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Instructions Development and Validation of an Augmented Reality Based Learning Module to Improve Problem Solving and Practical Skills

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Abstract: This study aimed to develop and validate an Augmented Reality based learning module designed to support the development of problem-solving and practical skills among students in the State Administration Study Program at Universitas Terbuka. The research employed a Research and Development methodology using five systematic stages: Analysis, Design, Development, Implementation, and Evaluation. During the analysis stage, learning needs, student characteristics, instructional challenges, and curriculum requirements were identified as the foundation for developing the module. The design and development stages focused on organizing learning materials, developing interactive content, integrating Augmented Reality features, and designing learning activities that were relevant to the competencies of State Administration students. The validity of the developed product was assessed by a panel of 11 experts representing four areas of expertise: media, subject matter, linguistics, and pedagogy. The validation process examined the quality, relevance, accuracy, usability, visual presentation, language clarity, and instructional appropriateness of the module. The results demonstrated that the developed AR-based learning module achieved an overall mean validity score of 85.92%, which was categorized as highly valid. Specifically, the media component obtained the highest score of 86.8%, followed by the pedagogical aspect at 86.4%, the language aspect at 86.0%, and the content aspect at 84.5%. These findings indicate that the module meets established standards of content accuracy, instructional design, language clarity, and technological presentation. The integration of Augmented Reality provides immersive, interactive, and contextually rich learning experiences, enabling students to better visualize and engage with public administration concepts and practical.

Keywords: Augmented reality; learning module; state administration education; problem-solving skills; practical skills.

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INTRODUCTION

The development of digital technology has created a major transformation in education, particularly in the era of the Industrial Revolution 4.0, which is characterized by the convergence of physical and virtual environments. This transformation necessitates the acquisition of innovative pedagogical methodologies that not only enable the assimilation of knowledge but also foster the cultivation of competencies requisite for the 21st century, which encompass critical thinking, collaboration, creativity, and digital literacy (Forum, 2020; Haryaka et al., 2025; Lee et al., 2025; Wider et al., 2026). A notable technological advancement that has surfaced as a viable innovation within the educational

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domain is Augmented Reality, which seamlessly integrates digital components such as textual information, visual imagery, video content, and three-dimensional objects into real-world contexts in real-time (Algerafi et al., 2023; Garzón, 2021; Koumpouros, 2024).

By virtue of its interactive and immersive features, Augmented Reality possesses the capacity to engender more significant and contextually relevant learning experiences within the sphere of higher education (Billinghurst et al., 2015; Bacca et al., 2014). The application of learning technologies holds particular significance in open and distance learning environments, exemplified by Universitas Terbuka. In such contexts, the infrequency of face-to-face interactions often diminishes opportunities for direct observation, simulation, and hands-on activities that are essential for enhancing students' comprehension of intricate concepts. Students enrolled in the State Administration Study Program frequently encounter challenges in grasping abstract subjects, including bureaucratic frameworks, public organizational architectures, policy development processes, and governance practices.

Traditional educational resources often prove inadequate for conveying these concepts in a contextual and practical manner, resulting in learning experiences that are less engaging, meaningful, and relevant to real-world situations. Consequently, students may experience difficulties in understanding complex concepts and applying theoretical knowledge effectively within authentic administrative contexts and professional environments. (Moore et al., 2011; O'Neill & Short, 2025; Sato, 2025). In this context, Augmented Reality presents opportunities to elucidate administrative concepts through visual representation, simulation, and interactive pedagogical activities that can facilitate a more profound understanding of public administration phenomena. Prior research has documented a plethora of educational advantages associated with Augmented Reality. Empirical findings suggest that Augmented Reality can augment students' motivation, conceptual comprehension, and engagement in learning (Garzón et al., 2020; Wu et al., 2013).

Additional investigations have indicated that Augmented Reality contributes to the enhancement of problem-solving skills, critical thinking, and practical competencies through simulation-based and inquiry-driven learning experiences (Ibáñez & Delgado-Kloos, 2018; Sirakaya & Alsancak Sirakaya, 2018; Chen et al., 2020). These findings underscore that Augmented Reality possesses substantial potential to facilitate active learning and enrich students' educational experiences across diverse instructional contexts. Notwithstanding these merits, the integration of Augmented Reality within Indonesian higher education remains constrained. A multitude of challenges has been identified, including limitations in technological infrastructure, disparate levels of digital literacy among educators and learners, and the scarcity of Augmented Reality based educational resources that align with local curricular requirements and pedagogical characteristics (De Moraes Rossetto et al., 2023; Garzón et al., 2022; Risqiyono & Setyasto, 2025; Utami & Setiawan, 2022).

