

Development Of A Digital And Ethnopedagogy-Based E-Module To Enhance Pre-Service Early Childhood Teachers' Assessment Competence

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Abstract

This research is motivated by the need to develop innovative learning materials that strengthen the assessment competencies of Early Childhood Education (ECE) teacher candidates in the Early Childhood Education Learning Evaluation course. Existing learning materials need further development to become more adaptive to digital learning environments and to connect evaluation concepts with local cultural contexts. This study aims to produce, test, and analyze a digital and ethnopedagogy based ECE Learning Evaluation e-module that is valid, practical, and effective for use in the learning of ECE teacher education students. The research employed a Research and Development (R&D) method using the ADDIE development model, consisting of analysis, design, development, implementation, and evaluation stages. The research subjects were 50 ECE students. Data were collected through validation instruments sheets from material and media experts, student response questionnaires, and assessment competency tests. The results showed that the developed e-module obtained a validity score of 89.50% categorized as highly valid, a practicality score of 90.48% categorized as highly practical, and improved students' assessment competencies from an average pretest score of 67.80 to 86.40 in the posttest, with an N-Gain score of 0.57 in the moderate category. The findings indicate that the digital and ethnopedagogy based Early Childhood Education Learning Evaluation e-module is feasible to be used as an innovative learning resource to strengthen the assessment competencies of ECE teacher candidates.

Keywords: e-module, early childhood education evaluation, ethnopedagogy, authentic assessment, pre-service ECE teachers



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Introduction

Early Childhood Education (ECE) represents a critical period for developing children's foundational competencies across multiple developmental domains, including moral and religious values, physical-motor development, cognition, language, social-emotional development, and the arts. Given the

holistic nature of early childhood development, learning should focus not only on educational outcomes but also on children's continuous developmental processes. Within this context, learning evaluation constitutes an integral component of early childhood educational practice, as it enables teachers to monitor children's developmental progress and to design appropriate instructional and stimulation strategies that address each child's individual needs. individualnya (Mulyasa, 2017). According to the latest curriculum framework, Early Childhood Education (ECE) is designed to provide meaningful, holistic, and developmentally appropriate play-based learning experiences. Consequently, learning evaluation in ECE extends beyond the assignment of scores or grades; rather, it is a systematic process of gathering comprehensive information about children's developmental progress to inform instructional planning, individualized stimulation, and appropriate follow-up interventions.

Learning evaluation in Early Childhood Education (ECE) differs fundamentally from assessment practices implemented at other educational levels. Rather than relying primarily on written tests, assessment in ECE emphasizes the observation of children's behaviors and learning experiences in natural settings through play and everyday interactions. Consequently, early childhood teachers are expected to be proficient in implementing authentic assessment using a variety of techniques, including systematic observation, anecdotal records, portfolios, performance-based assessment, and documentation of children's developmental progress (Wortham, 2012). Recent studies have demonstrated that authentic assessment plays a significant role in promoting a comprehensive understanding of children's development across cognitive, social-emotional, language, creativity, and character domains. However, its implementation continues to face several challenges, including limited conceptual understanding, administrative complexity, insufficient time for systematic observation, and the lack of practical digital assessment tools. Therefore, competence in authentic assessment has become an essential component of the professional competencies that pre-service early childhood teachers are expected to develop during their teacher education programs.

The Early Childhood Learning Evaluation course plays a pivotal role in the Early Childhood Teacher Education program by preparing students to become competent future educators. Through this course, students are expected not only to understand the fundamental principles of educational evaluation and assessment but also to develop practical skills in designing assessment instruments, observing children's developmental progress, interpreting assessment data, and preparing meaningful developmental reports. Despite its importance, the teaching and learning process continues to face several challenges, particularly the limited availability of learning resources that present early childhood learning evaluation in a practical, contextual, and professionally relevant manner.

A learning needs analysis revealed that many students continue to experience difficulties in translating assessment theories into authentic classroom practice. Although they generally understand the theoretical foundations of educational assessment, many still struggle to design assessment instruments that are appropriate for the developmental characteristics of young children. This finding is consistent with Kurniah et al. (2021), who reported that early childhood educators' competence in developing child development assessment tools remains limited and requires stronger support through well-designed learning resources and more systematic practical training (Kurniah et al., 2021).

