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Instructional Media Innovation: A Web-Based Digital Dictionary for Karate Terminology

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ABSTRACT

Purpose of the study: The integration of karate as a competitive sport and physical education discipline in higher education curricula presents significant pedagogical challenges, particularly in the domain of specialised Japanese-origin terminology. Students in physical education programmes frequently encounter difficulties in comprehending, correctly pronouncing, and applying karate-specific vocabulary, which impedes their overall learning progression and technical skill acquisition. This study aimed to develop, validate, and evaluate the feasibility of a web-based digital dictionary for karate terminology as an innovative instructional media tool for undergraduate students enrolled in physical education programmes.

Materials and methods: An educational Research and Development (R&D) methodology was employed using the ADDIE instructional design model (Analysis, Design, Development, Implementation, Evaluation). Participants comprised 30 undergraduate students from the Physical Education Study Programme at Sekolah Tinggi Olahraga dan Kesehatan Bina Guna, Indonesia, and two expert validators (one karate content expert; one instructional media expert). Data were collected using structured Likert-scale questionnaires and analysed through percentage-based feasibility assessment.

Results: Expert validation yielded feasibility scores of 87.5% for content validity and 90.0% for media design quality, both classified as "Very Feasible." Student response assessments from small-group (n = 10) and large-group (n = 30) trials yielded mean percentage scores of 84.2% and 87.6%, respectively, both categorised as "Very Feasible." The overall composite feasibility score was 87.3%.

Conclusions: The web-based digital dictionary for karate terminology demonstrated high feasibility as an instructional media innovation. The product effectively supports undergraduate students' comprehension of karate terminology and is recommended for systematic integration into physical education curricula.

Keywords

digital dictionary; web-based learning; karate terminology; instructional media; ADDIE model; physical education; R&D methodology.

INTRODUCTION

Contextual Framework

The global proliferation of karate as both a competitive martial art and a foundational component of physical education curricula has generated increasing demand for effective pedagogical tools that can bridge the linguistic and conceptual gap between the sport's Japanese cultural origins and contemporary educational practice (MIHALACHE, 2016, p. 1; Saharullah et al., 2025; Waśik & Ortenburger, 2013). Karate's inclusion as an Olympic sport at the Tokyo 2020 Games marked a historic milestone in its international legitimacy, further accelerating its integration into formal educational frameworks worldwide (Grinshpun, 2021, p. 2053; World Karate Federation, 2023). In Indonesia, karate occupies a prominent position within higher education physical education curricula, serving as both a discipline for competitive sport development and a vehicle for holistic physical and character development.

The terminology employed within karate practice is deeply rooted in the Japanese language and embodies centuries of martial arts tradition. Terms such as kihon (basic technique), kumite (sparring), kata (pre-arranged forms), ippon (full point), waza-ari (half point), shomen-ni-rei (bow to the front), and hundreds of additional technique-specific nomenclature items constitute the communicative substrate through which karate instruction is conducted. For students whose primary language is not Japanese — including the majority of Indonesian physical education undergraduates — this terminology presents a formidable cognitive barrier extending beyond mere vocabulary acquisition to encompass phonological, semantic, and procedural dimensions of understanding (Ali & Ali, 2023; Piepiora et al., 2018).

The consequences of inadequate terminology comprehension in karate education are multifaceted. Students who fail to assimilate standard karate vocabulary experience diminished capacity to execute instructor commands accurately, reduced ability to engage with technical literature and competition regulations, impaired self-directed learning, and constrained participation in the broader global karate community. These deficiencies ultimately compromise both academic performance and athletic development, creating a systemic gap in the quality of physical education delivery at the tertiary level.

Critical Examination of Existing Literature

The intersection of instructional technology and physical education has been extensively documented in the educational literature. [Casey & Jones \(2011\)](#) demonstrated that digital technology enhances student engagement in physical education contexts, reporting significant improvements in motivation and content retention when multimedia tools were integrated into learning activities. [Smaldino et al. \(2014\)](#) articulated a comprehensive theoretical framework for instructional technology, emphasising the role of media selection in optimising learning outcomes through alignment between instructional objectives, learner characteristics, and technological affordances.

Within the specific domain of digital vocabulary and terminology acquisition, the lexicographic community has increasingly recognised the pedagogical value of electronic dictionaries and digital glossaries. [Nesi \(2013\)](#) conducted a systematic investigation of dictionary use among language learners, demonstrating that electronic resources significantly outperform traditional print dictionaries in terms of accessibility, search efficiency, and the capacity to deliver multimedia definitional content. [Chen & Li \(2009\)](#) established that personalised, context-aware digital vocabulary tools enhanced English vocabulary acquisition in higher education settings, with effect sizes significantly exceeding those achieved through conventional instruction.

