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Development, Validity, and Practicality of Articulate Storyline–Based Audiovisual Mobile Learning Materials for Tennis Instruction

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ABSTRACT

This study aimed to develop and evaluate the validity and practicality of Articulate Storyline–based audiovisual teaching materials integrated into a mobile learning platform for university-level tennis instruction. This Research and Development (R&D) study followed the Analysis, Design, and Development stages of the ADDIE model. Product validity was evaluated by two media experts and two subject-matter experts using Aiken's V coefficient. Practicality testing involved one tennis-course lecturer and 90 students, comprising 30 students in a small-group trial and 60 students in a large-group trial. Practicality data were analyzed descriptively and expressed as percentages. The media and content evaluations each produced a mean Aiken's V coefficient of 0.86, indicating that both aspects were highly valid. The overall combined validity coefficient was also 0.86. Student practicality scores increased from 82.5% in the small-group trial to 85.0% in the large-group trial, with an overall mean of 83.8%, categorized as highly practical. The highest-rated indicator was the clarity of the technique-demonstration videos (88.2%), whereas interface navigation received the lowest score (79.4%). The lecturer assessment yielded a practicality score of 90.6%, which was also categorized as highly practical. These findings confirm that the developed teaching materials satisfy the established validity and practicality criteria for use in tennis courses. Articulate Storyline–based audiovisual mobile learning materials are highly valid and practical for supporting university-level tennis instruction. Further studies should evaluate their effectiveness in improving students' cognitive learning outcomes and basic tennis skills.

Keywords: *Articulate Storyline; Audiovisual Teaching Materials; Mobile Learning; Tennis Instruction; Physical Education*

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PENDAHULUAN

Tennis is one of the sports favored by various age groups and skill levels, making it widely offered as a practical course in physical education programs. As a course based on movement skills, mastering the basic techniques of tennis, such as how to hold the racket, footwork, groundstrokes, and serves, requires a clear visual understanding of the movement stages and common mistakes often made by beginners, before these techniques are practiced directly on the court (Raibowo et al., 2022). Misunderstanding the introduction to basic techniques has the potential tohinder the development of students' skills in subsequent stages of their studies, making the accurate delivery of material from the beginning crucial.

The conditions on the ground indicate that both learning and tennis introduction activities are generally still conducted conventionally, either thru printed textbooks (Belli et al., 2019; Van Der Meer et al., 2024). or face-to-face activities without the support of digital media

that can be re-accessed by students, as seen in the introductory tennis socialization activities for beginners that still rely on explanations and direct practice without accompanying digital teaching materials (Raibowo et al., 2022). Such an approach has limitations in depicting dynamic movement sequences, making it difficult for learners to independently review and evaluate their understanding outside of meeting times.

On the other hand, the trend of integrating digital technology into physical education learning in general continues to grow rapidly. (Damrah, Rasyid, et al., 2024), mentions that digital learning innovations in physical education, sports, and health subjects have become an urgent need in line with the demand for more flexible learning that is not limited by space and time. The application of digital learning materials in other sports practice courses has also proven to have a positive impact, for example, in the evaluation of hybrid learning in sports physiology courses, which showed evaluation results in the good category (Yulianti et al., 2022), as well as the use of flipbook media, which has been shown to improve student learning outcomes in similar courses during the pandemic (Susanto et al., 2022). These findings reinforce the assumption that a technology-based approach has the potential to be applied to tennis courses as well, particularly in the form of audiovisual teaching materials integrated into mobile learning.

One of the software widely used to develop interactive audio-visual teaching materials is Articulate Storyline, due to its ability to combine text, images, animations, narration, and video into a single learning package that can be published in a mobile-based format. (Junpahira & Pahlevi, 2023a)proved that interactive multimedia based on Articulate Storyline can significantly improve student learning outcomes when combined with a problem-based learning approach. Ajmadewi et al., (2024) also reported a material validation result of 97.7% with a very valid qualification for the Articulate Storyline product developed for short story learning in vocational high schools. Meanwhile, Putri et al., (2022) found that the Articulate Storyline media provided better learning outcomes compared to the use of conventional PowerPoint media. Unfortunately, the application of Articulate Storyline in those studies is still limited to general academic subjects, while research on practical sports courses such as tennis is still very rare.

