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FROM TRADITIONAL GAMES TO INTRACTIVE E-COMICS: *TUNGKUPAN*-BASED LEARNING MEDIA FOR EARLY LITERACY

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Abstract
Early childhood literacy skills form a crucial foundation for developing of critical thinking and academic readiness. In Indonesia, low reading interest and a lack of culturally contextualized learning media pose significant challenges. This study addresses this gap by aiming to developing and evaluating the validity, practicality, and effectiveness of an interactive e-comic based on the traditional Palembang game, *Tungkupan* as an innovative tool for early childhood literacy instruction. Employing a Research and Development (R&D) approach following the ADDIE model, the research involved three expert validators and 27 children from group B at Pembina 7 State Kindergarten in Palembang. Experts rated the product as highly valid average 80.00% – 83.56%, while teachers rated it very practical average 91.60%. The effectiveness test, measured by N-Gain, showed a significant increase in scores (from 37.4 to 84.44), with an average N-Gain score of 0.73 (high category), confirming its effectiveness (73.75%) in improving children's literacy skills. These results demonstrate that the interactive *Tungkupan* based e-comic is a highly valid, practical, and effective medium for both improving early literacy and preserving local cultural heritage.

Keywords: early childhood literacy, interactive e-comics, local wisdom, traditional games, *tungkupan*

Introduction

Deep literacy skills from an early age are the main foundation for learning success, critical thinking development, and intellectual expansion Novitasari et al., 2020; Nur Latifah et al., 2023). Literacy is understood as an individual's ability to access, understand, and do everything through various activities including reading, seeing, listening, writing, and speaking (Sumarni & Kuswardani, 2019). Children with a good foundation in literacy tend to find it easier to develop an interest in reading and access various new information and knowledge (Prasetya & Hirashima, 2018; Valdez & Mendoza, 2024). The reality in Indonesia is still concerning when viewed from the results of international surveys that place Indonesia at a low ranking in terms of literacy. Based on the latest the Central Bureau of Statistics (*Badan Pusat Statistik*) in 2024, the literacy achievements of the Indonesian people still vary between provinces, with average scores indicating low reading interest and community involvement in literacy activities. Despite an improvement in the 2022 PISA rankings, the report confirms that most Indonesian students still have difficulty understanding complex reading material (OECD, 2022). This indicates that the main challenge lies not only in basic reading skills but also in deeper reading comprehension; therefore, efforts to improve literacy should focus on strengthening a reading and enhancing text comprehension.

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Challenges in improving early childhood literacy include the lack of a strong literacy culture. Parents' dependence on schools and teachers in guiding their children's literacy is also a hindering factor (Setiadi, 2020). Because parents and those around them are considered role models (Sumarni, Pertiwi, et al., 2019). In addition, there is a gap in access to information and communication technology between urban and rural areas (Atmojo et al., 2022), as well as concerns about the impact of screen time on children's language development (Amanda & Najmah Shareeff, 2024). Therefore, to increase children's interest in learning and literacy through the use of digital technology in the form of interactive learning media (Son et al., 2020; Umairoh & Amaliyah, 2022). Digital interactive comics are a promising medium due to their ability to present stories with attractive visuals and interactive features that can stimulate children's cognition and understanding (Son et al., 2020). Research shows that educational digital comics can increase students' interest in reading and the effectiveness of learning (Lusiana & Nuryanto, 2025). In fact, the use of various digital media that integrate comics, interactive videos, and assessments can improve children's digital literacy (Muharam et al., 2021).

In addition to technological advances, the richness of local culture, especially traditional games, also plays an important role in child development. Traditional games not only serve as entertainment but also play a role in developing various aspects of early childhood development, including physical-motor, social-emotional, cognitive, and language skills (Ulfah et al., 2020). In this study, the traditional Palembang game *Tungkupan* does not function as a direct instrument for teaching literacy skills; instead, it serves as the narrative foundation for the interactive e-comic. The storyline provides a meaningful and culturally familiar context through which literacy activities are embedded. The specific literacy outcomes targeted in this research include reading two-syllable character names, answering simple comprehension questions, and arranging story sequences using picture series. These skills are directly aligned with the most recent *Capaian Pembelajaran PAUD* (Kemendikbudristek, 2022), which state that young children are expected to recognize simple familiar words, demonstrate understanding of short stories by responding to questions appropriately, and organize events in logical order through picture based sequencing. In this sense, *Tungkupan* supports literacy indirectly by offering a contextual narrative backdrop that enhances engagement and meaning-making while children perform the literacy tasks embedded in the digital media (Prasetyo et al., 2022).