Research on web-based learning environments has consistently affirmed their pedagogical efficacy across diverse disciplinary contexts. [Arkorful & Abaidoo \(2015\)](#) synthesised evidence from multiple studies to conclude that e-learning platforms confer substantial advantages in terms of accessibility, self-paced learning, immediate feedback provision, and the capacity for multimedia content integration. These advantages are particularly salient in domains characterised by complex, specialised vocabulary — a category into which karate terminology unambiguously falls.

The ADDIE instructional design model, first articulated in systematic form by [Molenda \(2003\)](#) and subsequently elaborated by [Branch \(2009\)](#), has emerged as a dominant framework for the systematic development of instructional media. Its five-phase structure — Analysis, Design, Development, Implementation, and Evaluation — provides a rigorous methodological scaffold that ensures the resulting product is empirically grounded, pedagogically sound, and continuously refined through iterative feedback. [Pelletier \(2008\)](#) cognitive theory of multimedia learning provides the theoretical underpinning for the design principles embedded in the present study's digital dictionary, positing that human learning is optimised when information is presented through coordinated verbal and visual channels, thereby reducing cognitive load, promoting dual-channel processing, and facilitating the construction of coherent mental models. [e-Learning and the Science of Instruction \(2016\)](#) translated these theoretical principles into actionable design guidelines — including the coherence principle, the signalling principle, the contiguity principle, and the redundancy principle — all of which informed the development of the present digital dictionary's multimedia content architecture.

Identification of Research Gaps

The review of existing literature reveals several important gaps. First, while digital dictionary development has been extensively studied in language-learning contexts, equivalent research in sports science and physical education terminology domains remains sparse. Second, the specific challenges confronting Indonesian physical education students in karate terminology acquisition have not been systematically investigated or addressed through purpose-designed instructional media. Third, no validated web-based lexicographic tool for karate instruction has been reported in the peer-reviewed literature, representing a substantial lacuna in both sports pedagogy and educational technology research. Fourth, the application of the ADDIE model to the specific domain of karate instructional media development has not been documented in the international literature.

Rationale for the Research

The present study is motivated by the confluence of two intersecting imperatives: the urgent pedagogical need for effective karate terminology instruction tools at the tertiary level in Indonesia, and the broader imperative to harness the demonstrated potential of web-based instructional media to address vocabulary acquisition challenges in specialised disciplinary domains. The web-based digital dictionary format was selected on the basis of its capacity to deliver immediate access, multimedia content, systematic organisation, and device-independent functionality — attributes that align directly with the learning needs and technological contexts of contemporary Indonesian undergraduate students.

Objectives

This study aimed to: (1) develop a web-based digital dictionary for karate terminology using the ADDIE instructional design model; (2) validate the developed product through expert assessment of content accuracy and media design quality; (3) evaluate the product's feasibility through student response assessments conducted in small-group and large-group trial implementations; and (4) provide evidence-based recommendations for the integration of the digital dictionary into physical education curricula.

MATERIALS AND METHODS

Participants

The participants consisted of undergraduate students enrolled in the Physical Education Study Programme at Sekolah Tinggi Olahraga dan Kesehatan Bina Guna, Medan, North Sumatra, Indonesia. All participants had prior exposure to karate courses as a compulsory component of their academic curriculum. For the small-group trial, ten ($n = 10$) students were purposively selected to represent diverse levels of prior karate terminology knowledge. For the large-group trial, thirty ($n = 30$) students were recruited through stratified random sampling from the eligible undergraduate cohort. Participant eligibility criteria included: (a) active enrolment in the Physical Education Study Programme; (b) prior completion of at least one karate course unit; and (c) access to a smartphone or computer with internet connectivity. Students who had not completed the prerequisite karate course unit or who declined to provide informed consent were excluded.

Expert validators comprised two specialists: (1) a karate content expert holding a minimum sixth-degree black belt (6th Dan) with over 15 years of university-level teaching experience and formal certification from the World Karate Federation (WKF) or

its national affiliate (PB FORKI); and (2) an instructional media expert with a minimum doctoral-level qualification in educational technology and demonstrated experience in the development and evaluation of digital instructional media in higher education settings.

Study Organization

Study Design

This study employed an educational Research and Development (R&D) methodology, operationalised through the ADDIE instructional design model (Branch, 2009; Molenda, 2003). The ADDIE model was selected due to its systematic, iterative structure that ensures alignment between learning objectives, instructional content, media design, and assessment throughout the development process. The five stages — Analysis, Design, Development, Implementation, and Evaluation — were implemented sequentially with feedback loops between stages to enable iterative refinement (Dick et al., 2015; Fahyan, 2011).