Furthermore, prior research has largely concentrated on science, technology, vocational, and professional education contexts. By contrast, the use of Augmented Reality within State Administration education remains insufficiently explored in the academic literature, more so in distance learning settings. This points to an ongoing demand for learning resources that can meaningfully incorporate Augmented Reality technology into State Administration subject matter in ways that foster contextual understanding, strengthen problem-solving capacities, and support the development of

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practical competencies. Motivated by this gap, the current study undertakes the development of an Augmented Reality-based learning module specifically tailored to State Administration education. The module brings together Augmented Reality functionalities and instructional content concerning public organizations and public management, with the intention of delivering a more interactive and contextually grounded learning experience.

Whereas earlier studies have largely examined the broad advantages of Augmented Reality in educational settings, the present study directs its attention specifically toward the development and validation of a learning module designed to align with the distinctive characteristics of State Administration learning within a distance education framework. This particular focus represents the core contribution of the study and serves to broaden the scope of Augmented Reality application into an educational domain that has thus far remained comparatively underexplored. Accordingly, this study aims to develop and validate an Augmented Reality-based learning module for use in State Administration education. The validation process involves a comprehensive evaluation of the module across several dimensions, including media quality, content relevance, linguistic appropriateness, and pedagogical soundness.

The evaluation is conducted to ensure that the developed module meets academic, technical, and instructional standards while effectively supporting student learning. The findings are expected to contribute to the development of innovative, interactive, and technology-enhanced learning resources that facilitate meaningful learning experiences, promote active student engagement, encourage independent learning, and improve students' understanding of complex concepts. Furthermore, the module is expected to enhance the accessibility, flexibility, and effectiveness of distance education in higher education institutions. Specifically, its implementation within State Administration education programs may provide students with contextual, practical, and engaging learning experiences that connect theoretical knowledge with real-world administrative practices and professional challenges.

METHOD

This study adopted a research and development approach guided by the instructional design framework five sequential stages: Analysis, Design, Development, Implementation, and Evaluation (Fadli & Irwandi, 2020; Arisman & Susanti, 2021). The primary focus of the study was the development and validation of an Augmented Reality based learning module intended for use in State Administration education. The Analysis, Design, Development, Implementation, and Evaluation model was deemed appropriate for this study given its structured and systematic nature in guiding the design, development, and evaluation of educational products. In the Analysis stage, an examination of students' learning needs, curriculum demands, and the specific characteristics of the subject matter was carried out through curriculum review and direct field observations. The primary objective of this stage was to ensure that the resulting module adequately addressed the competencies expected within the State Administration Study Program (Arisman & Susanti, 2021).

The Design stage encompassed the preparation of the instructional blueprint, determination of content organization, selection of appropriate media formats, and development of the module's visual layout. Throughout this process, considerations related to readability, interactivity, and pedagogical alignment were consistently

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maintained (Handayani & Johan, 2022; Tarun et al., 2025). During the Development stage, the instructional blueprint was transformed into a fully realized learning module through the integration of subject content, visual components, and AR functionalities. The resulting module was then subjected to expert validation to assess its feasibility across several dimensions, including content quality, media design, language use, and pedagogical appropriateness (Apriliyani & Mulyadi, 2021). The Implementation stage involved introducing the module to a limited group of learners to evaluate its usability and suitability within actual learning activities.

Feedback obtained during this stage informed subsequent product refinements. The Evaluation stage was conducted continuously throughout the development cycle to identify areas requiring improvement and to ensure that the final product met established quality standards (Ball et al., 2020; Sari & Wulandari, 2020). The validation process engaged a total of 11 validators comprising lecturers, educational practitioners, media experts, subject-matter specialists, language experts, and pedagogical experts. These validators were selected through purposive sampling based on their relevant expertise and professional background in the evaluation of educational media (Almanasreh et al., 2019; Apriliyani & Mulyadi, 2021). The purpose of the validation was to gather objective, critical, and comprehensive feedback on the developed module (Sugiyono, 2016; Silitonga et al., 2021; Loka Son, 2019). Furthermore, the validation process was designed to confirm that the module was well-suited to adult learners, who generally require clarity, a degree of autonomy, and flexibility in their learning experience (Moore et al., 2011).