However, traditional games are often forgotten by children due to a lack of exposure and competition with modern digital games (Pratalaharja & Dirgantoro, 2021; Syaripuddin et al., 2022). Therefore, innovation in combining local wisdom with digital technology is important (Eka D et al., 2023). Based on research, it was found that only a few early childhood education schools have implemented technology based learning, and the technology based learning objects used are limited to the use of projectors and PowerPoint presentations or animated videos (Sumarni, Ramadhani, et al., 2019). How to ensure that cultural integration does not interfere with literacy learning or cause excessive cognitive load, while preserving traditional values, still requires exploration. Furthermore, most research on digital media for early childhood literacy tends to be short-term, and the implementation of interactive e-comics based on traditional games remains limited. Thus, digitalization of local wisdom: development of interactive e-comics based on traditional games to improve kindergarten children's literacy is expected to be an innovative solution to improve early childhood literacy while introducing and preserving cultural heritage.

Based on the identified gaps specifically the limited research on integrating the Palembang traditional game *Tungkupan* into interactive digital media for literacy, and the need for a rigorously evaluated learning tool that preserves cultural values this study was conducted. The main objective of this Research and Development (R&D) study is to produce a valid, practical, and effective interactive

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e-comic based on the *Tungkupan* traditional game for early childhood literacy development. Specifically, the research questions guiding this study are:

1. How is the validity of the interactive e-comic based on the *Tungkupan* traditional game determined by expert reviewers?
2. How is the practicality of the interactive e-comic based on the *Tungkupan* traditional game according to teachers' responses?
3. How is the effectiveness of the interactive e-comic based on the *Tungkupan* traditional game in improving early childhood literacy skills?

Literature Review

The following literature review provides the theoretical framework for the study, covering three main concepts that are key to the research: the nature of early childhood literacy, the educational value of local wisdom as represented by the *Tungkupan* traditional game, and the characteristics of e-comics as an interactive learning medium. These concepts are reviewed to establish the foundation and relevance of the interactive e-comic development.

Early childhood literacy

Literacy, which traditionally refers to reading and writing skills, has evolved over time, including in the context of education. Based on research, literacy is defined as an important skill used by students to master various subjects, with language as a medium for acquiring knowledge (Simbolon, 2023). Literacy at the elementary school level includes the ability to understand and manage information in reading and writing activities (Bu'ulolo, 2021). According to Nahdi & Yunitasari, (2019), literacy learning in preschool age should be stimulated as early as possible because it will affect children's early reading abilities in the future.

Research shows that literacy education not only equips children with reading and writing skills, but also encourages critical thinking and communication skills (Agustin L. et al., 2023). Basically, literacy has two perspectives, namely literacy as basic skills such as reading and writing, and literacy as a social practice (social and cultural context activities). Therefore, the development of literacy in children does not only focus on mastering letters or words, but also on the process of socializing children to the language, culture, and values inherent in their environment. This view broadens the scope of literacy to be more contextual, especially in efforts to preserve local wisdom through culture based learning media such as traditional games.

Local wisdom in the form of traditional Palembang games (Tungkupan)

Local wisdom can be understood as a form of action and cultural product that originates from a community, which develops over time and is passed down from one generation to the next as an integral part of that community's culture (Poblea et al.,2022). In the context of Palembang, this wisdom is manifested in traditional games such as *Tungkupan*, which is the local name for hide-and-seek.

The traditional game of *Tungkupan* supports literacy development because the activities involved require children to communicate, engage in conversation, and give clues, thereby developing language

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skills and vocabulary, which are the main foundations of early literacy (Rosa et al., 2025). This is in line with research that explains the influence of the traditional game of hide and seek on aspects of literacy development (letter recognition) (Mianawati & Mariyana, 2023). In addition, *Tungkupan* involves cognitive processes such as understanding roles, remembering rules, and creating hiding and searching strategies, which are in line with cognitive literacy aspects such as the ability to make logical connections, understand sequences, and interpret symbols (Gasong & Tandiseru, 2024; Lestiyanawati, 2017). The game of *Tungkupan* has pedagogical value because it integrates language, social, motor, and cognitive development in one activity, in accordance with the principles of play-based learning, which is effective in increasing children's engagement.