Advances in digital technology have created new opportunities for developing learning resources that are more flexible and responsive to the demands of twenty-first-century education. One promising innovation in higher education is the electronic module (e-module), which offers a more interactive approach to learning by integrating text, images, videos, sample assessment instruments, and practical

learning activities. Beyond enhancing student engagement, e-modules also promote self-directed learning and provide richer, more meaningful learning experiences (Arsyad, 2019).

Previous studies have shown that e-modules can significantly improve the quality of learning in early childhood teacher education. By presenting content in an organized and interactive format, these digital learning resources help students develop a deeper understanding of key concepts while creating more engaging and meaningful learning experiences (Haling et al., 2023). Previous research on the development of e-modules in early childhood teacher education has demonstrated their validity and practicality as digital learning resources for higher education. These findings indicate that e-modules have strong potential to support teaching and learning in the Early Childhood Learning Evaluation course. (Puspitasari, R., Nurjanah, S., & Kurniawan, 2023).

Beyond digital innovation, the development of learning evaluation materials for Early Childhood Education (ECE) should also take into account the cultural and social contexts in which children grow and learn. Young children develop within families and communities whose cultural values and practices shape the way they interact, communicate, and express their abilities. Consequently, the assessment of children's development should be grounded in the sociocultural contexts of their everyday lives rather than conducted in isolation from them. From this perspective, ethnopedagogy offers a valuable framework by positioning local culture as a meaningful source of learning that connects educational experiences with children's real-life environments.

In Early Childhood Education (ECE), an ethnopedagogical approach can be implemented by integrating traditional games, local stories, cultural practices, and the surrounding environment into learning and assessment activities. These culturally grounded experiences provide authentic contexts for observing children's developmental progress. Through this approach, pre-service early childhood teachers not only acquire theoretical knowledge of assessment but also develop the ability to recognize and interpret children's development within diverse cultural contexts. This perspective is consistent with Morrison (2018), who argues that early childhood educators need to understand children's social and cultural environments to ensure that both teaching and assessment are responsive to their developmental needs (Morrison, 2018).

Despite the growing body of research on assessment in Early Childhood Education (ECE), several important gaps remain. Existing studies have largely focused on assessment practices implemented by in-service teachers in early childhood settings, while relatively little attention has been given to strengthening the assessment competencies of pre-service early childhood teachers through structured digital learning resources. Furthermore, most studies on e-module development have primarily emphasized the validity and practicality of instructional materials, with limited evidence regarding their effectiveness in improving students' assessment competencies in the Early Childhood Learning Evaluation course. In addition, the integration of ethnopedagogy into learning resources for assessment remains underexplored, even though effective assessment of young children's development should be grounded in the cultural contexts, family environments, and everyday social practices that shape their learning and development.

In response to these challenges, this study proposes the development of a digital and ethnopedagogy-based e-module for the Early Childhood Learning Evaluation course as an innovative learning resource for pre-service early childhood teachers. The e-module is designed not only to provide a strong conceptual foundation in learning evaluation but also to facilitate authentic learning experiences through sample assessment instruments, practical learning activities, and opportunities for reflective practice. By integrating ethnopedagogical principles, the e-module also aims to strengthen students'

understanding of the importance of considering children's cultural backgrounds when assessing their developmental progress.

The novelty of this study lies in the development of a digital and ethnopedagogy-based e-module for the Early Childhood Learning Evaluation course that integrates three complementary components: digital learning resources, authentic assessment competence, and ethnopedagogical principles. Unlike conventional e-modules that simply convert printed materials into electronic formats, the proposed e-module is designed to provide meaningful learning experiences through authentic assessment examples, hands-on learning activities, reflective exercises, and the integration of local cultural contexts as a foundation for observing and assessing young children's development.

This study aims to develop, validate, and evaluate a digital and ethnopedagogy-based e-module for the Early Childhood Learning Evaluation course to determine its validity, practicality, and effectiveness in strengthening the assessment competencies of pre-service early childhood teachers. It is expected that the findings will contribute to the development of innovative learning resources in early childhood teacher education while supporting the preparation of future teachers who are capable of conducting authentic, developmentally appropriate, and culturally responsive assessment of young children's development.

