons	Support access to and navigation through learning units
Content representation	Concise explanations, formulas, keywords, diagrams, and contextual examples	Organize grammatical concepts and make relationships more explicit.
Interactive multimedia	Illustrations, infographics, selectively used audio, videos, animations, and interactive quizzes.	Represent abstract concepts and provide opportunities for active practice.
SRL-oriented support	Goal setting, self-check, self-assessment, reflection, and progress monitoring	Provide opportunities for planning, monitoring, and evaluating learning.
Feedback	Response-specific feedback for practice activities	Help learners identify errors and review relevant concepts



Figure 2. Example of the User Interface

Synthesis of the Preliminary Design Framework

The preliminary design of *Shortcut Qawāʿid* integrates content organization, multimedia representation, and SRL-oriented learning support into a proposed framework for foundational Arabic grammar learning. The content component determines the concepts to be addressed and their proposed sequence across Nahwu and Sharaf. The multimedia component addresses how these concepts can be represented and practiced, while the SRL component gives learners opportunities to set goals, monitor understanding, assess progress, and reflect on their learning.

The alignment among these components can be illustrated through the proposed unit on *taṣrīf al-afʿāl*. The content introduces selected verb forms and their relationships; a visual comparison may help learners observe differences among the forms; and an interactive exercise with feedback may allow them to check their understanding. A self-assessment activity may then encourage learners to determine whether they need further practice. Similarly, in the unit on *jumlah ismiyyah*, a sentence diagram may introduce the relationship between *mubtadaʾ* and *khabar*, an interactive task may allow learners to identify these elements, and feedback may help them check their responses.

These examples illustrate how the proposed design components may work together within the teaching materials. They should not be interpreted as evidence that the framework or its individual features have already been tested. The current study has established a preliminary design proposal based on the initial needs analysis and relevant theoretical considerations. Subsequent EDR activities will further examine the proposed framework, including product development, expert review, and evaluation with the intended learners.

Overall, the preliminary design addresses the second research question by translating the identified learning needs into a structured proposal for digital teaching materials that cover foundational Nahwu and Sharaf. At this stage, its central contribution is articulating a design framework that combines a gradual content sequence, purposeful multimedia representation, and opportunities for self-regulated learning. This framework provides the basis for formulating preliminary design principles and guiding the subsequent development of *Shortcut Qawāʿid*.

Preliminary Design Principles

This study yields preliminary design principles to guide the subsequent development of *Shortcut Qawāʿid*, a proposed set of digital Arabic grammar teaching materials for beginner-level university students. These principles synthesize the needs analysis, the proposed instructional

sequence, and the planned multimedia and self-regulated learning (SRL) features. They translate the identified learning needs into initial guidelines for subsequent design decisions. At this stage, the principles represent design propositions informed by the study findings and relevant theoretical perspectives, rather than validated design knowledge.

Six preliminary principles are grouped into three complementary categories: pedagogical principles, multimedia principles, and learning support principles. The pedagogical category concerns simplifying and sequencing grammatical content; the multimedia category addresses purposeful concept representation and opportunities for interaction; and the learning support category focuses on SRL-oriented activities and accessible navigation. Table 7 summarizes these principles and their proposed implementation.

Table 7. Preliminary Design Principles for *Shortcut Qawāʿid*

Category	Design principle	Proposed implementation
Pedagogical principles	Simplification with conceptual accuracy	Present grammatical concepts through concise explanations, formulas, keywords, pattern visualizations, and contextual examples while maintaining grammatical accuracy.
Pedagogical principles	Sequential content organization	Arrange learning materials progressively, from foundational word categories and their classifications to basic morphological patterns and sentence structures.
Multimedia principles	Purposeful concept visualization	Use diagrams, illustrations, and infographics to clarify grammatical relationships; use audio, video, or animation selectively when they clearly support instruction.
Multimedia principles	Interactive practice and feedback	Include interactive exercises and quizzes that let learners apply grammatical rules and receive feedback to identify errors and review relevant concepts.
Learning support principles	Embedded SRL support	Incorporate goal setting, self-check activities, self-assessment, reflection, and progress monitoring into the proposed learning sequence.
Learning support principles	Accessible and consistent navigation	Propose a consistent navigation structure, clear instructions, and identifiable learning-unit pathways to support access to and movement through the materials.

The pedagogical principles address students' reported difficulties in understanding, remembering, and applying Arabic grammatical rules. Simplification is therefore conceived as the concise and structured presentation of concepts, not the removal of essential grammatical distinctions. The proposed sequence moves from *isim*, *fiʿil*, and *harf* to isim classifications, basic verb classifications and patterns, and sentence structures, including *jumlah ismiyyah* and *jumlah fiʿliyyah*. Contextual examples and exercises are intended to connect the explanations with opportunities for applying grammatical knowledge. The sequence should subsequently be checked against the learning outcomes and scope of the relevant Nahwu and Sharaf courses.