***Tungkupan* based e-comics**

Digital comics or e-comics are comics in digital form that combine visual elements, characters, dialogue, and storylines, thereby potentially improving literacy skills while creating a more conducive learning environment for students (Akbar et al., 2023; Anggito et al., 2023). Meanwhile, *Tungkupan*-based e-comics are adaptations of the traditional *Tungkupan* game into e-comic format, which illustrate socio-cultural values and encourage children's literacy, especially reading (Rosa et al., 2025). A number of studies also confirm that the use of digital comics in the learning process can significantly increase learning motivation and conceptual understanding. For example, it is reported that digital comics developed for science learning are effective in encouraging student motivation and deepening mastery of the material due to their interactive and visual-based characteristics (Habiddin et al., 2022; Mustikasari et al., 2020). Similar findings state that the use of digital comics contributes positively to improving students' reading skills and comprehension of short stories (Barliani et al., 2025).

Methodology.

Research design and approach

The development of interactive e-comics uses a Research and Development approach. The R&D methodology was chosen because of its focus on creating and testing new products that are effective for educational purposes (Prastiyono et al., 2023). The development model to be applied is the ADDIE model, which is widely used in the development of digital learning media and has been proven to be systematic and iterative in ensuring product quality (Adnyani & Wibawa, 2021). The ADDIE research and development stages are systematic and consist of five phases, namely Analyze, Design, Develop, Implement, and Evaluate (Branch, 2019). The following image explains the research stages.

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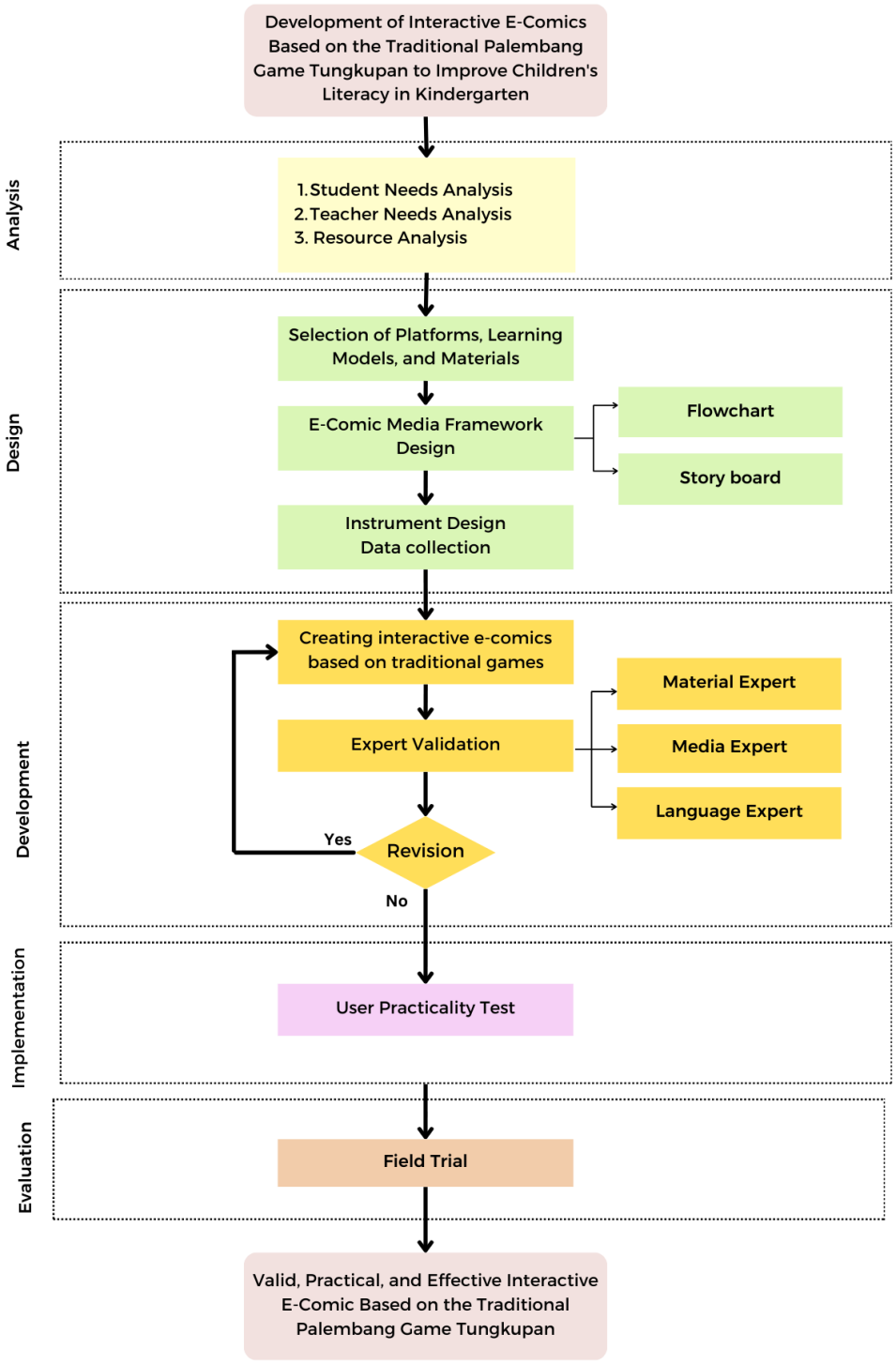
Research site and participants