Research Method

This study employed a Research and Development (R&D) approach to develop a digital and ethnopedagogy-based e-module for the Early Childhood Learning Evaluation course. The e-module was designed to strengthen the assessment competencies of pre-service early childhood teachers enrolled in the Early Childhood Teacher Education program. The development process focused on producing a learning resource that addressed the instructional needs of the course by supporting students in understanding the principles of learning evaluation, designing authentic assessment instruments, and applying developmentally appropriate and culturally responsive assessment practices in early childhood settings.

The development process followed the ADDIE instructional design model, which comprises five stages: analysis, design, development, implementation, and evaluation. During the analysis stage, a needs assessment was conducted to identify instructional requirements, review the course learning outcomes, examine students' characteristics, and analyze the content of early childhood learning evaluation and developmental assessment. The design stage focused on developing the e-module blueprint, including the organization of learning materials, presentation of key concepts, authentic assessment examples, learning activities, and the integration of ethnopedagogical principles through the use of local cultural contexts as learning resources. In the development stage, the initial prototype of the e-module was produced and subsequently validated by experts to obtain feedback for product refinement. The implementation stage involved integrating the e-module into the Early Childhood Learning Evaluation course for pre-service early childhood teachers. Finally, the evaluation stage examined the validity, practicality, and effectiveness of the e-module in supporting students' assessment competencies.

The participants consisted of 50 undergraduate students enrolled in the Early Childhood Teacher Education program at the Faculty of Teacher Training and Education, Universitas Bengkulu, who were taking the Early Childhood Learning Evaluation course. These participants were selected because they represented the primary users of the developed e-module and were in the process of developing the professional competencies required of pre-service early childhood teachers. In addition, the study

involved two expert validators, comprising one subject-matter expert and one instructional media expert. The subject-matter expert evaluated the content quality, conceptual accuracy, depth of coverage, and alignment of the learning materials with the competencies expected of pre-service teachers. Meanwhile, the instructional media expert assessed the e-module in terms of interface design, content presentation, readability, usability, and overall technical quality as a digital learning resource.

Data were collected using four research instruments: expert validation sheets, a student response questionnaire, an observation checklist, and an assessment competency test. The expert validation sheets were used to evaluate the quality of the e-module in terms of both content and instructional media. The student response questionnaire was administered to examine the practicality of the e-module and to capture students' learning experiences during its implementation. An observation checklist was employed to assess the fidelity of the e-module's implementation throughout the learning process. In addition, the assessment competency test was used to measure students' ability to understand the principles of early childhood learning evaluation, develop authentic assessment instruments, and interpret children's developmental assessment results..

Data were collected through expert validation, classroom observation, questionnaires, and competency testing. The initial version of the e-module was first evaluated by a subject-matter expert and an instructional media expert to establish its content and design quality before classroom implementation. Following revisions based on the experts' feedback, the finalized e-module was implemented in the Early Childhood Learning Evaluation course involving 50 pre-service early childhood teachers. Data on the practicality of the e-module were obtained from students' responses after its use, whereas its effectiveness was determined based on students' performance on the assessment competency test administered upon completion of the learning activities.

The collected data were analyzed using both quantitative and qualitative approaches. Quantitative data, including expert validation scores, students' questionnaire responses, and assessment competency test results, were analyzed to determine the validity, practicality, and effectiveness of the developed e-module. Qualitative data, consisting of comments and suggestions provided by the expert validators, were used to refine and improve the product. The findings from these analyses served as the basis for determining the feasibility of the digital and ethnopedagogy-based e-module as an innovative learning resource for the Early Childhood Learning Evaluation course and its potential to strengthen the assessment competencies of pre-service early childhood teachers.

Results and Discussion

The primary outcome of this study was the development of a digital and ethnopedagogy-based e-module for the Early Childhood Learning Evaluation course based on the ADDIE instructional design model. The e-module was designed to enhance pre-service early childhood teachers' competencies by supporting their understanding of learning evaluation, facilitating the development of authentic assessment instruments, and promoting contextually and culturally responsive assessment of young children's development.

The development process followed the five stages of the ADDIE instructional design model: analysis, design, development, implementation, and evaluation. The results are organized according to each stage of the development process and include findings from the expert validation, practicality evaluation, and effectiveness assessment of the developed e-module.

1. Development of the E-Module: Initial Design and Revised Version

The initial development stage resulted in a preliminary version of the e-module containing the core content of the Early Childhood Learning Evaluation course. However, the initial evaluation identified several aspects requiring improvement. Revisions were made based on feedback from both the subject-matter expert and the instructional media expert, with particular attention given to the visual design, content organization, readability, navigation, and the integration of ethnopedagogical elements. A comparison of the e-module before and after revision is presented in Figure 1.