The author has conducted a series of preliminary studies to underpin the development of digital teaching materials for the tennis course. As a continuation of that stage, the author then conducted a more specific needs analysis regarding the integration of Articulate Storyline in mobile learning as a basis for developing audio-visual teaching materials for the tennis course. The results of the needs analysis indicate that both lecturers and students require audio-visual teaching materials that can be flexibly accessed thru mobile devices, considering the limitations of conventional teaching materials in depicting the dynamic movements of tennis, and affirm that Articulate Storyline is viewed as the appropriate solution to meet these needs (Carboch & Váchová, 2024; Fu et al., 2018; Yasriuddin & Hudain, 2020). These two preliminary studies serve as the direct foundation for the current research, which focuses on testing the validity and practicality of the designed product before it is implemented more broadly.

However, an educational product cannot be directly recommended for widespread use without undergoing systematic quality testing. Gradini et al., (2022) explain that the quality of educational development products needs to be tested based on the criteria of validity, practicality, and effectiveness as outlined in the Plomp development model, where validity refers to the alignment of the product's content and construct with learning objectives according to expert assessment, while practicality refers to the ease of use and applicability of the product as perceived directly by its users. These two criteria are fundamental requirements that must be met before a product is tested for its effectiveness on student learning outcomes.

As far as the author has searched, no publication has specifically examined the validity and practicality of Articulate Storyline-based audiovisual teaching materials in mobile learning for the tennis course. This gap is the main novelty of this research, as well as a natural continuation of the author's previous series of studies on the needs and design of digital teaching materials for that course. Therefore, this article aims to test the validity of the developed audiovisual teaching materials thru assessments by media and subject matter

experts, as well as to evaluate their practicality thru user responses, namely lecturers and students teaching the tennis course.

The results of this study are expected to provide empirical evidence regarding the feasibility of Articulate Storyline-based audiovisual teaching materials in mobile learning, serve as a reference for physical education lecturers in designing technology-based teaching materials for other sports practice courses, and lay the groundwork for further research on the effectiveness of this product in improving students' mastery of basic tennis techniques.

METHOD

Study Participants

The population comprised 90 students enrolled in tennis courses within Physical Education Study Programs at three universities: the University of Bengkulu, the University of Lampung, and Dehasen University of Bengkulu. The research participants consisted of two groups: (1) experts responsible for assessing product validity and (2) lecturers and students responsible for assessing product practicality.

Four experts participated in the validity assessment, comprising two media experts with expertise in educational technology or multimedia learning development and two subject-matter experts with expertise in tennis or physical education. Each expert held at least a master's degree and had a minimum of five years of teaching experience in their respective field. The number of experts was determined with reference to Aiken (1985), who established that a content validity coefficient can be calculated using a relatively small panel, provided that the experts possess competencies relevant to the evaluated content.

The practicality assessment involved all 90 students, comprising 30 students in the small-group trial and 60 students in the large-group trial, as well as one lecturer responsible for teaching the tennis course. Media and subject-matter experts were selected through purposive sampling based on their academic qualifications, professional competencies, and relevant experience. The lecturer was also selected purposively because of their direct involvement in teaching the course. Meanwhile, the students were selected through simple random sampling from the population of students enrolled in the tennis course during the semester in which the study was conducted.

Study Organization

(Praditya et al., 2024) This study employed a Research and Development (R&D) approach based on the model—Analysis, Design, Development, Implementation, and Evaluation—proposed The analysis stage had been completed in a previous study through a needs assessment concerning the use of audiovisual teaching materials in tennis courses. Therefore, the present study focused on the design and development stages, particularly the evaluation of the validity and practicality of Articulate Storyline–based audiovisual teaching materials integrated into mobile learning before their broader implementation.