Figure 1. *Research Procedure Modification of the ADDIE Development Procedure* (Branch, 2009)



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The first stage is Analysis, in which researchers identify media needs and target characteristics (kindergarten students and literacy curriculum). Next is the design stage, which involves designing the concept and storyboard for the *Tungkupan* e-comic. The third stage is development, which focuses on creating digital products and validation by a team of experts (material, media, and language) to ensure academic feasibility. The validated product is then tested in the implementation stage, which includes practical testing by teachers and effectiveness testing with students. The entire process ends with the evaluation stage, in which data from all stages is collected to measure the validity, practicality, and effectiveness of the product, which forms the basis for the final revision of the media.

Research site and participants

This research was conducted at Pembina 7 State Kindergarten in Palembang, South Sumatra. The development of e-comics underwent several assessments before being tested on students. The first stage of the e-comic was submitted for validity assessment by three expert reviewers, consisting of material, media, and language validation. The product proceeded to the practicality stage if the expert reviewers gave a feasible rating. the data collected were highly credible and aligned with the study's technical objectives (Creswell, 2017). The practicality test was conducted offline with three educators filling out a prepared questionnaire. The effectiveness test involved 27 students from TK Negeri Pembina 7 Palembang, where students answered questions before using the e-comic (pre-test) and after using the e-comic (post-test). The participants for the practicality test (educators) and effectiveness test (students) were selected using purposive sampling, a non-random technique where the sample is chosen based on specific characteristics relevant to the research objectives (Sugiyono, 2017). The 27 students were selected from Group B because they were the target age group (5-6 years old) for early literacy development. Meanwhile, the three educators were selected for their direct experience in teaching literacy to this age group, ensuring their feedback on the media's practicality was relevant and informed.

Data collection and analysis

Data analysis was conducted to determine how well the interactive e-comic was developed. In this study, the validity and practicality were assessed at the development stage based on the ADDIE model, while the effectiveness was assessed at the evaluation stage. Instrument Development and Validation: The data collection instruments validation sheets (for experts), practicality sheets (for teachers), and pretest/posttest questions (for students) were constructed by the researchers based on the theoretical framework and objectives of the e-comic. The validation and practicality sheets utilized a Likert scale (5 = Very Good to 1 = Very Not Good). The initial instruments underwent review and refinement based on input from subject matter experts before being used for data collection (Please insert citation for instrument validation process). Data Analysis Procedures: The analysis procedure included three main steps:

Validity and Practicality Analysis: The scores from the validation and practicality sheets were converted into percentages and interpreted using the established criteria (Table 1 and Table 2).

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Table 1. *Validity criteria*

Score (%)	Category	Follow-Up Information
80.01-100	Highly Valid	Can be used without revision
60.01-80.00	Valid	Can be used with minor revisions
40.01-60.00	Sufficiently valid	Major revisions recommended
20.01–40.00	Not valid	Cannot be used
0.00 < 20.00	Highly invalid	Extremely unusable

(Khairunnisa et al., 2024)

Table 2. *Practicality score assessment criteria for e-comics*

Range	Category
0% - 20	Very Unpractical
21% - 40	Not very practical
41% - 60	Fair
61% - 80	Practical
81% - 100	Very Practical

(Aulia et al., 2022)

Effectiveness Analysis (Pretest/Posttest): Descriptive statistics (Mean, Standard Deviation) were calculated for the pretest and posttest scores.