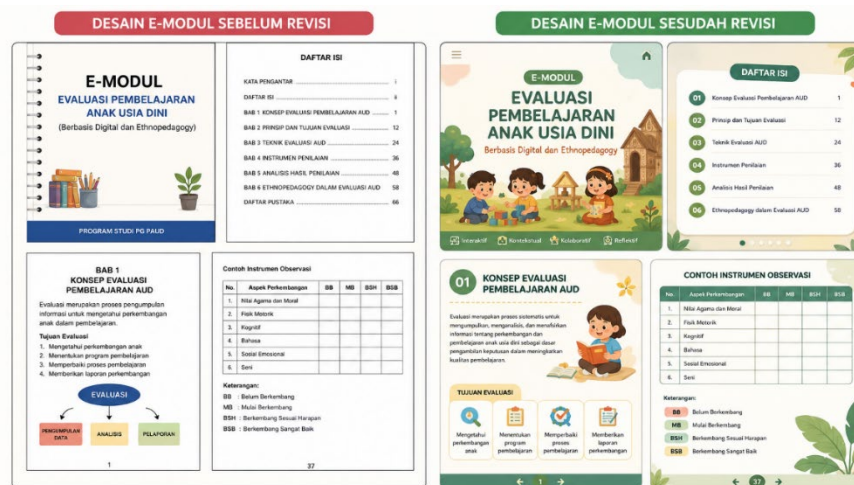


Figure 1. Initial and Revised Versions of the E-Module

As shown in Figure 1, the initial version of the e-module featured a relatively simple layout characterized by a text-dominant presentation, limited visual illustrations, and suboptimal navigation. In addition, the organization of the learning content closely resembled that of a conventional printed module, limiting its ability to fully reflect the characteristics of an interactive digital learning resource.

Following expert review and revision, the e-module was substantially refined to improve both its pedagogical and technical quality. Key enhancements included the incorporation of illustrations reflecting the developmental characteristics of young children, a more systematic and user-friendly layout, improved text readability, intuitive navigation features, and the integration of ethnopedagogical principles through local cultural illustrations and authentic cultural activities that serve as meaningful contexts for assessing children's development.

The finalized e-module was structured into seven integrated sections: (1) user guidelines; (2) foundations of Early Childhood Learning Evaluation; (3) principles and purposes of educational evaluation; (4) developmental assessment techniques for young children; (5) designing authentic assessment instruments; (6) interpreting and reporting assessment outcomes; and (7) integrating ethnopedagogical principles into early childhood learning evaluation.

2. Expert Validation Results

Following the revision process, the finalized e-module was subjected to expert validation by both a subject-matter expert and an instructional media expert to determine its suitability for classroom implementation. The validation process evaluated the quality of the e-module in terms of its content, instructional design, and technical aspects before it was used in the implementation stage. The results of the expert validation are presented in Table 1.

Tabel 1. Subject-Matter Expert Validation

No.	Evaluation Criteria	Maximum Score	Obtained Score	Percentage
1	Alignment of the content with the course learning outcomes	20	18	90%
2	Accuracy of early childhood learning evaluation and assessment concepts	25	22	88%
3	Comprehensiveness and depth of the learning materials	25	22	88%
4	Quality of authentic assessment instrument examples	20	18	90%
5	Integration of ethnopedagogical principles	10	9	90%
Total		100	89	89%

As presented in Table 1, the e-module achieved an overall validation score of 89%, indicating excellent content validity. The highest ratings were obtained for the alignment of the learning materials with the course learning outcomes, the quality of the authentic assessment examples, and the integration of ethnopedagogical principles, each receiving a score of 90%. These findings indicate that the developed e-module is well aligned with the content of the Early Childhood Learning Evaluation course while effectively connecting assessment practices with local cultural contexts. Meanwhile, the accuracy of the evaluation and assessment concepts, as well as the comprehensiveness and depth of the learning materials, each received a score of 88%. Although these results indicate a high level of quality, the expert suggested further refinement by expanding case-based examples, diversifying authentic assessment instruments, and providing more detailed guidance on interpreting and reporting assessment results.