Data collection was conducted using a closed-ended questionnaire based on a five-point Likert scale to obtain systematic and measurable assessments from the validators. The validation instrument consisted of four main evaluative dimensions, namely media quality, content quality, language appropriateness, and pedagogical suitability (Akbar, 2017; Pratiwi & Nurhayati, 2023). Each dimension contained several indicators designed to assess the quality, relevance, clarity, usability, and instructional effectiveness of the developed learning module. The completed questionnaires were compiled and scored according to the predetermined Likert scale. The resulting quantitative data were then analyzed descriptively using percentage scores to determine the overall validity level of the developed learning module and to identify aspects requiring further revision before its implementation in the learning process.

RESULT AND DISCUSSION

The primary output of this study was an Augmented Reality based learning module developed for use in State Administration education. The module was constructed to facilitate learning on topics related to public organizations and public management by incorporating interactive three-dimensional visualizations, digital narratives, self-reflection activities, problem-solving exercises, and group-based tasks grounded in Problem Based Learning. Throughout its development, the Analysis, Design, Development, Implementation, and Evaluation model served as the guiding framework to ensure that the module remained responsive to students' learning needs and aligned with relevant curriculum requirements. The final product takes the form of a digital learning resource accessible via mobile devices, enabling learners to engage with instructional content in a more interactive and contextually meaningful way.

At the Analysis stage, a comprehensive examination was conducted to identify curriculum requirements, learner characteristics, and difficulties encountered during the

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learning process. The findings indicated that students often experienced difficulties understanding abstract public administration concepts, including governmental structures, policy-making processes, and inter-organizational relationships. These concepts are challenging to visualize through conventional instructional media, particularly in distance learning environments where opportunities for direct observation and practical experience are limited. This condition highlights the need for innovative learning resources that can bridge theoretical knowledge with practical contexts and promote meaningful learning. In response, Augmented Reality technology was integrated into the module to provide interactive, contextual, and engaging learning experiences.

Augmented Reality facilitates the overlay of virtual objects onto real-world environments, enabling students to visualize otherwise complex concepts and engage more actively with the instructional content (Azuma, 1997; Yuen et al., 2011). A growing body of research has demonstrated that Augmented Reality holds significant potential for enhancing conceptual understanding, sustaining learning motivation, and promoting student engagement through the provision of immersive educational experiences (Akçayır & Akçayır, 2017; Billinghurst et al., 2015; Ibáñez & Delgado-Kloos, 2018; Rahmawati et al., 2022; Bacca et al., 2014). On this basis, the integration of Augmented Reality into the module was anticipated to assist students in making sense of public administration concepts that are commonly perceived as abstract and difficult to comprehend. The Design stage centered on the construction of learning content and interactive features intended to actively engage students with the instructional materials.

The module was developed to include three-dimensional visualizations, narrative explanations, audio support, self-reflection prompts, practice exercises, and problem-solving tasks. The design process was informed by the principles of Multimedia Learning Theory and Dual Coding Theory, both of which underscore the importance of combining visual and verbal representations to promote deeper cognitive engagement and more durable knowledge retention (Akdag et al., 2025; Mayer, 2009). In addition, user experience considerations were embedded throughout the design process to ensure that the module offered ease of navigation, broad accessibility, and compatibility across a range of mobile devices (Dunleavy et al., 2009; Segun-Falade et al., 2024). The outcome of the design stage was an initial prototype of the Augmented Reality based learning module. The structure and main components of the developed module are presented in Table 1.

Table 1. Initial Plan

Module Component	Initial Design
Cover	Designed to include the e-module title, author and institutional identity, educational level, and illustrations representing public organization and public management content.
Foreword	Contains the rationale for the development of the module, the importance of public organization and public management topics, the objectives of the module, and expectations regarding students' competency development in understanding public administration dynamics.
Table of Contents	Presents the structure of the e-module, including Public Organization, Fundamentals of Public Management, self-reflection activities, exercises, and Augmented Reality based learning activities.
Discussion	Covers two major topics: (1) Public Organization (definitions, theories, organizational structures, organizational models, line and staff organizations), and (2) Fundamentals of Public Management (management theories, management functions, leadership, and decision-making).