Table 4. *Interpretation of N-Gain Score Effectiveness N-Gain*

N-Gain Percentage	Interpretation
>76%	Effective
56%-75%	Enough
40%-505%	Less Effective
< 40%	Not Effective

(Batubara et al., 2023)

N-Gain Analysis: To measure the learning increase, the Normalized Gain (N-Gain) score was calculated based on the difference between the posttest and pretest scores, divided by the maximum possible score change. The results were then interpreted using the N-Gain categories (Table 3) and effectiveness level (Table 4). The N-Gain calculation was performed to determine the effectiveness level of the e-comic media in improving children's literacy skills (Batubara et al., 2023).

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Table 3. *N-Gain Categories*

N-Gain Score Criteria	N-Gain Interpretation
g > 0,7	High
0,3 ≤ g ≤ 0,7	Medium
0 < g < 0,3	Low
g = 0	Failure

(Batubara et al., 2023)

Both instruments underwent expert validation to ensure content relevance, clarity, and theoretical alignment. Validation was conducted by three experts two senior lecturers in early childhood education and one expert in gender studies. The validators reviewed each item for construct validity, linguistic clarity, and alignment with the study's theoretical framework. Based on their feedback, revisions were made to refine terminology and improve item focus.

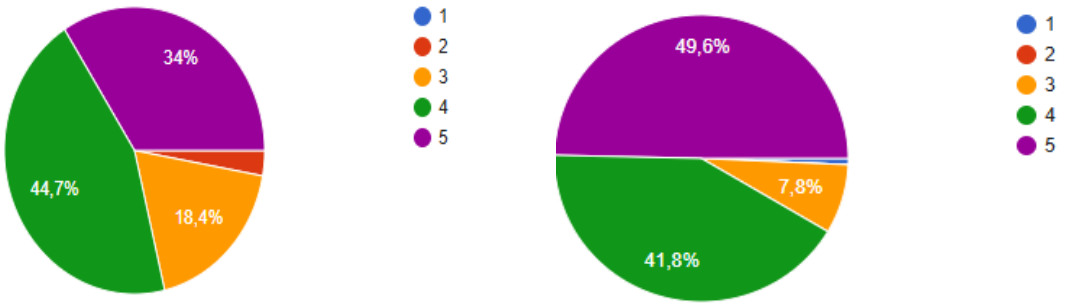
Results

The development of digital interactive comics has followed the systematic ADDIE methodology framework.

Analysis stage

The analysis stage was conducted to obtain information related to problems occurring in the field. Activities carried out at this stage included analyzing the needs of students and educators. Researchers conducted direct interviews with students using open-ended questions. The interview process with kindergarten children was conducted offline. Each child was given 5 minutes to answer questions, with teachers accompanying them while they answered. Based on the results of interviews with 30 children, it was found that the majority of children liked bright colors, expressive characters, and animated images. Children preferred videos with short durations. In addition, children were enthusiastic about buttons that they could press themselves (sound buttons, *next* buttons), and liked game elements (short picture quizzes). Many children need a little guidance from the teacher when using digital media for the first time. Meanwhile, from the teacher's perspective, it can be seen in the following image.

Figure 2 and 3. *The need for e-comics in contributing to children's literacy skills*



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Based on Figure 2 and 3, it shows that the use of e-comics: The majority of teachers (44.7% score 4, 34% score 5) believe that the use of e-comics in learning can improve children's literacy skills. The need for interactive media: Almost all respondents (49.6% score 5 and 41.8% score 4) really need interactive learning media to increase children's interest in learning. This shows that there is a high urgency for the availability of innovative media. However, there are difficulties in finding suitable media: The majority of teachers (31.2% score 3, 31.9% score 4, 22.7% score 2) have difficulty finding learning media that suits the characteristics of kindergarten children. Including a Preference for Traditional Game-Based Media: Most teachers (38.3% score 4, 38.3% score 3) prefer interactive traditional game-based learning media. This is in line with Figure 2, which shows that nearly 90% of teachers are in dire need of interactive media, consistent with research stating that the use of interactive learning media significantly increases student learning motivation.

Design stage

In the design stage, the type of media to be developed was selected, namely e-comics using the Canva platform as a place to compile material in learning media. The media framework design to be developed includes flowcharts and storyboards. Flowcharts are used as a guide for managing e-comic display instructions. Meanwhile, storyboards serve as preliminary designs that display the form and layout of learning media in more detail.

Validity results of interactive E-comics

During the development stage, the product was created according to *the flowchart* and *storyboard* that had been prepared. Once the product was completed, the next step was to conduct a validation process by media experts, subject matter experts, and language experts to determine the validity of the product and obtain suggestions for improvement from the experts. Next, the product underwent a practicality test conducted by five teachers. The results of the experts' data are shown in Table 5.