3. Results of the Instructional Media Expert Validation

The instructional media expert validation was conducted to assess the quality of the e-module in terms of its visual design, information presentation, navigation, and overall digital learning presentation. The assessment covered four evaluation criteria, namely visual design and interface layout, readability and clarity of information presentation, ease of navigation, and quality of the digital learning presentation. The results of the instructional media expert validation are presented in Table 2.

Table 2. Results of the Instructional Media Expert Validation

No	Evaluation Criteria	Maximum Score	Obtained Score	Percentage
1	Visual design and interface layout	25	23	92%
2	Readability and clarity of information presentation	25	23	92%
3	Ease of navigation	25	22	88%
4	Quality of the digital learning presentation	25	23	92%
Total		100	91	91%

As shown in Table 2, the instructional media expert validation yielded an overall score of 91%, indicating excellent media validity. The highest ratings were obtained for visual design and interface layout, readability and clarity of information presentation, and the quality of the digital learning presentation, each receiving a score of 92%. These results indicate that the e-module provides an attractive visual interface, presents information clearly, and meets the essential characteristics of a high-quality digital learning resource. The ease of navigation criterion received a score of 88%, suggesting opportunities for further improvement, particularly in enhancing user guidance, optimizing the organization of navigation controls, and facilitating smoother transitions between learning sections. Overall, the instructional media expert concluded that the e-module was suitable for implementation in the Early Childhood Learning Evaluation course.

4. E-Module Practicality Evaluation

The practicality of the e-module was evaluated through a student response questionnaire administered to 50 pre-service early childhood teachers after they had used the e-module in the Early Childhood Learning Evaluation course. The questionnaire was designed to assess students' perceptions of the e-module in terms of its ease of use, clarity of presentation, usefulness, and overall learning experience. The results of the practicality evaluation are presented in Table 3.

Table 3. Student Responses to the E-Module

No.	Evaluation Criteria	Mean Score	Percentage (%)	Category
1	Ease of understanding the learning materials	4.41	88.17	Excellent Practicality
2	Ease of using the e-module	4.56	91.25	Excellent Practicality
3	Visual appeal of the interface and illustrations	4.45	89.00	Excellent Practicality
4	Integration of ethnopedagogical elements with assessment contexts	4.62	92.33	Excellent Practicality
5	Relevance of authentic assessment examples to early childhood education practice	4.48	89.67	Excellent Practicality
Overall Mean		4.50	90.48	Excellent Practicality

As presented in Table 3, the student responses indicated that the developed e-module achieved an overall practicality score of 90.48%, which falls within the excellent practicality category. The highest rating was obtained for the integration of ethnopedagogical elements with assessment contexts (92.33%), suggesting that the inclusion of local cultural activities, traditional games, and culturally relevant examples helped students better understand the practical application of developmental assessment in early childhood education. The lowest rating was recorded for the ease of understanding the learning materials (88.17%); however, this criterion also remained within the excellent practicality category. These findings suggest that although the e-module effectively supported independent learning, some topics-particularly those related to educational evaluation and the interpretation of assessment data-would benefit from additional instructor guidance, scaffolded learning activities, and more case-based examples.

5. E-Module Effectiveness in Enhancing Students' Assessment Competencies

The effectiveness of the developed e-module was examined by comparing students' assessment competencies before and after the intervention. A total of 50 pre-service early childhood teachers participated in the evaluation. Their assessment competencies were measured using a standardized competency test that assessed their knowledge and application of early childhood learning evaluation, including the development of authentic assessment instruments and the interpretation of children's developmental assessment results.

Table 4. Improvement in Students' Assessment Competencies

Test	N	Mean	SD	Minimum Score	Maximum Score	Mean Gain	Normalized Gain (N-gain)	Category
Pretest	50	67.80	8.67	50	83	—	—	—
Posttest	50	86.40	7.94	70	98	18.60	0.57	Moderate

As presented in Table 4, students' assessment competencies improved substantially following the implementation of the e-module. The mean score increased from 67.80 on the pretest to 86.40 on the posttest, representing a mean gain of 18.60 points. The pretest results indicate that although students possessed a foundational understanding of early childhood learning evaluation, they had not yet fully

developed the ability to apply evaluation concepts in designing authentic assessment instruments. After using the e-module, students demonstrated higher posttest scores, and the minimum score increased from 50 to 70, reflecting improvement across the entire group rather than among only high-performing students. Furthermore, the normalized gain (N-gain) was 0.57, which falls within the moderate category. These findings indicate that the e-module effectively enhanced students' competencies in understanding early childhood learning evaluation, developing authentic assessment instruments, and interpreting children's developmental progress. Nevertheless, further improvement may be achieved through direct classroom observation, sustained teaching practice, and continuous guidance from course instructors.