Development Procedures

Analysis Phase. A comprehensive needs analysis was conducted through three complementary methodological approaches. First, structured observations of ongoing karate learning sessions ($n = 6$ sessions, 90 minutes each) documented the frequency and nature of student difficulties in processing terminology-based instructional content. Second, semi-structured interviews with eight students (45 minutes each) elicited detailed accounts of specific terminological challenges, preferred learning modalities, and technology use patterns. Third, a preliminary documentary analysis of existing karate instructional materials — including the current course textbook, lecture slides, and online resources — assessed their adequacy in addressing terminology needs. The analysis phase established the following evidence base: 78% of interviewed students reported confusion with Japanese pronunciation of karate terms; 85% expressed difficulty distinguishing between phonetically similar technique names; 91% indicated interest in a digital tool accessible outside classroom hours; and 67% identified a lack of systematic explanatory content accompanying technique terms as a primary learning barrier.

Design Phase. Based on analysis findings, the design phase specified the product's structural and pedagogical architecture. The design framework included: (a) a hierarchical content organisation structured around five principal karate domains — fundamentals (kihon), stances (tachi-waza), striking techniques (tsuki-waza), kicking techniques (keri-waza), and blocking techniques (uke-waza), supplemented by competition-specific terminology (shiai), examination terminology (shinsa), and ceremonial terms (rei-gi); (b) a standardised entry template incorporating the Japanese term, romanised phonetic transcription, pronunciation guide, English translation, Indonesian language equivalent, categorical classification, and illustrative description; (c) a user interface designed according to (Pelletier, 2008) multimedia learning principles, featuring a minimalist aesthetic, high-contrast typography, intuitive search and browse navigation, and mobile-responsive layout; and (d) a navigation architecture incorporating alphabetical index, categorical browse, search function, and bookmarking capability.

Development Phase. The web-based digital dictionary was developed using an accessible online platform optimised for educational content delivery. The development phase produced a complete initial prototype incorporating 150 karate terms drawn from the WKF Technical Committee's standardised terminology compendium (World Karate Federation, 2023). Each term entry was developed in accordance with the standardised template established in the design phase. The user interface was implemented using contemporary web technologies to ensure cross-device compatibility and optimal performance across diverse network conditions representative of Indonesian tertiary education contexts. The initial prototype underwent internal review by the research team prior to expert validation.

Implementation Phase. Following iterative refinement based on expert validation feedback, the finalised product was implemented in two successive phases. In Phase I (small-group trial), ten students engaged with the digital dictionary as a supplementary resource during a structured 90-minute karate terminology learning session, following which they completed the student response questionnaire. In Phase II (large-group trial), thirty students utilised the digital dictionary across three weeks of regular karate course instruction, with structured integration into weekly learning activities facilitated by the course instructor.

Evaluation Phase. Product evaluation was conducted through two complementary instruments: expert validation questionnaires and student response questionnaires, as detailed in Section 2.3.

Test and Measurement Procedures

Expert Validation Questionnaire. The expert validation instrument was specifically developed for this study, drawing on established frameworks for educational media evaluation (Dick et al., 2015; Smaldino et al., 2014). The content expert validation questionnaire comprised eight items addressing: (1) accuracy of karate terminology definitions; (2) completeness of karate term coverage; (3) accuracy of phonetic guidance; (4) appropriateness of illustrative descriptions; (5) alignment with curriculum objectives; (6) clarity and accessibility of language; (7) accuracy of technique classifications; and (8) appropriateness of cultural and historical contextual information. The media expert validation questionnaire comprised ten items addressing: (1) user interface design quality; (2) navigational ease and intuitiveness; (3) typographic readability; (4) colour scheme and visual aesthetics; (5) search functionality efficiency; (6) cross-device responsiveness; (7) loading performance; (8) accessibility features; (9) multimedia content integration quality; and (10) overall user experience coherence.

Student Response Questionnaire. The student response questionnaire comprised ten items addressing: (1) ease of product access; (2) clarity of terminology definitions; (3) usefulness of phonetic guidance; (4) quality of illustrative descriptions; (5) visual appeal of the interface; (6) ease of navigation; (7) support for understanding karate techniques; (8) motivation for independent use; (9) appropriateness for learning needs; and (10) overall satisfaction. All questionnaire items were rated on a five-point Likert scale (1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree). Before administration, the instruments were subjected to face validity review by two independent educational technology scholars not involved in the study.

Statistical Analysis

Descriptive statistical analysis was employed to characterise responses on both expert validation and student response

instruments. The primary metric employed was the Percentage Feasibility Score (PFS), calculated according to the formula:

$$\text{PFS (\%)} = (\Sigma X / \Sigma X_{\max}) \times 100$$

where ΣX represents the sum of observed scores and $\Sigma X_{\max}$ represents the maximum possible score. Feasibility categories were determined according to the classification framework proposed by Arikunto (2019), as presented in Table C.1. For student response data, within-group mean scores and standard deviations were computed for each questionnaire item. Inter-item internal consistency was assessed using Cronbach's alpha (α), with values exceeding 0.70 considered acceptable (Sullivan & Artino, 2013). All statistical computations were performed using SPSS software (Version 26.0; IBM Corporation, Armonk, NY, USA).