Table 5. *Summary of content expert validation results*

Aspect	Max Score	Score Achievement	Percentage (%)	Intepretation
Curriculum	20	17	85	Highly Valid
Materials	35	30	85,7	Highly Valid
Evaluation	20	16	80	Valid
Average			83,56	Highly Valid

Based on the results of subject matter expert validation, an average percentage of 83.56% was obtained, which falls into the highly valid category. These results indicate that in terms of curriculum, material, and evaluation, all components have met the criteria for excellent suitability for use in learning. Thus, the developed product is considered valid and suitable for implementation as a learning medium.

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Table 6. *Results of language expert validation*

Aspects	Max Score	Score Achievement	Percentage (%)	Intepretation
Word/sentence writing	2 5	20	80,00	Valid
Language	2 5	21	84,00	Highly Valid
Writing Letters and Numbers	2 5	19	76,00	Valid
Average			80,00	Valid

Based on the validation results by language experts, an average percentage of 80% was obtained, which is classified as valid. This finding indicates that the aspects of word or sentence writing, language use, and letter and number writing have met good linguistic standards and are in accordance with scientific writing rules. Overall, the product is considered suitable for use.

Table 7. *Expert validation results media*

Aspect	Max Score	Score Achievement	Percentage (%)	Intepretation
Visual Design	25	20	80,00	Valid
Interactivity	10	7	70,00	Valid
Functionality and Technology	25	22	88,00	Highly Valid
Consistency and Design	15	12	80,00	Valid
The Usefulness of Design for Learning	15	13	86,67	Highly Valid
User Experience	10	8	80,00	Valid
Average			80,78	Highly Valid

Based on the validation results conducted by media experts, an average percentage of 80.78% was obtained, which falls into the highly valid category. These results indicate that in terms of visual design, interactivity, functionality and technology, aesthetic design consistency, design usefulness for learning, and user experience, all components have met the criteria for learning media feasibility. The results of the e-comic development can be clearly seen by clicking the following link https://organiksampah.my.canva.site/dag0x1tooha. The product is considered to have optimal display and function quality and is suitable for use in the learning process.

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Figure 4. *Interactive comic display*

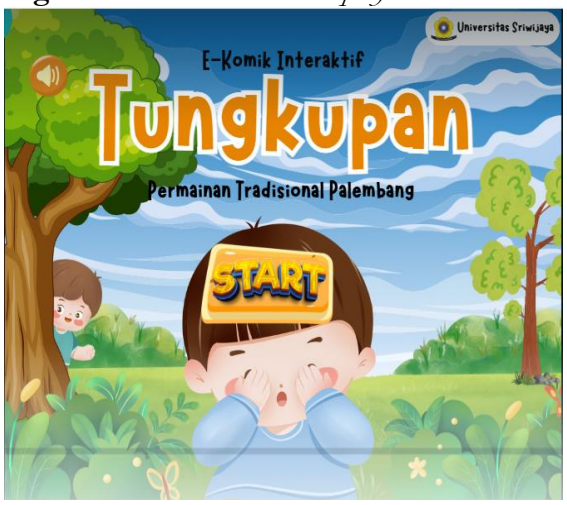

Figure 5. *Menu display*

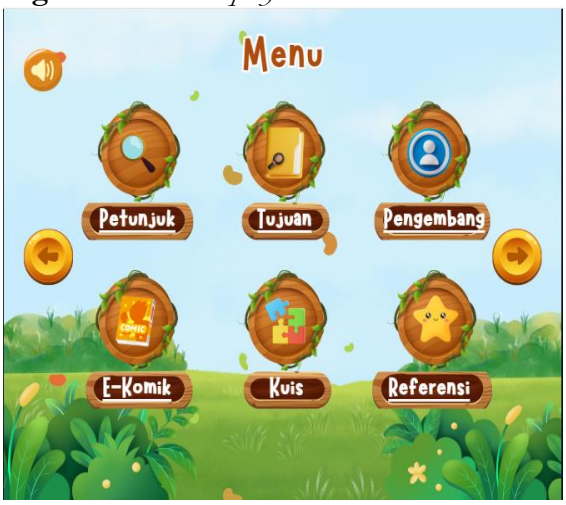

Figure 6. *Story e-comic display*

Figure 7. *Quiz e-comic*

Practicality results of interactive E-comics

Next, the implementation stage will involve testing the product on 27 early childhood students. The implementation will be carried out by observing the children interacting with the e- comic media and its effectiveness in helping them learn basic literacy through *a game-based approach.* The e-comic was tested on kindergarten children in group B. The following are the results of the initial trial.