Overall, the findings demonstrate that the digital and ethnopedagogy-based e-module for Early Childhood Learning Evaluation met the established criteria for excellent validity (89.50%) and excellent practicality (90.48%), and was effective in enhancing the assessment competencies of pre-service early childhood teachers.

This study resulted in the development of a digital and ethnopedagogy-based e-module for Early Childhood Learning Evaluation that demonstrated satisfactory levels of validity, practicality, and effectiveness for use in pre-service early childhood teacher education. The findings suggest that a systematic development process can produce instructional materials that effectively address students' learning needs, particularly in strengthening their conceptual understanding of educational evaluation and their ability to implement authentic developmental assessment in early childhood settings. The discussion focuses on five key aspects: the overall quality of the developed e-module, its feasibility based on expert validation, its practicality from the students' perspective, its effectiveness in enhancing assessment competencies, and the novelty of integrating digital learning with ethnopedagogical principles in an early childhood learning evaluation course.

The findings demonstrate that the ADDIE instructional design model provided a systematic framework for developing the e-module. The analysis phase ensured that the e-module was designed in response to students' learning needs and course requirements. During the design phase, the content structure, learning activities, and assessment components were carefully planned. The development phase resulted in a prototype that underwent expert validation to establish its quality, while the implementation phase examined its use in an authentic classroom setting. Finally, the evaluation phase provided evidence for revising and refining the e-module based on expert feedback and student responses. Collectively, these stages contributed to the development of a pedagogically sound and contextually relevant digital learning resource.

The expert validation results, with an overall mean score of 89.50% from both the subject-matter expert and the instructional media expert, indicate that the development process produced an e-module that met the established quality standards. This finding supports the perspective of Branch (2019), who argued that the ADDIE model provides an effective framework for instructional development by incorporating iterative processes of analysis, design, refinement, and evaluation throughout the development cycle. The high validation scores further suggest that the systematic application of the ADDIE model contributed to the production of a pedagogically appropriate, technically sound, and contextually relevant digital learning resource (Branch, 2009). Effective instructional design should ensure alignment among learning objectives, learner characteristics, instructional strategies, and learning assessment (Gustafson, K. L., & Branch, 1997).

The subject-matter expert validation score of 89% indicates that the e-module was well aligned with the content and learning outcomes of the Early Childhood Learning Evaluation course. The high

ratings for the alignment with course learning outcomes and the inclusion of authentic assessment examples suggest that the e-module extends beyond presenting theoretical concepts by providing practical applications that support the development of assessment competencies among pre-service early childhood teachers. This is particularly important in teacher education, where the ability to translate theoretical knowledge into authentic classroom practice is a key component of professional competence.

Similarly, the instructional media expert validation score of 91% demonstrates that the e-module meets the quality standards expected of an effective digital learning resource. Its strengths lie in its visual design, readability, and digital presentation, all of which contribute to a more accessible and engaging learning experience. These features enable students to access learning materials more flexibly and promote greater autonomy in the learning process, which is consistent with the pedagogical principles of technology-enhanced learning.

The development process also demonstrated that digital instructional materials should be designed through a systematic instructional design process rather than by simply converting printed modules into electronic formats. Effective digital learning resources require careful planning of learning objectives, instructional strategies, learner engagement, assessment activities, and interactive features to maximize their educational value. This finding is consistent with the perspective of Reigeluth (2018), who emphasized that instructional design should create meaningful learning experiences that facilitate the achievement of intended learning outcomes and competencies (Reigeluth, 2018). Similarly, Molenda (2021) emphasized the importance of formative evaluation as an integral component of instructional development, enabling continuous refinement of learning products to better address users' needs and improve their overall quality (Molenda, 2015).