During the design stage, the content structure, audiovisual components, interface, navigation system, interactive evaluation activities, and mobile-device compatibility were planned based on the course learning outcomes and syllabus. During the development stage, these components were integrated into an Articulate Storyline–based product. The resulting prototype was subsequently subjected to expert validation, revised according to the experts' feedback, and tested for practicality with lecturers and students.

Data were collected using expert assessment instruments and user-response questionnaires. Media and subject-matter expert assessment instruments were used to establish product validity, whereas lecturer and student response questionnaires were used to assess product practicality. Before their administration, all instruments were developed using assessment grids and reviewed by evaluation experts to ensure the relevance and clarity of their content.

The expert-validation instruments used a five-point rating scale following the Aiken's V calculation procedure (Fizi et al., 2023). The practicality instruments used a four-point Likert scale comprising *very good*, *good*, *fair*, and *poor*. This scale was designed to assess whether the

product was understandable, accessible, and easy for its intended users to operate, consistent with the principles of product usability assessment described by Düking et al. (2024). The media-validation instrument consisted of seven items covering visual presentation, audio quality, video quality, software engineering, and interactivity, as presented in Table 1.

Table 1. Media Expert Validation Instrument

No.	Aspect	Indicator	Number of Items
1	Visual	Clarity of visual display	1
		Consistency of display design	1
2	Audio	Quality of audio narration	1
3	Video	Quality of movement-technique demonstrations	1
4	Software engineering	Ease of interface navigation	1
		Compatibility with mobile devices	1
5	Interactivity	Interactivity of evaluation activities	1
	Total		**7**

The subject-matter validation instrument contained six items covering curriculum alignment, content accuracy, material presentation, and linguistic clarity, as shown in Table 2.

Table 2. Subject-Matter Expert Validation Instrument

No.	Aspect	Indicator	Number of Items
1	Curriculum alignment	Alignment of materials with course learning outcomes (CPMK)	1
		Completeness of materials in relation to the course syllabus	1
2	Content accuracy	Accuracy of basic tennis technique concepts	1
		Relevance of video examples to the techniques taught	1
3	Material presentation	Accuracy of the sequence of material presentation	1
4	Linguistic clarity	Clarity of language and technical terminology	1
	Total		**6**

After the product had been validated and revised, its practicality was evaluated by the lecturer and students. The lecturer practicality instrument comprised eight items across four aspects: ease of implementation, curriculum suitability, efficiency, and sustainability (Table 3).

Table 3. Practicality Instrument for the Lecturer

No.	Aspect	Indicator	Number of Items
1	Ease of implementation	Ease of use in the learning process	1
		Ease of integration with face-to-face instruction	1
2	Curriculum suitability	Alignment with course learning outcomes	1
		Alignment of materials with the course syllabus	1
3	Efficiency	Time efficiency in delivering the materials	1
		Ease of monitoring students' understanding	1
4	Sustainability	Support for students' self-directed learning	1
		Feasibility of sustainable use	1
	Total		**8**

The student practicality instrument also comprised eight items, covering ease of use, attractiveness, content clarity, and learning benefits, as presented in Table 4.

Table 4. Practicality Instrument for Students

No.	Aspect	Indicator	Number of Items
1	Ease of use	Ease of accessing the mobile learning application	1
		Clarity of instructions for use	1
		Ease of interface navigation	1
2	Attractiveness	Attractiveness of the media presentation	1
3	Content clarity	Clarity of technique-demonstration videos	1
4	Learning benefits	Assistance in understanding basic tennis techniques	1
		Suitability for self-directed learning	1
		Improvement in learning motivation	1
	Total		**8**

The practicality test was conducted sequentially. The initial product was first tested with a small group of 10 students. Feedback from this trial was used to identify difficulties related to accessibility, instructions, navigation, presentation, content clarity, and learning benefits. After the necessary revisions, a large-group trial involving 20 students was conducted. The lecturer then evaluated the product's practicality for supporting the delivery of the tennis course.