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Module Component	Initial Design
Self-Reflection	Provided after each major topic to encourage students to reflect on their conceptual understanding and its application in public institutions and community settings.
Exercises	Consists of practical skill exercises and problem-solving tasks based on case studies related to organizational structure, management functions, leadership styles, and decision-making challenges.
Group Activity Sheet	Designed using a Problem-Based Learning approach supported by Augmented Reality. The activity sheet includes stages of problem orientation, idea generation, knowledge synthesis, solution development, reflection, and learning evaluation.

The Development stage was primarily concerned with translating the instructional blueprint into a fully operational Augmented Reality based learning module. During this phase, learning content, visual elements, and interactive features were consolidated into a unified digital learning resource. The development activities encompassed the creation of three-dimensional objects, animations, audio narration, and a range of interactive learning tasks intended to deepen students' understanding of concepts related to public organizations and public management. Beyond content delivery, problem-solving exercises and reflective activities were deliberately embedded within the module to stimulate active participation and cultivate habits of independent learning. The incorporation of Augmented Reality functionalities was aimed at providing students with direct opportunities to interact with instructional content through visualization and exploratory engagement.

By rendering abstract administrative concepts in a more concrete and contextually situated form, the module was designed to support conceptual comprehension and promote learning experiences that are genuinely meaningful. This rationale is well-supported by prior research indicating that Augmented Reality enriches learning environments through the convergence of visual representation, interactivity, and experiential learning elements (Akçayır & Akçayır, 2017; Billinghurst et al., 2015). The finalized prototype consisted of an Augmented Reality -based application seamlessly integrated with a digital learning module accessible through mobile devices. Upon completion, the prototype was submitted to a panel of experts for validation, with the evaluation focused on assessing the overall quality and instructional suitability of the developed product.

Following the development phase, the Augmented Reality-based learning module underwent expert validation to assess its overall quality and readiness for educational implementation. The validation involved 11 experts from diverse professional backgrounds, including lecturers, educational practitioners, media specialists, language experts, pedagogical experts, and subject-matter experts in State Administration. The evaluation focused on four principal dimensions: media quality, content quality, language appropriateness, and pedagogical suitability. This validation process aimed to ensure that the developed module met established academic, technical, and instructional standards. The experts' assessments also provided valuable feedback regarding the module's strengths and areas requiring improvement. The results served as an important basis for refining the module before its implementation in actual learning activities.

The feedback provided by the validators served two main purposes: identifying specific aspects requiring refinement and guiding subsequent revisions to enhance the module's overall quality. In addition to numerical ratings, validators provided qualitative recommendations concerning visual presentation, content organization, language clarity,

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and instructional design. These recommendations were carefully considered to improve the module's effectiveness, usability, accessibility, and instructional relevance. The feedback also helped ensure that the learning materials were presented clearly and aligned with the intended learning objectives. Furthermore, the suggestions supported improvements in the module's interactive features and overall learning experience. The results of the expert validation process, including assessment scores and recommendations, are presented in Table 2.

Table 2. Validation Results of Augmented Reality Learning Module

Aspect	Percentage (%)	Category
Media	86.8	Highly Valid
Content	84.5	Highly Valid
Language	86.0	Highly Valid
Pedagogical	86.4	Highly Valid
Average	85.92	Highly Valid

As reflected in Table 2, the Augmented Reality based learning module that was developed in this study attained an overall validity score of 85.92%, a figure that places it within the category of highly valid instructional materials. Across all evaluated dimensions, the scores consistently exceeded 84%, indicating that the module satisfactorily met the established standards with respect to media design, content quality, language use, and pedagogical appropriateness. The notably high validity level obtained suggests that the module has succeeded in integrating instructional content with Augmented Reality technology in a way that remains coherent with and supportive of the intended learning objectives. These findings collectively point to the conclusion that the developed module is not only technically sound but also instructionally appropriate for application within State Administration education.

Moreover, the validation outcomes demonstrate that the integration of Augmented Reality features into the learning module did not compromise the quality of the content, linguistic clarity, or overall instructional effectiveness. Instead, the findings indicate that Augmented Reality can be incorporated effectively while maintaining the essential academic and pedagogical standards required for learning materials. The technology provides additional opportunities to present subject-specific concepts in a more interactive, contextual, and engaging manner without reducing the accuracy or coherence of the instructional content. These results therefore reinforce the viability of Augmented Reality as an innovative medium for delivering learning materials in State Administration education, particularly within distance learning environments where students have limited opportunities for direct observation and practical learning experiences.