The practicality evaluation revealed that students responded very positively to the use of the e-module, with an overall practicality score of 90.48%. Students reported that the e-module facilitated their understanding of the course content by presenting evaluation concepts alongside authentic assessment examples, guided assessment design activities, and structured learning tasks. The particularly high rating for the ethnopedagogical component suggests that integrating local cultural contexts made the learning materials more relevant and closely connected to authentic assessment practices in early childhood education. These findings indicate that the e-module provided a more flexible, engaging, and contextually meaningful learning experience than conventional instructional materials, thereby supporting students' independent learning and professional skill development.

The high level of practicality observed in this study is consistent with Mayer's Cognitive Theory of Multimedia Learning (Mayer, 2021), which posits that learners achieve deeper understanding when instructional materials integrate words, visuals, and meaningful learning activities in ways that promote active cognitive processing. Rather than passively receiving information, learners actively select, organize, and integrate new information with their prior knowledge. The findings therefore suggest that the multimedia features embedded in the e-module contributed to students' conceptual understanding of early childhood learning evaluation while supporting the development of practical assessment competencies (Mayer, 2021).

The findings of this study further corroborate previous research on the development of digital e-modules, which has consistently demonstrated their potential to enhance students' learning independence and engagement. Laili et al. (2019) reported that e-modules facilitate independent learning by providing flexible access to instructional materials and enabling students to learn at their own pace (Laili et al., 2019). Similarly, Wulandari et al. (2022) found that interactive e-modules improve conceptual

understanding by presenting learning content in a more systematic, engaging, and learner-centered manner (Wulandari, D., Wahyuni, S., & Bachtiar, 2022). In the context of early childhood teacher education,utama et al. (2021) demonstrated that e-modules serve as effective learning resources for supporting the professional preparation of pre-service early childhood teachers (utama et al., 2021). Likewise, Puspitasari et al. (2023) concluded that digital instructional materials developed in accordance with the early childhood education curriculum significantly enhanced the quality of students' learning experiences. Taken together, these studies provide strong evidence that well-designed digital instructional materials promote active learning, greater learner autonomy, and improved learning outcomes.(Puspitasari et al., 2023). The findings of the present study are consistent with this body of evidence, while further demonstrating that integrating ethnopedagogical principles into digital learning resources can enrich students' learning experiences and strengthen their assessment competencies within culturally meaningful educational contexts.

The improvement in students' assessment competencies following the use of the e-module indicates that the developed instructional resource effectively supported the acquisition of assessment-related knowledge and skills. Students' mean score increased from 67.80 on the pretest to 86.40 on the posttest, demonstrating the positive contribution of the e-module to strengthening assessment competencies among pre-service early childhood teachers. This improvement can be attributed to the instructional design of the e-module, which extended beyond the presentation of theoretical concepts by incorporating authentic assessment examples, guided practice activities, and contextualized assessment scenarios. These features enabled students to develop a deeper understanding of the assessment process and its application in early childhood education.

Furthermore, the findings suggest that students not only acquired a stronger conceptual understanding of educational evaluation but also developed the ability to design authentic assessment instruments and align developmental indicators with children's learning activities. These competencies are essential for effective assessment practices in early childhood education, where teachers are expected to monitor children's development continuously and use assessment evidence to inform instructional planning and individualized learning support.

These findings reinforce the view that assessment in early childhood education should be authentic, continuous, and developmentally appropriate. Morrison (2018) argued that early childhood educators require strong competencies in observing, documenting, and interpreting children's development, as assessment serves as the foundation for planning responsive and meaningful learning experiences (Morrison, 2018). Likewise, Wortham (2020) emphasized that assessment in early childhood settings should employ multiple methods of evidence collection to provide a comprehensive understanding of children's developmental progress. Together, these perspectives highlight that effective assessment extends beyond measuring learning outcomes; it is an ongoing process that informs instructional decision-making and supports each child's individual development (Wortham, 2020).

In the context of the present study, the developed e-module enabled students to recognize that assessment is not merely a process of assigning scores, but rather a systematic process of collecting, documenting, and interpreting evidence of children's developmental progress. This understanding is fundamental to effective assessment practice in early childhood education, where assessment is intended to inform instructional planning and support children's individual learning needs. These findings are consistent with those of Nurhayati and Rakhman (2017), who emphasized that pre-service early childhood teachers should be equipped with the competencies required to design assessment instruments

that are developmentally appropriate and aligned with children's characteristics (Nurhayati & Rakhman, 2017). Similarly, Supandi et al. (2022) reported that learning media designed to support authentic assessment practices significantly enhanced pre-service teachers' readiness to implement assessment in early childhood learning. Collectively, these studies suggest that integrating authentic assessment activities into digital instructional materials can effectively strengthen both conceptual understanding and practical assessment competencies among future early childhood educators (Supandi et al., 2022).