Table 1. Feasibility Classification Criteria (Arikunto, 2019)

Score	Percentage (%)	Category
1	0–20%	Very Not Feasible
2	21–40%	Not Feasible
3	41–60%	Moderately Feasible
4	61–80%	Feasible
5	81–100%	Very Feasible

Ethical Considerations

This study was conducted in accordance with the Declaration of Helsinki and applicable Indonesian national regulations governing research involving human participants. Ethical approval was obtained from the Institutional Research Ethics Committee of Sekolah Tinggi Olahraga dan Kesehatan Bina Guna (Protocol No.: STOK-BG/REC/2024/011). All participants provided written informed consent prior to enrolment, including explicit acknowledgment of their right to withdraw at any time without academic penalty. Expert validators provided written consent for their participation and the use of their evaluation data. Participant data were anonymised prior to analysis, and all identifying information was stored in encrypted form with access restricted to the principal research team. No potential risks to participant wellbeing were identified; no financial compensation was provided to participants; and engagement was entirely voluntary.

RESULTS

Content Expert Validation

The content expert validation results are presented in Table 1. The expert validator assessed eight aspects of the web-based digital dictionary's content quality using a five-point Likert scale, yielding a composite feasibility score of 87.5%, classified as "Very Feasible." The highest-rated content aspects were completeness of karate term coverage, appropriateness of illustrative descriptions, and accuracy of technique classifications, each receiving a perfect score of 5 (100%). The aspects of accuracy of terminology definitions, phonetic guidance accuracy, curriculum alignment, language clarity, and cultural contextual appropriateness each received a score of 4 (80%), indicating areas for potential enhancement while remaining within the "Feasible" categorical range. Expert narrative feedback emphasised the importance of expanding the dictionary's coverage of advanced competition terms and incorporating etymological annotations for pedagogically significant terms.

Table 1. Content Expert Validation Results

No.	Assessment Aspect	Score	Max Score	% Score	Category
1	Accuracy of karate terminology definitions	4	5	80.0%	Feasible
2	Completeness of karate term coverage	5	5	100.0%	Very Feasible
3	Accuracy of phonetic guidance	4	5	80.0%	Feasible
4	Appropriateness of illustrative descriptions	5	5	100.0%	Very Feasible
5	Alignment with curriculum objectives	4	5	80.0%	Feasible
6	Clarity and accessibility of language	4	5	80.0%	Feasible
7	Accuracy of technique classifications	5	5	100.0%	Very Feasible
8	Appropriateness of cultural/historical context	4	5	80.0%	Feasible
Total	35	40	87.5%	Very Feasible	

Media Expert Validation

The media expert validation results are presented in Table 2. The expert validator assessed ten aspects of the product's media design quality, yielding a composite feasibility score of 90.0%, classified as "Very Feasible." The highest-rated media aspects were user interface design quality, typographic readability, search functionality efficiency, accessibility features, and multimedia content integration quality, each receiving a maximum score of 5 (100%). Navigation ease, colour scheme, cross-device responsiveness, loading performance, and overall user experience each received a score of 4 (80%). Expert recommendations included the implementation of audio pronunciation features in future iterations and enhancement of the category filter interface to support more granular technique classification filtering.

Table 2. Media Expert Validation Results

No.	Assessment Aspect	Score	Max Score	% Score	Category
1	User interface design quality	5	5	100.0%	Very Feasible
2	Navigation ease and intuitiveness	4	5	80.0%	Feasible
3	Typographic readability	5	5	100.0%	Very Feasible
4	Colour scheme and visual aesthetics	4	5	80.0%	Feasible
5	Search functionality efficiency	5	5	100.0%	Very Feasible
6	Cross-device responsiveness	4	5	80.0%	Feasible
7	Loading performance	4	5	80.0%	Feasible
8	Accessibility features	5	5	100.0%	Very Feasible
9	Multimedia content integration quality	5	5	100.0%	Very Feasible
10	Overall user experience coherence	4	5	80.0%	Feasible

Total	45	50	90.0%	Very Feasible
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Small-Group Student Response Trial (n = 10)

The small-group trial results, derived from ten participants, are presented in Table 3. The composite mean percentage feasibility score was 84.2%, classified as "Very Feasible." Internal consistency was acceptable (Cronbach's $\alpha = 0.83$). The highest-rated aspects were support for understanding karate techniques ($M = 4.40$, $SD = 0.52$; 88.0%) and visual appeal of the interface ($M = 4.30$, $SD = 0.48$; 86.0%), reflecting strong positive responses to the product's primary instructional function and aesthetic qualities. The lowest-rated aspect was quality of illustrative descriptions ($M = 4.00$, $SD = 0.67$; 80.0%), consistent with expert validator feedback suggesting room for enhancement in descriptive content depth.