The multimedia principles emphasize the relationship between the instructional purpose and the choice of representation. Diagrams and visual comparisons may help make relationships among grammatical elements and morphological patterns more explicit, while interactive exercises provide opportunities to apply the concepts. This approach is informed by Mayer's (2009) Cognitive Theory of Multimedia Learning, which provides a rationale for coordinating

verbal and visual representations according to the demands of the learning task. However, the theory serves as a design rationale in this study; the proposed materials have not yet been evaluated to establish their effects on comprehension or learning outcomes.

The learning support principles complement content organization and multimedia presentation by giving learners opportunities to plan, monitor, and evaluate their learning. Drawing on Zimmerman's (2002) account of SRL, the proposed materials include goal setting, self-checking, self-assessment, reflection, and progress monitoring. Consistent navigation and clear instructions are also proposed to help learners access the learning activities. These features are intended to support self-regulatory processes, but their inclusion alone does not demonstrate that students' SRL skills or learning independence will improve.

Taken together, the six principles provide an initial framework for coordinating pedagogical decisions, multimedia representations, and learner-support features in the proposed *Shortcut Qawāʿid* materials. At this stage, they make the design rationale explicit and link proposed features to the needs identified in the study. Further EDR cycles, including design refinement, expert review, and evaluation with intended users, are needed to examine the clarity, feasibility, and suitability of these principles. Their potential relevance to other digital Arabic learning contexts may be considered in subsequent research, but transferability cannot yet be assumed.

Discussion

The present study conducted a comprehensive needs analysis to inform the preliminary design framework and principles of *Shortcut Qawāʿid*, an interactive digital learning package for foundational Arabic grammar (Nahwu and Sharaf) tailored for first-semester university students. By synthesizing qualitative classroom observations and interviews with quantitative survey findings, the research highlights a critical instructional gap: traditional grammar instruction relies heavily on abstract rule memorization, leading to cognitive overload and difficulties in applying grammatical rules to authentic contexts. To bridge this gap, the discussion contextualizes the empirical results across three major theoretical axes: pedagogical simplification through Cognitive Load Theory (CLT), purposeful media integration via the Cognitive Theory of Multimedia Learning (CTML), and the embedding of Self-Regulated Learning (SRL) mechanisms.

The empirical findings revealed that while 30.9% of students experienced general difficulties in understanding Arabic grammar, a significantly higher proportion (41.8%) struggled specifically with remembering and applying grammatical rules. Furthermore, an overwhelming majority demanded concise explanations through formulas/keywords (78.2%), contextual examples (87.3%), and varied practice exercises (87.3%). Observations confirmed that traditional teaching emphasized whiteboard explanations and rule memorization, which isolated grammatical forms from their functional usage. This pedagogical imbalance often obscures the operational connection between syntactic structures and semantic meaning during actual sentence analysis.

These findings directly align with Cognitive Load Theory, particularly regarding the reduction of intrinsic and extraneous cognitive loads when learning complex domain knowledge (Sweller, 2024). Arabic morphology (*Sharaf*) and syntax (*Nahwu*) are characterized by high element interactivity, where learners must simultaneously process root structures (*jidhr*), patterns (*wazn*), syntactic markers (*iʿrāb*), and semantic functions. When instruction presents these elements exclusively through dense textual rules, learners' working memory capacities are quickly overwhelmed. The preliminary design of *Shortcut Qawāʿid* addresses this by modularizing concepts into progressive units (from word categories to *jumlah ismiyyah* and *jumlah fiʿliyyah*) and utilizing structural formulas alongside keywords.

Recent literature strongly supports this structural simplification in foreign language education. Ritonga et al. (2022) demonstrated that restructuring Arabic syntax into visually categorized, formulaic chunks significantly decreases rule abstraction, enabling faster syntactic processing among non-native speakers. Similarly, Albantani and Madkur (2021) highlighted that foreign language learners require explicit bridge structures such as functional formulas to translate abstract linguistic rules into immediate sentence construction skills. Furthermore, Mustafa and Yasin (2023) confirmed that organizing Arabic morphological rules into structured visual patterns enhances long-term retention and reduces cognitive friction during structural analysis. By structuring *Shortcut Qawāʿid* to maintain conceptual accuracy without sacrificing linguistic rigor, the design provides an optimized instructional schema that transforms abstract grammatical laws into actionable analytical steps.

A critical insight from the questionnaire data is that general enthusiasm for digital materials as a broad category was relatively low (29.1% positive vs. 41.8% neutral). In contrast, preferences for specific functional features were exceptionally high. Specifically, students strongly favored user-friendly interfaces (80.0%), immediate feedback (83.6%), structural diagrams/illustrations (72.7%), and interactive quizzes (80.0%). These empirical nuances align precisely with Mayer's (2021) Cognitive Theory of Multimedia Learning and the *coherence principle*, which dictate that media selection must be strictly function-driven rather than decorative. In Arabic grammar, abstract spatial and hierarchical relationships such as the structural dependency between *mubtadaʾ* and *khabar* or verb conjugation shifts in *taṣrīf al-afʿāl* are best mediated through dual-coding channels that balance visual and verbal representations (Khedher & Al-Thubaiti, 2025).