The primary novelty of this study lies in the integration of ethnopedagogical principles into the digital e-module for Early Childhood Learning Evaluation. Unlike conventional digital learning materials that primarily emphasize the delivery of theoretical content, the developed e-module situates assessment within children's socio-cultural contexts, enabling students to connect assessment concepts with authentic educational experiences. Through this approach, pre-service early childhood teachers not only learn how to use authentic assessment instruments but also develop an understanding that children's development is shaped by their social interactions, family environments, cultural backgrounds, and everyday experiences. Consequently, assessment is viewed as a culturally responsive and context-sensitive process rather than merely a technical procedure for measuring developmental outcomes.

The integration of cultural contexts into instructional materials promotes more meaningful learning by enabling students to construct knowledge through experiences that are closely connected to their everyday lives and future professional practice. Rather than learning assessment concepts in isolation, students are encouraged to interpret children's developmental evidence within authentic socio-cultural settings. This finding is consistent with Chofifah et al. (2019), who argued that culture-based learning enhances conceptual understanding by establishing meaningful connections between academic knowledge and learners' social and cultural experiences (Chofifah et al., 2019). Similarly, Miskiyyah et al. (2025) reported that culturally responsive learning approaches increase the relevance and authenticity of learning experiences because students engage with instructional content situated within familiar cultural contexts. Collectively, these findings suggest that integrating ethnopedagogical principles into digital instructional materials not only improves conceptual understanding but also fosters culturally responsive pedagogical competencies among pre-service early childhood teachers (Miskiyyah et al., 2025).

An ethnopedagogical approach also contributes to strengthening cultural identity within teacher education by positioning local culture as an integral component of the learning process rather than merely as instructional content. This perspective is supported by Suningsih et al. (2025), who found that ethnopedagogy-based instructional materials in early childhood teacher education enhanced students' pedagogical competencies by providing contextualized and culturally meaningful learning experiences (Suningsih et al., 2025). Likewise, Putra et al. (2024) argued that integrating cultural perspectives into teaching and learning enables pre-service teachers to better understand the diversity of children's learning environments and to design instructional practices that are more responsive to learners' cultural backgrounds and developmental needs. Taken together, these findings suggest that incorporating ethnopedagogical principles into digital instructional materials not only strengthens assessment competencies but also prepares future early childhood educators to implement culturally responsive and inclusive educational practices (Putra et al., 2024).

Based on the findings, the digital and ethnopedagogy-based e-module for Early Childhood Learning Evaluation makes a meaningful contribution to the development of innovative instructional materials in higher education, particularly in supporting the professional preparation of pre-service early childhood teachers. By integrating digital technology, authentic assessment content, and local cultural

contexts, the e-module functions not only as a resource for developing conceptual understanding of educational evaluation but also as a learning tool that enables students to apply assessment principles effectively in authentic early childhood settings. This integration bridges theoretical knowledge with practical application, thereby fostering both pedagogical competence and assessment literacy.

Furthermore, the findings suggest that embedding ethnopedagogical principles within digital instructional materials enhances the contextual relevance of learning while preparing future teachers to conduct developmentally appropriate, culturally responsive, and authentic assessments. Consequently, the developed e-module has the potential to support more meaningful learning experiences and to strengthen the readiness of pre-service early childhood teachers to implement professional assessment practices in diverse early childhood education settings.

Conclusion

This study developed a digital and ethnopedagogy-based e-module for Early Childhood Learning Evaluation that demonstrated excellent validity, practicality, and effectiveness for use in pre-service early childhood teacher education. Developed using the ADDIE model, the e-module was validated by subject-matter and instructional media experts and received highly positive responses from 50 pre-service early childhood teachers. The findings showed a significant improvement in students' assessment competencies, with the mean score increasing from 67.80 on the pretest to 86.40 on the posttest. By integrating digital technology, authentic assessment, and local cultural contexts, the e-module provides an innovative instructional resource that enhances assessment competencies and supports more contextualized, culturally responsive, and professional preparation of future early childhood teachers.

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