Table 3. Small-Group Student Response Trial Results (n = 10)

No.	Questionnaire Item	Mean	SD	% Score	Category
1	Ease of product access	4.30	0.48	86.0%	Very Feasible
2	Clarity of terminology definitions	4.10	0.57	82.0%	Very Feasible
3	Usefulness of phonetic guidance	4.20	0.42	84.0%	Very Feasible
4	Quality of illustrative descriptions	4.00	0.67	80.0%	Feasible
5	Visual appeal of the interface	4.30	0.48	86.0%	Very Feasible
6	Ease of navigation	4.20	0.42	84.0%	Very Feasible
7	Support for understanding karate techniques	4.40	0.52	88.0%	Very Feasible
8	Motivation for independent use	4.10	0.57	82.0%	Very Feasible
9	Appropriateness for learning needs	4.30	0.48	86.0%	Very Feasible
10	Overall satisfaction with the product	4.20	0.42	84.0%	Very Feasible
Average	4.21	0.50	84.2%	Very Feasible	

Large-Group Student Response Trial (n = 30)

The large-group trial results, derived from thirty participants following three weeks of integrated product use, are presented in Table 4. The composite mean percentage feasibility score was 87.6%, classified as "Very Feasible." Internal consistency was strong (Cronbach's $\alpha = 0.87$). Comparison of small-group and large-group trial results indicated improvement across all ten questionnaire dimensions between the two implementation phases, reflecting the positive impact of iterative product refinements implemented following the small-group trial. The largest improvements were observed in quality of illustrative descriptions (+0.23 points), clarity of terminology definitions (+0.20 points), and motivation for independent use (+0.20 points). The highest-rated item in the large-group trial was support for understanding karate techniques ($M = 4.50$, $SD = 0.51$; 90.0%).

Table 4. Large-Group Student Response Trial Results (n = 30)

No.	Questionnaire Item	Mean	SD	% Score	Category
1	Ease of product access	4.43	0.50	88.7%	Very Feasible
2	Clarity of terminology definitions	4.30	0.47	86.0%	Very Feasible
3	Usefulness of phonetic guidance	4.40	0.50	88.0%	Very Feasible
4	Quality of illustrative descriptions	4.23	0.57	84.7%	Very Feasible
5	Visual appeal of the interface	4.43	0.51	88.7%	Very Feasible
6	Ease of navigation	4.43	0.50	88.7%	Very Feasible
7	Support for understanding karate techniques	4.50	0.51	90.0%	Very Feasible
8	Motivation for independent use	4.30	0.47	86.0%	Very Feasible
9	Appropriateness for learning needs	4.43	0.50	88.7%	Very Feasible
10	Overall satisfaction with the product	4.37	0.49	87.3%	Very Feasible
Average	4.38	0.50	87.6%	Very Feasible	

Overall Feasibility Summary

Table 5 presents the composite feasibility summary across all four assessment phases. The overall composite feasibility score of 87.3% — representing the arithmetic mean of all four assessment phase scores — confirms the web-based digital dictionary's classification as "Very Feasible" as an instructional media tool for karate terminology learning.

Table 5. Overall Feasibility Summary Across All Assessment Phases

Assessment Phase	Assessor	n	Score (%)	Category
Content Expert Validation	Karate Content Expert	1	87.5%	Very Feasible
Media Expert Validation	Instructional Media Expert	1	90.0%	Very Feasible
Small-Group Student Trial	Undergraduate Students	10	84.2%	Very Feasible
Large-Group Student Trial	Undergraduate Students	30	87.6%	Very Feasible
Overall Composite	41	87.3%	Very Feasible	

DISCUSSION

Interpretation of Outcomes

The findings of the present study demonstrate that the web-based digital dictionary for karate terminology developed through the ADDIE model represents a feasible and pedagogically sound instructional media innovation. The consistently high feasibility ratings across all assessment phases — content expert validation (87.5%), media expert validation (90.0%), small-group student trial (84.2%), and large-group student trial (87.6%) — provide robust empirical support for the product's readiness for institutional adoption and broader dissemination.

The very high media expert validation score (90.0%) reflects the successful application of [Pelletier \(2008\)](#) cognitive theory of multimedia learning principles in the product's design architecture. The coherence principle was operationalised through the exclusion of extraneous content elements and the maintenance of focused, purposive entry structures; the signalling principle was implemented through the consistent use of typographic hierarchy and categorical colour coding; and the contiguity principle was

enacted through the co-presentation of textual definitions and illustrative descriptions within integrated entry layouts. These design choices are consistent with (Clark & Mayer, 2016) evidence-based recommendations for effective digital instructional media and align with the findings of (Santos et al., 2016, p. 10), who reported that the integration of text, audio, and graphic aids in multimedia instruction significantly enhanced vocabulary learning outcomes.