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Table 8. *Practicality questionnaire results*

Aspect	Score	Ideal Score	Percentage (%)
Ease of Use	82	100	82,00
Engagement and Motivation	96	100	96,00
Understanding of Material	67	75	89,33
Visual Design and Interactivity	96	100	96,00
Alignment with Student Needs	71	75	94,67
Average	82,4	90	91,60

Based on the results of the practicality questionnaire, an average percentage of 91.60% was obtained, which falls into the very practical category. This score indicates that in terms of ease of use, engagement and motivation, material comprehension, visual design and interactivity, as well as suitability to student needs, the developed learning media has met high practicality criteria. The product is considered easy to use, attractive, and capable of supporting the learning process effectively.

Effectiveness results of interactive E-comics

The Evaluation stage aims to assess the effectiveness of e-comics. The research test at this stage consists of *a* pretest and posttest with the aim of evaluating the effectiveness of interactive e-comics based on traditional *Tungkupan* games to improve children's literacy in kindergarten. The following N-gain results can be seen in the table 9.

Figure 8. *Student learning outcomes before and after using e-comics*

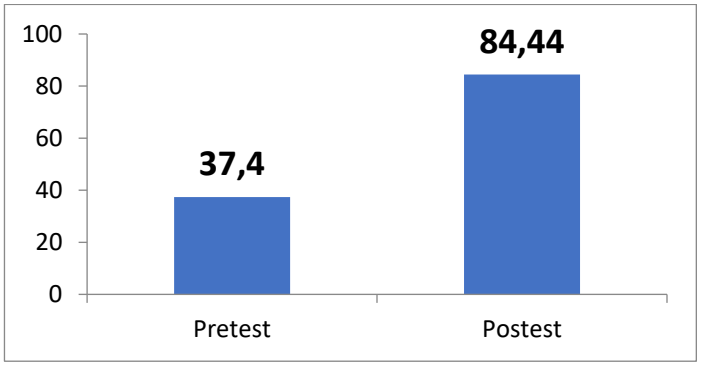

Table 9. *Effectiveness results of the e-comic*

	N	Minimum	Maximum	Mean	Std. Deviation
NGain	27	.50	.88	.7376	.13865
NGainPersen	27	50.00	87.50	73.75	13.86500
Valid N (listwise)	27				

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Based on the results of data analysis in the figure and table above, it can be seen that the average pretest score of students was 37.4, which increased significantly to 84.44 on the posttest after using e-comics. This increase is supported by the N-Gain calculation results with an average value of 0.73, which is in the high category. These results indicate that the use of e-comics is 73.75% effective in improving student learning outcomes, particularly in promoting children's literacy and active engagement during the learning process.

Discussion

The results of the study show that the development of interactive e-comics based on the traditional game of *Tungkupan* is proven to be valid, practical, and effective in improving early childhood literacy. From the validation results by experts in material, language, and media, an average percentage of above 80% was obtained with a category of very valid, which means that the media has met the aspects of content, language, and visual appearance in accordance with the characteristics of early childhood. This finding is in line with the research Khairunnisa et al. (2024) which states that e-comic based media is capable of delivering educational messages in an attractive way and increasing students' information absorption. This shows that the digital comic-based approach has great potential to be applied in the context of early childhood education because it suits their visual needs and learning styles (Lusiana & Nuryanto, 2025).

Furthermore, the practicality aspect scored an average of 91.60%, which falls into the very practical category. This result indicates that both teachers and students found the media easy to use, were actively involved, and were motivated during the learning process. These results support the research (Rahman et al., 2024), which shows that game-based digital media can increase children's interest in learning and their involvement in literacy activities. The integration of attractive visuals and simple interactivity makes children more focused and helps them understand the content of the story better. Thus, interactive e-comics based on traditional games can be widely implemented because they have a high level of acceptance from direct users, namely teachers and students.

In terms of effectiveness, the results of the pretest and posttest showed a significant increase in scores, with the average score increasing from 37.4 to 84.44 after using e-comics, with an N-Gain of 0.73 or 73.75% (high category). Importantly, the improvement occurred across three core components of early literacy**:** (1) phonics-related word recognition, reflected in children's ability to read two-syllable character names; (2) basic comprehension, measured through their responses to simple story questions; and (3) symbolic representation and sequencing**,** demonstrated through their ability to arrange picture series into a coherent narrative. These findings align with recent evidence showing that interactive digital story-based media effectively support emergent literacy by enhancing word recognition, vocabulary development, and narrative understanding (López-Escribano et al., 2021; Son et al., 2020). The multisensory nature of e-comics combining visuals, text, and interactive elements helps strengthen children's memory and comprehension processes, contributing to meaningful gains in foundational literacy skills.