Table 3. Media Aspect Validation Results

Indicator	Assessment Item	X	%	Criteria
Design	The visual design of the media is appropriate to the presented theme or topic.	2.54	85	Highly Valid
	The layout of media elements is well organized and easy to follow.	2.63	88	Highly Valid
	The font size is appropriate for users' reading needs.	2.63	88	Highly Valid
	Numerical information is presented clearly and is easy to understand.	2.63	88	Highly Valid

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Indicator	Assessment Item	X	%	Criteria
	The images used are relevant to the topic or theme of the media.	2.63	88	Highly Valid
	The image quality is clear and visually appropriate.	2.45	82	Highly Valid
Ease of Use	Navigation between pages and Augmented Reality features is easy and intuitive.	2.63	88	Highly Valid
	The media layout helps users understand how to use the module effectively.	2.63	88	Highly Valid

Among the four evaluated dimensions, the media aspect yielded the highest validation score at 86.8%, reflecting the validators' strong endorsement of the module's visual design, navigational structure, and the manner in which Augmented Reality features were integrated. This result indicates that the module was capable of presenting instructional content in a manner that is clear, well-organized, and accessible to learners. The favourable appraisal of the visual and technical dimensions carries particular significance in the context of distance learning, where students are largely dependent on digital resources as their primary means of accessing and comprehending course materials. The elevated score in this dimension may also be attributed to the presence of three-dimensional visualizations and interactive components that afford learners the opportunity to explore otherwise abstract concepts in a more tangible and concrete form.

Within State Administration education specifically, a considerable number of topics revolve around intricate organizational structures, policy-making processes, and governance systems that prove difficult to convey adequately through conventional instructional materials. The deployment of Augmented Reality features within the module allows these concepts to be rendered in a more dynamic and visually engaging manner, which in turn is expected to support students' comprehension and sustain their engagement with the learning content. These findings are in alignment with the tenets of Multimedia Learning Theory, which holds that the simultaneous use of visual and verbal representations promotes deeper cognitive processing and strengthens long-term knowledge retention. Furthermore, the results corroborate earlier empirical work demonstrating that Augmented Reality based learning environments have the capacity to heighten student engagement and enrich learning experiences through interactive and immersive modes of content delivery (Billinghurst et al., 2015; Akçayır & Akçayır, 2017).

Therefore, the high validation score obtained in the media aspect reflects not only the technical quality of the module but also its potential to support meaningful learning experiences in State Administration education. The findings indicate that the module possesses an effective combination of visual quality, functional usability, interactive features, and technological accessibility. These characteristics enable the Augmented Reality-based module to present learning materials in an engaging and comprehensible manner while facilitating students' interaction with abstract administrative concepts. Furthermore, the strong media validation results suggest that the module is sufficiently appropriate for use in distance learning environments. Thus, its technological and instructional features can contribute to increased student engagement, improved conceptual understanding, and more meaningful learning experiences in State Administration education.

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Table 5. Results of Material Aspect Validation

Indicator	Assessment Item	X	%	Criteria
Content Feasibility	The content is aligned with the study program learning outcomes.	2.54	85	Highly Valid
	The scope of the content supports understanding of State Administration concepts.	2.54	85	Highly Valid
	The State Administration concepts presented are accurate.	2.54	85	Highly Valid
	Definitions, scientific terms, and institutional names are accurate.	2.54	85	Highly Valid
	The use of foreign terms and institutional names is appropriate.	2.72	90	Highly Valid
	The content is organized systematically and logically.	2.63	88	Highly Valid
	The content is updated with current data and policies.	2.54	85	Highly Valid
	Quizzes and exercises are provided to assess the achievement of learning objectives.	2.63	88	Highly Valid
Presentation	The content is presented in a systematic and consistent structure.	2.63	88	Highly Valid
	The selected font type complies with academic presentation standards.	2.54	85	Highly Valid
	The font size is easy for students to read.	2.45	82	Highly Valid
	The module follows standard spelling and writing conventions.	2.27	76	Valid
	The sentences used are clear and easy to understand.	2.45	82	Highly Valid
	Instructions for using the AR learning media are provided.	2.45	82	Highly Valid
	AR visualizations and multimedia elements support learning activities.	2.45	82	Highly Valid
	References and learning resources are clearly provided.	2.54	85	Highly Valid
Interest and Learning Motivation	The AR media attracts students' interest in learning.	2.54	85	Highly Valid
	Students find it easier to understand the material through AR.	2.63	88	Highly Valid
	Interactive AR features encourage active student participation.	2.54	85	Highly Valid
	The AR media provides a meaningful and enjoyable learning experience.	2.45	82	Highly Valid