Statistical Analysis

This study used a descriptive quantitative approach. Data obtained from media and subject-matter experts were analyzed using Aiken's V content-validity coefficient (Aiken, 1985), calculated as follows:

$$V = \frac{\sum s}{n(c-1)}$$

where:

$$s = r - l_o$$

V is Aiken's content validity coefficient, rrr is the score assigned by an expert, lol_olo is the lowest possible score, nnn is the number of experts, and ccc is the number of rating categories. The coefficient ranges from 0 to 1, with a value closer to 1 indicating stronger content validity. Following Merino-Soto (2018), an assessment indicator and the overall product were considered valid when the Aiken's V coefficient was at least 0.70.

Data obtained from the lecturer and student practicality questionnaires were analyzed descriptively using percentages. The practicality percentage was calculated using the following formula:

P=∑x∑xi×100%P=\frac{\sum x}{\sum x_i}\times 100\%P=∑xi∑x×100%

where PPP represents the practicality percentage, ∑x\sum x∑x is the total empirical score obtained, and ∑xi\sum x_i∑xi is the maximum possible score.

The resulting percentages were interpreted according to the criteria presented in Table 5.

Table 5. Practicality Score Interpretation Criteria

Percentage (%)	Practicality Category
81–100	Very practical
61–80	Practical
41–60	Fairly practical
21–40	Less practical
<20	Not practical

The audiovisual teaching materials were considered valid when they obtained an Aiken's V coefficient of at least 0.70. They were considered suitable in terms of practicality when the lecturer and student assessments reached the *practical* or *very practical* category, corresponding to a minimum score of 61%.

RESULT AND DISCUSSION

Expert Validation Results

The validity assessment was conducted by two media experts and two subject-matter experts. The media experts evaluated seven indicators, whereas the subject-matter experts evaluated six indicators based on the validation frameworks presented in Tables 1 and 2. Table 6 summarizes the expert-validation results.

Table 6. Summary of Expert Validation Results

Validation Aspect	Number of Experts	Number of Indicators	Mean Aiken's V	Interpretation
Media	2	7	0.86	Very valid
Content	2	6	0.86	Very valid
Overall	4	13	0.86	Very valid

Both validation aspects obtained a mean Aiken's V coefficient of 0.86 and were therefore categorized as very valid. The identical mean coefficients indicate that the product demonstrated consistently strong validity in terms of both media design and instructional content.

As presented in Table 7, the quality of the technique-demonstration videos obtained the highest media-validation coefficient (V=1.00V=1.00V=1.00). By contrast, audio-narration quality and display-design consistency received the lowest coefficients (V=0.75V=0.75V=0.75). Nevertheless, these coefficients remained above the predetermined validity threshold of 0.70. Within the content assessment, alignment between the materials and the course learning outcomes (*Capaian Pembelajaran Mata Kuliah* or CPMK) obtained the highest coefficient (V=1.00V=1.00V=1.00). The completeness of the materials in relation to the course syllabus and the accuracy of the material-presentation sequence received the lowest coefficients (V=0.75V=0.75V=0.75). These results indicate that all reported indicators met the minimum validity criterion, although improvements to narration, design consistency, content completeness, and presentation sequence were identified as priorities for product refinement.

Table 7. Highest- and Lowest-Rated Indicators in the Expert Validation

Validation Aspect	Assessment Position	Indicator	Aiken's V	Interpretation
Media	Highest	Quality of technique-demonstration videos	1.00	Very valid
Media	Lowest	Quality of audio narration	0.75	Valid
Media	Lowest	Consistency of display design	0.75	Valid
Content	Highest	Alignment with course learning outcomes (CPMK)	1.00	Very valid
Content	Lowest	Completeness of materials in relation to the syllabus	0.75	Valid
Content	Lowest	Accuracy of the material-presentation sequence	0.75	Valid

Overall, the combined mean Aiken's V coefficient was 0.86. Thus, the Articulate Storyline–based audiovisual mobile learning materials satisfied the established content-validity requirements and were eligible to proceed to the practicality-testing stage.

