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Development of ULOS Learning Model with AR to Foster Cultural Appreciation

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ABSTRACT

Indonesia is rich in diverse cultural heritage, including the traditional ULOS cloth from North Sumatra. To preserve and appreciate local culture, it is essential for student teachers to develop a deep understanding and love for that culture. **The ULOS-based learning model**, assisted by Augmented Reality (AR), is designed to achieve this goal. **This research** aims to develop a learning model based on the Project-Based Learning (PjBL) model, referred to as the ULOS model, to increase cultural understanding and appreciation among prospective teacher students. **The study follows** a Research and Development approach using the ADDIE development model. The sample includes elementary school teacher education students from UHKBPNP during the trial and effectiveness testing stages. Data collection involved expert validation sheets to assess the model suitability and test instruments to measure students love for their culture. **The results** demonstrate that the ULOS learning model assisted by AR, was declared valid, effective, and practical. It significantly enhanced students understanding of Batak culture and ULOS cloth, while also increasing their positive attitudes and love for local culture. **The use of ULOS** cloth as a teaching aid not only enriches the learning process but also strengthens cultural identity and fosters pride in Indonesia cultural heritage. **The ULOS learning model** is effective in enhancing cultural understanding and appreciation and has the potential to be adopted and developed in various educational and cultural contexts worldwide.

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1. INTRODUCTION

Indonesia is a country rich in cultural diversity, one of which is the Batak culture which is known for its traditional cloth. ULOS cloth has high historical, philosophical, and artistic value, and is an integral part of the cultural identity of the Batak people. However, in this era of globalization, there has been a decline in interest and appreciation for traditional culture among the younger generation. ULOS fabric not only has an aesthetic function, but is also full of symbolic and philosophical meanings that reflect the social and spiritual life of the Batak people [1, 2]. ULOS cloth holds deep philosophical meaning, symbolizing life cycles, kinship, and community bonds within Batak society. Traditionally used in ceremonies such as weddings and funerals, the cloth serves as both a functional textile and a spiritual artifact, making it an essential aspect of

cultural preservation. In the midst of globalization and modernization, the existence of cultural heritage such as ULOS faces serious challenges, especially related to the decline in interest and appreciation from the younger generation. This phenomenon raises concerns about the continuity of the nation cultural heritage [3].

Education has an important role in preserving and developing culture. Through education, cultural values can be instilled in the younger generation from an early age. Student teacher candidates have a strategic role in this effort, because they are prospective educators who will instill cultural values in future students. Therefore, it is important to develop a learning model that can increase the cultural appreciation among prospective teacher students [4]. Preparing teachers to face inclusive and diverse educational environments requires significant curricular reform. This study investigates how changes in initial teacher education courses can effectively equip prospective teachers with the skills and knowledge necessary to address diverse learning needs in the classroom [5–7]. Student teachers, as the next generation and future educators, play an important role in preserving and developing local culture. They are not only required to master teaching materials, but are also expected to be able to instill cultural values in students. However, the reality on the ground shows that many student teachers do not understand and appreciate local culture, including ULOS fabric. This is caused by a lack of cultural integration in the education curriculum and the minimal use of learning methods that are contextual and relevant to local culture [8]. The ULOS-based learning model was developed as a solution to overcome this problem. Unlike general AR-assisted learning models, the ULOS model specifically combines cultural heritage education with interactive, hands-on learning through Augmented Reality, making it particularly effective for fostering cultural understanding. Comparative analysis with other models (e.g., AR-based models in cultural education from Japan and India) highlights the novelty and cultural immersion provided by ULOS-assisted learning. This approach aims to integrate cultural elements in the learning process so that student teachers can better understand, appreciate and love local culture. Local wisdom in learning plays an important role in the teacher learning and teaching process. Local wisdom values can be used as a basis for character education in schools [9, 10].

The Project-based Learning Model (PjBL) is a pedagogical approach that invites students to learn through active involvement in relevant and meaningful projects. This approach emphasizes student involvement in the learning process directly and practically, as well as developing critical thinking, creativity and collaboration skills. Diversity presents significant challenges for teachers, requiring changes in the way teacher education programs prepare future educators. This includes integrating principles of inclusivity and cultural competency into the curriculum to ensure teachers can manage and embrace diverse classroom environments effectively [11]. The ULOS learning model assisted by Augmented Reality was developed as a variant of the PjBL model, with a special focus on integrating local cultural elements, namely ULOS fabric, in the learning process [12]. This development aims to not only provide an in-depth and contextual learning experience, but also instill a sense of love and appreciation for local culture among prospective teacher students. The development of the ULOS learning model assisted by Augmented Reality refers to the syntax of the PjBL model, namely (Use the essential question, Let's design project and do it, Observation project results and discussion, Solution and reflection). So by implementing the ULOS learning model assisted by Augmented Reality, it not only brings learning material content but also contains cultural values that have not been found in other learning models. By using ULOS as a teaching tool, prospective teacher students are expected to be able to better understand and appreciate the richness of the nation culture, and be able to teach it to students in an interesting and effective way [13–15]. This approach is also expected to increase creativity and innovation in the learning process. Prospective teacher students are invited to develop creative and interactive learning methods, utilizing the richness of local culture. In this way, learning becomes more contextual and relevant to everyday life.

The development of the ULOS learning model assisted by Augmented Reality includes several stages, starting from literature study and observation, learning module development, training and workshops, to evaluation and revision. Implementation of this model requires collaboration between educational institutions, cultural communities and students themselves [16]. This is also in line with Pamenang opinion which states that the culture-based integrated learning model (MPTBB) is an appropriate learning model to help students master subject matter as an effort to increase appreciation of local culture. With this effort, it is hoped that a young generation can be created that is not only academically intelligent, but also has a love and concern for the nation cultural heritage. Integrating local wisdom, such as ULOS, in educational practice fosters a deeper understanding and appreciation of cultural heritage among prospective teachers. By developing and implementing the ULOS learning model, it is hoped that student teachers will not only become academically competent educators, but also have a sense of love and appreciation for the nation cultural heritage. This approach is also

expected to improve the quality of education and preserve culture in Indonesia [17, 18].