Recent studies in digital Arabic pedagogy and educational technology reinforce this targeted, function-driven approach. Soliman (2023) argued that visual mapping and interactive sentence-diagramming platforms significantly outperform passive video lectures in developing students' structural analysis skills (*iʿrāb*). In line with these findings, Alshammari (2024) observed that managing cognitive load through interactive visual prompts directly enhances task engagement and rule comprehension in complex foreign language environments. Moreover, Al-Maroof et al. (2021) demonstrated that mobile learning environments achieve maximum user acceptance when they prioritize intuitive navigation structures and immediate evaluative feedback over complex animation. In *Shortcut Qawāʿid*, the selective integration of infographics, concept maps, and interactive quizzes provides target-oriented visual support that directly scaffolds rule application without cluttering the learner's cognitive architecture.

The needs analysis also demonstrated a decisive demand for self-directed learning support, including self-assessment mechanisms (83.6%), progress monitoring (87.3%), and materials explicitly designed for autonomous study (85.5%). Integrating SRL mechanisms directly into the instructional sequence reflects Zimmerman and Moylan's (2023) triadic model of self-regulation, which encompasses forethought (goal setting), performance (guided practice and monitoring), and self-reflection (self-assessment). Contemporary empirical research in computer-assisted language learning strongly advocates for such embedded scaffolding; Han and Ellis (2023) revealed that digital language tools featuring immediate response-specific feedback and progress tracking significantly elevate student self-efficacy and task completion rates. In the specific context of Arabic learning, Syihabuddin et al. (2022) emphasized that automated, immediate feedback in grammar quizzes serves as a self-corrective mirror, allowing students to diagnose morphological misapplications independently and foster sustainable learning autonomy.

Synthesizing these empirical and theoretical insights yields six core preliminary design principles categorized into pedagogical (simplification with accuracy, sequential organization),

multimedia (purposeful visualization, interactive practice with feedback), and learning support (embedded SRL, accessible navigation). It is crucial to note that these principles and the preliminary framework represent design propositions derived from baseline needs analysis and theoretical modeling. As emphasized in Educational Design Research methodologies, needs analysis establishes *what should be built* based on learner voice, but does not constitute empirical proof of pedagogical efficacy. Limitations of this initial phase include reliance on self-reported survey data and a localized sample of 55 first-semester students. Subsequent EDR phases—comprising iterative prototyping, expert validation (media and content experts), and field usability/effectiveness testing—are essential to validate whether *Shortcut Qawāʿid* measurably reduces cognitive load, fosters self-regulation, and improves grammatical competence in real-world academic settings.

CONCLUSION

This study proposed a preliminary conceptual design of interactive multimedia-based digital Arabic grammar teaching materials oriented toward Self-Regulated Learning (SRL) for first-semester university students, based on the needs analysis phase of an Educational Design Research (EDR) approach. The findings identified three main instructional needs: (1) simpler and more systematic explanations of Arabic grammar through formulas and keywords, supported by contextual examples and varied exercises; (2) accessible digital teaching materials incorporating purposeful multimedia, interactive quizzes, and immediate feedback; and (3) learning opportunities that support self-regulation through self-assessment and progress monitoring. These needs informed the proposed conceptual framework, content organization, and features of Shortcut *Qawāʿid*.

Based on the needs analysis and design process, six preliminary design principles were proposed: (1) simplification with conceptual accuracy, (2) sequential and contextualized learning, (3) purposeful visualization, (4) interactive application and feedback, (5) embedded SRL opportunities, and (6) accessible and consistent navigation. These principles represent an initial synthesis of the identified learner needs and the proposed instructional responses, rather than a validated set of design principles. Accordingly, this study establishes a needs-informed design proposal but does not establish its pedagogical validity, usability, effectiveness, or transferability to other learning contexts.

Several limitations should be considered when interpreting the findings. The needs analysis involved 55 first-semester students from one study program at a single university, limiting the range of learner backgrounds and institutional contexts represented. In addition, the findings primarily reflect students' reported perceptions and learning needs, supplemented by classroom observations and interviews, rather than evidence of learning gains. The study also did not proceed to full product development, expert validation, classroom implementation, or effectiveness testing. Future research should therefore develop the proposed design into a functional digital teaching resource, examine its content and instructional quality through expert review, evaluate its usability with learners, and test its implementation and learning outcomes. Further studies involving students from different institutions and learning contexts are also needed to determine whether the proposed principles can be refined and applied more broadly.

AUTHOR CONTRIBUTIONS STATEMENT

[SM] conceived the study, designed the research, conducted the data analysis, developed the conceptual design, and prepared the manuscript. [RH] assisted with data collection and overall research implementation. [SS] contributed to the development of the instructional content. [IR]

designed the interactive multimedia and user interface. [PZ] contributed to the research methodology and instrument development. [MW] reviewed and refined the manuscript for theoretical and academic quality. All authors reviewed and approved the final version of the manuscript.

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