The content expert's validation score (87.5%), while classified as "Very Feasible," incorporated specific recommendations for content enhancement, particularly regarding advanced competition terminology and etymological annotation. These recommendations are instructive for future iterations of the product and reflect the inherent complexity of the karate terminology domain, which encompasses not only technical vocabulary but also cultural, historical, and regulatory dimensions that resist complete representation in a single educational resource. This finding resonates with (Emerson & Hobson-West, 2025, p. 4) observation that domain-specific digital dictionaries must balance comprehensive coverage with user accessibility — a tension that will require ongoing negotiation in future development cycles.

Evaluation in Relation to Antecedent Studies

The feasibility scores reported in the present study are consistent with, and in several dimensions exceed, those reported in comparable instructional media development studies employing the ADDIE model. Studies on digital instructional media development in physical education contexts have typically reported feasibility scores in the range of 78–92%, with the present study's composite score of 87.3% situating the developed product favourably within this range (Fathoni & Riyana, 2021; Heinich et al., 2002).

The improvement in student response scores between the small-group trial (84.2%) and the large-group trial (87.6%) is particularly noteworthy, as it demonstrates the responsiveness of the product to iterative, evidence-informed refinement — a defining characteristic of quality instructional design processes (Aryuntini et al., 2018, p. 191; Suyanta et al., 2022, p. 122). This trajectory of improvement parallels findings reported by Arkorful & Abaidoo (2015), who documented consistent gains in user satisfaction ratings as web-based educational platforms underwent iterative optimisation cycles.

The strong positive student response to the product's support for karate technique understanding (large-group $M = 4.50$, $SD = 0.51$) is aligned with Chen & Li (2009) finding that personalised, context-aware digital vocabulary tools produce significantly enhanced conceptual comprehension outcomes relative to conventional instructional approaches. The higher ratings for visual appeal and navigation ease in the large-group trial also reflect the positive impact of interface refinements informed by small-group feedback, consistent with the iterative quality assurance cycle embedded in the ADDIE model's evaluation phase (Branch, 2009; Triantafyllou et al., 2007, p. 1325; Varga et al., 2025, p. 168).

The Cronbach's alpha values for both student response instruments (small group: $\alpha = 0.83$; large group: $\alpha = 0.87$) indicate acceptable to strong internal consistency, supporting the reliability of the instruments as measures of student-perceived product feasibility. These values meet the reliability standards recommended for educational measurement instruments (Sullivan & Artino, 2013) and enhance confidence in the validity of the reported feasibility scores.

Implications of the Findings

The findings of this study carry several important implications for physical education pedagogy and instructional media practice. First, they provide empirical support for the viability of web-based digital dictionaries as a specialised genre of instructional media capable of addressing the distinctive vocabulary acquisition challenges posed by martial arts disciplines with Japanese-origin terminology. This finding extends the evidence base for educational digital lexicography — hitherto concentrated in foreign language education contexts — to the domain of sports science and physical education.

Second, the study demonstrates the feasibility of developing high-quality instructional media within the resource constraints characteristic of Indonesian physical education higher education institutions, without recourse to specialised software development infrastructure. The use of an accessible online platform for dictionary development suggests that comparable products could be developed by motivated faculty members with modest technical training, potentially enabling scalable dissemination of this pedagogical innovation across the national physical education higher education sector.

Third, the positive student responses to the digital dictionary's accessibility features and self-directed use affordances suggest that web-based terminology tools may play a meaningful role in supporting the development of autonomous learning habits among physical education undergraduates — a capability increasingly emphasised in contemporary higher education pedagogy (Plass et al., 2015; Reigeluth, 1999).

Limitations of the Research

Several limitations of the present study merit acknowledgment. First, the study was conducted at a single institution with a relatively small participant sample, which restricts the generalisability of findings to broader physical education student populations. Multi-site designs with larger, more diverse samples are recommended for future research. Second, the study employed a single-group pre-post design without a control condition, precluding causal inferences about the relative efficacy of the digital dictionary compared to existing instructional approaches. Third, expert validation was conducted by a single validator in each domain, which may introduce idiosyncratic assessment biases; future validation studies should employ panels of at least two experts per domain and report inter-rater agreement statistics. Fourth, the evaluation timeframe for the large-group trial (three weeks) may be insufficient to capture the full range of longitudinal learning outcomes associated with sustained digital dictionary use. Fifth, the study did not systematically assess actual learning outcomes (e.g., karate terminology test scores) as a function of digital dictionary use, relying instead on student-perceived utility and feasibility ratings.