Practicality Test Results

The product practicality test involved 90 students and one lecturer responsible for the tennis course. The student participants comprised 30 students in the small-group trial and 60 students in the large-group trial. Both the lecturer and student instruments contained eight indicators based on the frameworks presented in Tables 3 and 4.

As shown in Table 8, the student practicality score increased from 82.5% in the small-group trial to 85.0% in the large-group trial. Both scores were within the very practical category. The difference of 2.5 percentage points suggests that the refinements made following the small-group trial improved students' experiences of using the teaching materials. Across the two trials, the mean student practicality score was 83.8%.

Table 8. Student Practicality Test Results

Trial Stage	Number of Students	Practicality Score (%)	Category
Small-group trial	30	82.5	Very practical
Large-group trial	60	85.0	Very practical
Overall mean	90	83.8	Very practical

The clarity of the technique-demonstration videos was the highest-rated student indicator, reaching 88.2%. This result is consistent with the expert-validation findings, in which video-demonstration quality also received the highest coefficient. Ease of interface navigation obtained the lowest student score of 79.4%. Although this score remained within the practical category, it indicates that interface navigation represents the principal area requiring further improvement. The lecturer awarded an overall practicality score of 90.6%, categorizing the product as very practical (Table 9). This score was 6.8 percentage points higher than the overall student score of 83.8%. The lecturer's lowest-rated indicators were time efficiency in delivering the materials, ease of integration with face-to-face instruction, and feasibility of sustainable use, each of which obtained 75.0%. Despite being the lowest-rated indicators, all three remained within the practical category.

Table 9. Summary of Lecturer Practicality Assessment

Assessment Component	Practicality Score (%)	Category
Overall lecturer assessment	90.6	Very practical
Time efficiency in delivering materials	75.0	Practical
Integration with face-to-face instruction	75.0	Practical
Feasibility of sustainable use	75.0	Practical

Figure 1 compares the practicality scores obtained across the student trials and lecturer assessment. The lecturer assessment produced the highest score, followed by the large-group and small-group student trials. All overall assessment scores exceeded the minimum practicality criterion of 61%.Practicality scores of the developed teaching materials
Comparison of student and lecturer assessments.

Figure 1. Practicality scores obtained from the small-group trial, large-group trial, overall student assessment, and lecturer assessment.

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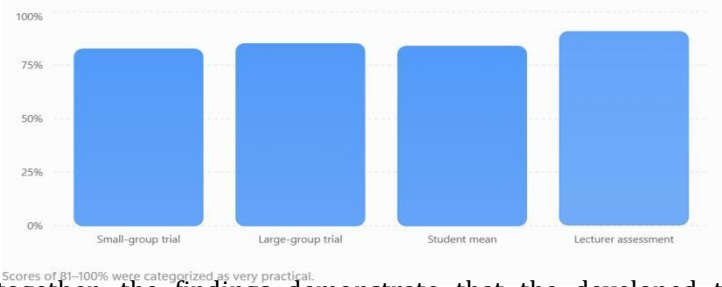

Taken together, the findings demonstrate that the developed teaching materials fulfilled both evaluation criteria. The product obtained an overall validity coefficient of V=0.86V=0.86V=0.86, an overall student practicality score of 83.8%, and a lecturer practicality score of 90.6%. Therefore, the Articulate Storyline–based audiovisual mobile learning materials were considered valid and highly practical for use as instructional materials in university tennis courses.

DISCUSSION

The principal finding of this study is that the Articulate Storyline–based audiovisual mobile learning materials developed for university tennis instruction met both quality gates examined before implementation: expert validity (mean Aiken's V = 0.86 for both media and content) and user practicality (83.8% among students and 90.6% among the lecturer). Technique-demonstration video quality was the strongest component, whereas navigation, audio narration, visual consistency, and integration with face-to-face teaching remained the main areas for refinement. The novelty lies not simply in digitizing tennis content, but in

combining interactive Articulate Storyline authoring, mobile access, and technique-specific audiovisual demonstrations in a product evaluated by both disciplinary experts and intended users across three Indonesian universities. Existing work has examined audiovisual tennis materials, digital tennis modules, or needs for Articulate Storyline separately (Belli et al., 2019; Damrah, P, et al., 2024; Pluim et al., 2023; Raibowo et al., 2022), the present study connects these strands by establishing the product's content–media validity and real-user practicality before an effectiveness trial.