The content dimension of the validation yielded a score of 84.5%, reflecting the validators' assessment that the learning materials incorporated within the developed module were highly appropriate for their intended educational purpose. This outcome suggests that the instructional content was well-aligned with the curriculum requirements, learning outcomes, and competencies prescribed within the State Administration Study Program. The materials themselves were organized in a systematic and coherent manner to guide students through key subject areas, including public organizations, public management, and administrative processes. The relatively high score attained in this dimension underscores the critical role of content accuracy and relevance in the development of digital learning resources.

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While interactive technologies undeniably have the potential to enrich the learning experience, the educational value of any instructional module is ultimately determined by the quality and appropriateness of its content. It follows, therefore, that maintaining strong alignment between the learning materials, course objectives, and the actual needs of students remains an indispensable condition for effective learning. Beyond content delivery, the integration of Augmented Reality features into the module opens avenues for students to establish meaningful connections between theoretical constructs and their practical, real-world representations. Through three-dimensional visualizations, simulations, and interactive learning tasks, learners are afforded the opportunity to engage with administrative concepts in ways that would be difficult, if not impossible, to replicate through conventional instructional materials alone.

This finding is consistent with prior research demonstrating that Augmented Reality can support conceptual understanding by translating abstract information into more concrete and contextually meaningful representations (Ibáñez & Delgado-Kloos, 2018; Chen et al., 2020). The favourable evaluation of the content dimension indicates that the developed module successfully harmonizes technological innovation with substantive academic content. Consequently, the module goes beyond providing interactive learning experiences by delivering instructional materials that are relevant, accurate, coherent, and aligned with the learning objectives of State Administration education. This integration ensures that Augmented Reality technology serves a meaningful pedagogical function while supporting students' understanding of subject-specific concepts and practical administrative contexts.

Table 6. Language Aspect Validation Results

Indicator	Assessment Item	X	%	Criteria
Language Aspect	The sentences used are effective and efficient.	2.45	82	Highly Valid
	Grammar and sentence structure comply with standard language conventions.	2.54	85	Highly Valid
	The terminology used is appropriate to the discipline of State Administration.	2.72	90	Highly Valid
	The language used is clear and easy for students to understand.	2.63	88	Highly Valid
	The text is free from spelling and punctuation errors.	2.54	85	Highly Valid

The language dimension of the validation received a score of 86.0%, reflecting the validators' collective judgment that the language employed throughout the module was clear, appropriate, and readily accessible to the intended learners. The panel of validators concurred that the module made effective use of sentence construction, employed terminology suited to the subject matter, and maintained language expressions consistent with established academic conventions. This particular finding carries considerable significance, given that linguistic clarity plays a pivotal role in facilitating students' comprehension of instructional materials, most notably in distance learning settings where learners are expected to engage with course content largely on their own. The favorable assessment of the language dimension implies that the module was effective in conveying information in a manner that did not impose unnecessary cognitive burdens on learners.

Well-structured and unambiguous language enables students to process concepts, follow instructions, and engage with learning activities more efficiently. Conversely,

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language that is vague or excessively complex tends to impede comprehension and diminish the overall instructional effectiveness of a learning resource. The appropriateness of the language to students' academic backgrounds further contributes to the module's overall accessibility and ease of use. This consideration becomes especially pertinent in Augmented Reality supported learning environments, where learners must simultaneously process multiple streams of information encompassing textual content, visual representations, and interactive features. Under such conditions, linguistic clarity is not merely desirable but essential, as it allows students to direct their cognitive resources toward the learning tasks at hand rather than expending effort on deciphering unclear or ambiguous instructions.

These findings resonate with prior studies highlighting language quality as a foundational element of effective educational media, given its direct influence on information processing, comprehension, and learner engagement (Carroll et al., 2021; Diansah, 2020; Martin & Borup, 2022; Mikić et al., 2026). The strong score achieved in this dimension suggests that the developed module has effectively integrated technological innovation with clear, accurate, and purposeful instructional communication. Appropriate language use enables students to understand the presented materials more easily, follow learning instructions accurately, and engage actively with the content. Moreover, linguistic clarity supports independent learning by reducing potential misunderstandings and facilitating students' ability to navigate the module. Thus, language quality strengthens both the accessibility and pedagogical effectiveness of the module.