CONCLUSION

This study has successfully developed, validated, and evaluated a web-based digital dictionary for karate terminology as an instructional media innovation for undergraduate students in the Physical Education Study Programme at Sekolah Tinggi Olahraga dan Kesehatan Bina Guna, Indonesia. The development process, guided by the ADDIE instructional design model, yielded

a product that received high feasibility ratings from both expert validators and student participants across all evaluation phases, with a composite feasibility score of 87.3% corresponding to a "Very Feasible" classification.

The study makes several original contributions to the literature. It provides the first documented development and validation of a web-based digital dictionary specifically designed to address karate terminology learning needs in Indonesian physical education higher education. It demonstrates the applicability of the ADDIE model to karate instructional media development, establishing a replicable methodological template for analogous initiatives in other martial arts disciplines and specialised sports vocabulary domains. It also provides empirical evidence for the capacity of web-based digital tools to support terminology acquisition in sports education contexts, extending the evidence base for educational digital lexicography beyond its conventional language-learning domain.

The authors recommend the systematic integration of the developed digital dictionary into karate course instruction as a supplementary instructional resource, accessible via web browser during and outside class sessions. Future development priorities should include: the incorporation of audio pronunciation functionality for all dictionary entries; expansion of the term database to encompass advanced competitive and examination terminology; the development of formative assessment features (e.g., interactive terminology quizzes) within the digital dictionary platform; and longitudinal evaluation of the product's impact on karate terminology knowledge acquisition, retention, and application. Comparative studies employing experimental or quasi-experimental designs are also recommended to establish the relative efficacy of the digital dictionary compared to conventional instructional approaches. Future research should additionally explore the adaptation of this instructional media model for related sports disciplines characterised by specialised foreign-origin terminology, including judo, taekwondo, and aikido.

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CONFLICT OF INTERESTS

The authors declare no conflict of interest. The expert validators were selected exclusively on the basis of their professional qualifications and had no prior involvement in the development of the instructional media product evaluated in this study. The funding sources had no role in study design, data collection, analysis, interpretation, or the decision to publish the findings.

REFERENCES

- Ali, N., & Ali, M. (2023). Difficulties with English-language Content Acquisition for Undergraduates. *Journal of Education and Finance Review*, 2(1), 1–12. <https://doi.org/10.62843/jefr/2023.5970106>
- Arikunto, S. (2019). *Prosedur penelitian: Suatu pendekatan praktik [Research procedures: A practical approach]*. Rineka Cipta.
- Arkorful, V., & Abaidoo, N. (2015). The role of e-learning, advantages and disadvantages of its adoption in higher education. *International Journal of Instructional Technology and Distance Learning*, 12(1), 29–42.
- Aryuntini, N., Astuti, I., & Yuliana, Y. G. S. (2018). Development of Learning Media Based on VideoScribe to Improve Writing Skill for Descriptive Text of English Language Study. *JETL (Journal Of Education Teaching and Learning)*, 3(2), 187–187. <https://doi.org/10.26737/jetl.v3i2.746>
- Branch, R. M. (2009). Instructional Design: The ADDIE Approach. In *Digital Access to Libraries (Université catholique de Louvain (UCL), l'Université de Namur (UNamur) and the Université Saint-Louis (USL-B))*. UCLouvain. <https://doi.org/10.1007/978-0-387-09506-6>
- Casey, A., & Jones, B. (2011). Using digital technology to enhance student engagement in physical education. *Asia-Pacific Journal of Health Sport and Physical Education*, 2(2), 51–66. <https://doi.org/10.1080/18377122.2011.9730351>
- Chen, C., & Li, Y. (2009). Personalised context-aware ubiquitous learning system for supporting effective English vocabulary learning. *Interactive Learning Environments*, 18(4), 341–364. <https://doi.org/10.1080/10494820802602329>
- Dick, W., Carey, L., & Carey, J. O. (2015). The systematic design of instruction. In *The systematic design of instruction*. Pearson.
- Clark, R. C., & Mayer, R. E. (2016). *e-Learning and the Science of Instruction*. <https://doi.org/10.1002/9781119239086>
- Emerson, T. E., & Hobson-West, P. (2025). Negotiating Critical Tensions: Creating an Online Resource on Vaccine Hesitancy for Healthcare Professionals. *Sociological Research Online*. <https://doi.org/10.1177/13607804251351131>
- Fahyan, S. E. (2011). Metode penelitian kualitatif, kualitatif dan R&D / Sugiyono. *Koleksi Buku UPT Perpustakaan Universitas Negeri Malang*. <http://library.um.ac.id/free-contents/index.php/buku/detail/metode-penelitian-kualitatif-kualitatif-dan-rd-sugiyono-38593.html>
- Fathoni, A., & Riyana, C. (2021). Digital-based instructional media development in physical education: A systematic review. *Journal of Physical Education and Sport*, 21(3), 1567–1576. <https://doi.org/10.7752/jpes.2021.03197>
- Grinshpun, H. (2021). Japan through the Lens of the Tokyo Olympics. *The International Journal of the History of Sport*, 38(18), 2004–2005. <https://doi.org/10.1080/09523367.2021.1999766>
- Heinich, R., Molenda, M., Russell, J. D., & Smaldino, S. E. (2002). *Instructional media and technologies for learning*. Merrill/Prentice Hall.
- MIHALACHE, G. (2016). Interaction And Complementarity's Between Karate Specific Resources And Adapted Tools From Different Sport Motions In Multilaterally Training For Military Students. *Scientific Bulletin of Naval Academy*, 19(2).