The validity and practicality results are consistent with empirical studies of Articulate Storyline in other subjects, which generally report strong expert appraisal and favorable user responses (Ajmadewi et al., 2024b; Junpahira & Pahlevi, 2023b; Monalisa & Ariani, 2023; Sunanto et al., 2022). They also parallel findings from mobile physical-education products: (Adi & Fathoni, 2020). reported that an Android-supported floor-exercise resource was feasible and practical, while (Mahfud et al., 2022), found high expert-validation and large-group trial scores for mobile physical-fitness media. International evidence similarly indicates that well-designed mobile learning can support flexible access, interaction, and independent learning in higher education (Crompton & Burke, 2018; Lazaro & Duart, 2023; Naveed et al., 2023; Sophonhiranrak, 2021), Thus, the present scores are not isolated product ratings; they fit a wider empirical pattern in which mobile learning is valued when the content is aligned with course outcomes and the application remains understandable and usable.

The especially high rating for technique-demonstration videos is also supported by research on motor-skill learning. Immediate or structured video feedback has improved learners' opportunities to observe, compare, and correct movement performance in physical education (Nowels & Hewit, 2018; Potdevin et al., 2018; Zhou et al., 2021) Comparable benefits have been reported for laboratory skill engagement (Donkin et al., 2019) soccer performance (Martinez et al., 2024), dance skills (Deshmukh et al., 2022), and tennis tactical learning (Van Der Meer et al., 2024) wearable and biomechanical feedback research points in the same direction (Zhang et al., 2019). In addition, (Koekoek et al., 2018), showed that digital video can be aligned with game pedagogy rather than treated as a stand-alone display tool. These studies help explain why the demonstration-video indicator reached V = 1.00: tennis strokes involve temporally ordered and spatially coordinated actions that are difficult to represent adequately through static text or images, whereas replayable video externalizes critical movement information for repeated observation before and alongside on-court practice.

The present findings nevertheless differ in purpose and evidential strength from studies that measured learning outcomes. (Li & Zhang, 2024), for example, evaluated a mobile-supported flipped model for badminton motor skills, whereas (Zulkifli & Danis, 2022) examined a movement-analysis application that provided feedback on sports skills. (Costa et al., 2021) focused on relationships between fundamental motor competence and subsequent sport skill learning, while (Petancevski et al., 2022), synthesized experimental evidence on augmented feedback. By contrast, this study stopped at the design–development phase and measured expert agreement and perceived practicality rather than knowledge retention or tennis performance. Differences in outcomes, learner age, sport task, intervention duration, feedback modality, and study design therefore explain why its percentages should not be interpreted as directly equivalent to effect estimates from controlled motor-learning studies. They indicate readiness for implementation, not demonstrated instructional effectiveness.

The similarity between the high student and lecturer ratings can plausibly be attributed to alignment among the product's content, the course learning outcomes, and users' need to revisit demonstrations beyond scheduled court sessions. Research on mobile learning emphasizes readiness, instructional management, and supporting systems as conditions for adoption (Gupta et al., 2021; Krull & Duart, 2017; Sophonhiranrak, 2021). Interactive and cooperative mobile designs are also more useful when response time, access, and user interaction are treated as explicit usability features (Parsazadeh et al., 2018). The slightly higher lecturer score may reflect the lecturer's ability to recognize curriculum alignment and opportunities for repeated explanation, whereas students interacted more directly with the navigation sequence and therefore encountered usability friction that was less visible to the

lecturer. This interpretation is consistent with evidence that teachers' beliefs, digital competence, and pedagogical context shape how technology is evaluated and enacted in physical education (Isgren Karlsson et al., 2023; R. Marttinen et al., 2019, 2020; R. H. J. Marttinen et al., 2017).