Table 7. Pedagogical Aspect Validation Results

Indicators	Assessment Items	X	%	Criterion
Aspects of Pedagogic	Materials are in accordance with the Learning Outcomes (CP) and the level of student development	2,45	82%	Highly Valid
	Delivering encouraging material critical thinking activities and Understanding concepts	2,54	85%	Highly Valid
	Augmented Reality media supports the implementation of an active and participatory learning approach	2,72	90%	Highly Valid
	The material is presented in a concise, logical and simple manner Followed	2,63	88%	Highly Valid
	Media can help achieve learning goals	2,54	85%	Highly Valid

The pedagogical dimension of the validation yielded a score of 86.4%, reflecting the validators' strong endorsement of the module's capacity to support learning objectives and facilitate meaningful instructional processes. The validators were in agreement that the learning activities, organizational structure of the content, and Augmented Reality features were well-aligned with learner-centered pedagogical approaches and were effective in encouraging active student participation throughout the learning experience. This outcome suggests that the module holds considerable potential for fostering meaningful learning by promoting exploration, critical reflection, and sustained engagement with instructional materials. The favourable appraisal of the pedagogical

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dimension can be attributed, in large part, to the deliberate incorporation of Problem-Based Learning activities and contextually grounded learning tasks within the module.

These activities are designed to prompt students to analyze real-world scenarios, identify underlying problems, weigh alternative solutions, and arrive at informed decisions based on available evidence. Such learning experiences are particularly well-suited to State Administration education, a field in which students are expected to cultivate analytical thinking, sound decision-making capabilities, and practical problem-solving competencies in response to the complex demands of public governance. From a theoretical standpoint, these findings lend support to constructivist learning principles, which hold that knowledge is not passively received but actively constructed through processes of interaction, exploration, and direct experience. The integration of Augmented Reality technology within the module affords students opportunities to engage with instructional content in more authentic and contextually situated ways, thereby facilitating deeper conceptual understanding and supporting the active construction of knowledge.

Furthermore, the simultaneous use of visual, verbal, and interactive elements within the module may serve to heighten cognitive engagement and contribute to more effective and durable learning outcomes. The results of this study are in accordance with a body of prior research demonstrating that Augmented Reality based learning environments are capable of enhancing student engagement, motivation, and active involvement in learning activities (Garzón et al., 2020; Bacca et al., 2014; Wu et al., 2013). Notably, however, the present study distinguishes itself from much of the existing literature, which has predominantly concentrated on science, technology, and vocational education contexts, by extending the application of Augmented Reality to the domain of State Administration education. This contribution is of considerable significance, as it provides empirical evidence for the potential of Augmented Reality to support learning in disciplines that are inherently centered on abstract organizational, managerial, and governance-related concepts.

Taken together, the validation results confirm that the developed Augmented Reality-based learning module satisfactorily meets established standards across four dimensions: media quality, content quality, language appropriateness, and pedagogical suitability. The findings demonstrate that the module is feasible for implementation as an instructional resource in State Administration education and has considerable potential to enrich students' learning experiences through interactive, contextual, and engaging activities. Furthermore, the module supports the presentation of complex concepts in more accessible ways, particularly within distance learning environments. Beyond its practical contribution, this study adds to the growing body of scholarly literature on the integration of Augmented Reality technology in higher education. It also provides valuable insights into technology-enhanced learning resources for distance education.

CONCLUSION

This study developed and validated an Augmented Reality-based learning module for State Administration education using the Analysis, Design, Development, Implementation, and Evaluation framework. Based on assessments from 11 experts, the module achieved an overall validity score of 85.92%, placing it in the highly valid category. The four dimensions recorded scores of 86.8% for media quality, 84.5% for content quality, 86.0% for language appropriateness, and 86.4% for pedagogical suitability, indicating that the module meets established standards for quality educational media. The findings

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confirm that the module is feasible for instructional use, particularly in distance learning contexts. Its Augmented Reality features enable public administration concepts to be presented interactively, contextually, and visually, thereby supporting meaningful learning experiences. The study also contributes to the growing literature on Augmented Reality in higher education by highlighting its application in State Administration education. Future research should examine the module's practicality and instructional effectiveness through broader implementation involving larger and more diverse student populations.

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