- <https://doi.org/10.21279/1454-864x-16-i2-072>
- Molenda, M. (2003). In search of the elusive ADDIE model. *Performance Improvement Journal*, 42(5), 34–36. <https://doi.org/10.1002/pfi.4930420508>
- Nesi, H. (2013). Dictionary use by English language learners. *Language Teaching*, 47(1), 38–55. <https://doi.org/10.1017/s0261444813000402>
- Pelletier, C. (2008). Richard E. Mayer (ed). The Cambridge Handbook of Multimedia Learning. *Information Design Journal*, 16(1), 81–83. <https://doi.org/10.1075/idj.16.1.12pel>
- Piepiora, P., Witkowski, K., & Piepiora, Z. (2018). Personality profiles of karate masters practising different kumite styles. *Archives of Budo*, 14. <http://archbudo.com/view/abstract/id/12143>
- Plass, J. L., Homer, B. D., & Kinzer, C. K. (2015). Foundations of Game-Based Learning. *Educational Psychologist*, 50(4), 258–283. <https://doi.org/10.1080/00461520.2015.1122533>
- Reigeluth, C. M. (1999). A new paradigm of instructional theory. In *Lawrence Erlbaum Associates eBooks*. Taylor & Francis. <http://ci.nii.ac.jp/ncid/BA4288705X>
- Saharullah, S., Surbakti, E. P., Hermawan, I., Yoda, K., Idrus, N. A., & Kasih, I. (2025). Android Application for Autonomous Karate Kata Training: A Sustainable Approach to Skill Development and Inclusive Education. *International Journal of Human Movement and Sports Sciences*, 13(1), 30–36. <https://doi.org/10.13189/saj.2025.130104>
- Santos, M. E. C., Lübke, A. in W., Taketomi, T., Yamamoto, G., Rodrigo, Ma. M. T., Sandor, C., & Kato, H. (2016). Augmented reality as multimedia: the case for situated vocabulary learning. *Research and Practice in Technology Enhanced Learning*, 11(1), 4–4. <https://doi.org/10.1186/s41039-016-0028-2>
- Smaldino, S. E., Lowther, D. L., & Russell, J. D. (2014). *Instructional technology and media for learning*. Pearson.
- Sullivan, G. M., & Artino, A. R. (2013). Analyzing and Interpreting Data From Likert-Type Scales. *Journal of Graduate Medical Education*, 5(4), 541–542. <https://doi.org/10.4300/jgme-5-4-18>
- Suyanta, S., Wiludjeng, I., Jumadi, J., Astuti, S., Sari, A. R. P., Isa, I. M., Jafaar, R., & Rahadian, R. (2022). Virtual Laboratory-Based Game Application: The Quality and Its Effects Towards Students' Motivation and Self-Regulated Learning. *International Journal of Interactive Mobile Technologies (IJIM)*, 16(18), 114–132. <https://doi.org/10.3991/ijim.v16i18.32875>
- Triantafillou, E., Georgiadou, E., & Economides, A. A. (2007). The design and evaluation of a computerized adaptive test on mobile devices. *Computers & Education*, 50(4), 1319–1330. <https://doi.org/10.1016/j.compedu.2006.12.005>
- Varga, M. N., Napoles, M. A., Lee, J., Rosales, V. S., & Caparida, S. M. V. (2025). Development of an ADDIE-Based Self-Learning Website: Usability Analysis and Its Impact on TLE-ICT Students' Learning Outcomes. *Journal of Education and Teaching (JET)*, 7(1), 160–187. <https://doi.org/10.51454/jet.v7i1.777>
- Waśik, J., & Ortenburger, D. (2013). The attitudes of karatekas at the national level of sports competition towards the training contents. *Archives of Budo*, 9(3), 185–191.
- World Karate Federation. (2023). *WKF competition rules*. World Karate Federation. <https://www.wkf.net/competition-rules.html>