In addition to its effectiveness in improving literacy outcomes, the use of *Tungkupan* as the narrative basis of the e-comic provides children with exposure to the idea that traditional games are part of Palembang's local wisdom. Through this storyline, children are introduced to traditional play as a form of cultural heritage that is worth appreciating and preserving. In this study, however, the cultural element functions solely as contextual support and was not measured as a learning outcome. Although previous research suggests that integrating digital media with cultural content may enhance

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children's motivation and interest(Lin et al., (2024), the present study does not assess cultural understanding or the internalization of cultural values. Therefore, any cultural benefits should be interpreted as potential rather than empirical.

Within this scope, the e-comic primarily serves as a literacy medium that leverages a culturally familiar narrative to support engagement during learning. This study shows that the use of digital media that integrates local cultural values, such as *Tungkupan* based e-comics, can increase the interest and literacy skills of early childhood. According to the theory of literacy as a social practice, interactive and visual media can stimulate children's active engagement and strengthen their contextual understanding of the material being taught (Lyna Sari, 2024; Wijayanti et al., 2022). In addition, this approach is also in line with the concept of culture-based learning, where the introduction of local values through digital media can strengthen children's cultural identity and motivation to learn (Sari et al., 2022).

The findings of this research offer several implications for key stakeholders. For early childhood educators, the use of culturally grounded digital media can serve as an effective pedagogical strategy to enhance literacy development while simultaneously fostering cultural appreciation. Practitioners are encouraged to integrate local-wisdom-based content into classroom activities to create more contextualized and child-friendly learning experiences. For school administrators and curriculum developers, this study underscores the importance of supporting policies that promote the development and adoption of digital learning resources incorporating regional cultural heritage. Such policies can contribute to curriculum enrichment and the strengthening of local identity at the institutional level. Finally, for policymakers, the success of this innovation highlights the need for broader initiatives that fund and regulate culture-based digital content as part of national early childhood education programs, ensuring equitable access and long-term cultural preservation.

Limitations of the study

Although the results of this study are effective, there are several limitations that need to be considered. First, the sample used was limited to one group of early childhood in the Palembang area, so the results cannot be generalized to a wider population. Second, this study relied on assessments from validators and teachers over a certain period of time without long-term measurements of the sustainability of children's literacy skills.

These limitations open up opportunities for further research involving a larger and more geographically diverse sample and a longer observation period. Future research could explore the long-term impact of using this media on children's literacy development and the role of parents and educators in supporting this culture and technology based learning process.

Conclusion and Recommendations

This study successfully developed interactive e-comics based on the traditional game of *Tungkupan*, which proved to be valid, practical, and effective in improving the literacy of early childhood. Expert validation results showed that the media met the criteria for content, language, and appearance in accordance with children's needs, with an average score above 80%. In terms of practicality, the e-comic was easy to use, attractive, and encourages active participation of children in learning, with a practicality score of 91.60%. Meanwhile, the effectiveness test results showed a significant increase in children's literacy skills with an average N-Gain score of 0.73 (high category),

which confirms the effectiveness of the media in improving early reading and writing comprehension. The main novelty and contribution of this research lie in the successful integration of Palembang's local wisdom (*Tungkupan*) into a validated, practical, and effective interactive digital literacy medium, directly addressing the gap of limited culturally contextualized technology based learning tools mentioned in the introduction. In addition to contributing to the development of digital learning media, this research also has cultural implications, namely as a means of preserving Palembang's local wisdom through the integration of traditional games in a digital context.

Future research can expand upon this study in several ways. First, larger scale investigations involving more diverse early childhood populations across different regions could provide deeper insights into the generalizability of *Tungkupan* based e-comics and other local game based digital media. Second, future studies may incorporate experimental or longitudinal designs to examine the long term effects of culture based digital literacy tools on children's cognitive, social, and cultural development. Third, researchers could explore the integration of additional technological features such as augmented reality (AR), interactive animations, or gamification elements to determine whether these enhancements further improve engagement and learning outcomes. Finally, comparative studies examining various traditional games transformed into digital formats may help identify which cultural elements best support learning and how digital culture-based resources can be optimized for early childhood education.

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