The lower scores for navigation and face-to-face integration are likewise theoretically and empirically plausible. Systematic reviews show that digital technology in physical education produces benefits only when pedagogy, learner activity, and classroom routines are deliberately coordinated (Jastrow et al., 2022; Mödinger et al., 2022). Mobile learning research also identifies usability, institutional support, distraction, and instructional orchestration as recurring barriers (Crompton & Burke, 2018; Lai et al., 2022; Sophonhiranrak, 2021). Moreover, feedback studies do not identify one universally optimal format or frequency; effects vary by learner expertise, task complexity, timing, and feedback design ((Milroy et al., 2022; Petancevski et al., 2022). The weaker integration indicators in this study should therefore be understood as a design signal: the media require clearer navigation cues, shorter learning paths, and an explicit before–during–after court-use sequence so that audiovisual support complements demonstration, guided practice, peer observation, and lecturer feedback rather than competing with them (Sargent & Casey, 2020)

The study contributes to the literature in three ways. First, it extends Articulate Storyline research from predominantly cognitive school subjects to a university psychomotor course in which movement representation is central. Second, it provides a tennis-specific development pathway linking a prior needs analysis to expert validation and staged user testing, thereby making the pre-implementation evidence chain more explicit. Third, it identifies a useful contrast between content strength and implementation readiness: high ratings for demonstration quality and curriculum alignment coexisted with lower ratings for navigation and blended integration. This distinction advances the argument that technology itself does not determine learning quality; its value depends on the activities and pedagogical relationships it enables (Ferriz-Valero et al., 2022; Gradini et al., 2022b; Jastrow et al., 2022; Van Andel et al., 2022). Evidence from tablet-integrated physical education and technology-integration studies supports the same principle (Afifah Maulidiyyah & Purwoko, 2023; Kuswoyo & Betaubun, 2019; Lee & Gao, 2020; R. Marttinen et al., 2019).

Practically, tennis lecturers can use the materials as preparation before class, a visual reference during technical explanation, and a review resource after practice. The next product revision should simplify menu hierarchies, standardize visual and audio presentation, add progress and return controls, and provide brief lesson-integration guidance indicating when students should watch, practise, record, compare, and reflect. Academically, subsequent research should proceed to the implementation and evaluation phases of ADDIE using a controlled design, validated tennis-skill rubrics, cognitive and motivational outcomes, delayed retention tests, usage analytics, and qualitative interviews with students and lecturers. The evidence should also be tested across devices, connectivity conditions, universities, and levels of prior tennis experience. Because this study used expert ratings and self-reported practicality without a control group or learning-outcome test, its findings support feasibility rather than effectiveness. Institutional policy should consequently prioritize device compatibility, reliable access, lecturer professional development, and technical support before scaling the product, consistent with broader recommendations for sustainable mobile and digital learning (Gupta et al., 2021; Lamrani & Abdelwahed, 2020; Naveed et al., 2023; Novaliendry et al., 2020).

CONCLUSIONS

This study demonstrates that the Articulate Storyline–based audiovisual mobile learning materials developed for university tennis instruction satisfy the required validity and practicality criteria. The product achieved a mean Aiken's V coefficient of 0.86 for both media and content validation, indicating a high level of expert agreement regarding its instructional and technical quality. It was also rated as highly practical by students (83.8%) and the course lecturer (90.6%). In particular, the technique-demonstration videos emerged as the product's strongest component, confirming the value of clear audiovisual representations in supporting

the learning of basic tennis techniques. Despite these positive findings, interface navigation, audio narration, consistency of visual design, integration with face-to-face instruction, and sustainable classroom use require further refinement. These findings indicate that developing valid digital content alone is insufficient; effective integration into existing instructional practices must also be considered. Overall, the product is suitable for proceeding to the implementation and effectiveness-evaluation stages of the ADDIE model. However, the present findings establish only its validity and perceived practicality and should not be interpreted as evidence of improved learning outcomes. Future research should employ a controlled experimental design to determine its effects on students' knowledge, independent learning, motivation, and mastery of basic tennis techniques.

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