2. RESEARCH METHOD

2.1. Types and Procedures of Research

The research employed a Research and Development (R&D) approach, utilizing the ADDIE model, which consists of the following stages:

- Needs analysis
- Initial prototype design
- Validation
- Revision
- Limited trial
- Further revision
- Extensive testing
- Final product review

The methodology combined development and experimental methods. After the initial stages, iterative design and testing phases were conducted to ensure the model practicality and effectiveness. The research subjects were students from the Primary School Teacher Study Program at HKBP Nommensen Pematangsiantar University (PGSD UHKBPNP). The AR tool was developed using the Vuforia SDK, integrated with Unity, to create an interactive 3D model of ULOS cloth. Students accessed the tool via smartphones, which overlaid ULOS designs onto physical spaces, enhancing their interaction with the cultural elements. The effectiveness of the AR tool in increasing cultural appreciation was measured using pre-tests and post-tests, focusing on students engagement and cultural understanding. The research population consisted of all PGSD UHKBPNP Class of 2023 second-semester students. The sample was divided into two groups: PGA4 as the experimental class and PGA2 as the control class [19, 20].

2.2. Data Analysis Technique

Data obtained through initial observations with interviews and several literature studies related to science education learning, are presented in descriptive analysis [21]. So that the results of the findings at the research stage can be used as guidelines in the initial prototype design stage of the ULOS learning model assisted by Augmented Reality. Then if the prototype of the ULOS learning model has been completed, what is done next is a validity test carried out by a validator, in this case who has expertise in field of science education learning and learning models. After the ULOS learning model prototype design is valid for use, the design is tested, both on a limited basis and widely, to see its practicality and effectiveness. The following is a data analysis for the validity, practicality and effectiveness of the initial prototype of the ULOS learning model [22, 23].

2.2.1. Validity Analisis

Table 1. Validity Criteria

Interval	Criteria
$3.25 < M < 4.00$	Can be used without revision
$2.50 < M < 3.25$	Can be used with minor revisions
$1.75 < M < 2.50$	Can be used with major revisions
$1.00 < M < 1.75$	Can not be used

Table 1 outlines the validity criteria for the initial prototype of the ULOS learning model based on expert evaluations. The Average Score (M) determines how the prototype can be utilized: if M is between 3.25 and 4.00, the prototype can be used without revisions; if M is between 2.50 and 3.25, it can be used with minor

revisions; if M is between 1.75 and 2.50, it requires major revisions, and if M is between 1.00 and 1.75, the prototype cannot be used. This scale ensures the model readiness and highlights areas needing improvement based on the average validity score.

2.3. Practicality Analisis

The initial prototype of the ULOS learning model is said to be practical if according to the assessment of lecturers it can be easily implemented. Practitioner assessment data will be analyzed using descriptive percentage techniques using the following formula:

$$\text{Percentage} = \left(\frac{\sum x}{\text{SMI}}\right) \times 100\%$$

Noted: $\sum$ x = Total Score
SMI = Criteria Ideal Maximum Score
Practicality refers to the following intervals:

Table 2. Practical Criteria

Persentage Range	Criteria
85.01% - 100%	Very Practical
70.01% - 85%	Quit Practical
70.01% - 85%	Quit Practical
50.01% - 70%	Less Practical
01.00% - 50%	Impractical

Table 2 presents the practical criteria for evaluating the ULOS learning model based on the percentage range of practicality. The table defines four levels of practicality: if the percentage range is 85.01% - 100%, the model is considered ”Very Practical”; if it falls between 70.01% - 85%, it is deemed ”Quite Practical”; if the range is 50.01% - 70%, the model is classified as ”Less Practical”; and if the percentage is 1.00% - 50%, the model is considered ”Impractical”. This table helps assess how user-friendly and applicable the model is based on practical use in real learning environments.

2.4. Effectiveness Analysis

The initial prototype of the ULOS learning model is said to be effective if according to the assessment of lecturers based on their knowledge and experience, it states that the initial prototype of the ULOS learning model is effective and that in the learning process its implementation is actually effective, with indicators that the objectives of developing the ULOS learning model are achieved, namely increasing the cultural love of prospective teacher students towards culture [24, 25]. If students are able to obtain cultural love test scores, students will experience an increase. And conversely, if students are unable to process coconut shells into a craft product, then students creativity has not increased. Assessment is carried out based on the assessment rubric prepared. The effectiveness criteria refer to the following intervals:

Table 3. Effectiveness Criteria

Percentage Range	Criteria
85.01% - 100%	Very effective
70.01% - 85%	Effective enough
50.01% - 70%	Less effective
01.00% - 50%	Ineffective

3. RESULT AND DISCUSSION

3.1. ULOS Model Syntax

The results of the development of the ULOS model assisted by Augmented Reality have a syntax for the science teaching aid material, namely:

3.1.1. Use The Essential Question (Using Fundamental Questions)

This syntax can explain the importance of maintaining local wisdom by exploring elements of science that can be learned from one of the local wisdoms of North Sumatra, namely ULOS and asking related questions:

- Students lack of knowledge about ulos
- Project-based learning that contains local wisdom has not been widely developed which can build 21st century skills
- There is still a small amount of science material that is integrated into local wisdom

The basic question that can be used is "How to design local wisdom ulos that can be used by teachers in explaining science teaching aid material?

3.1.2. Let's Design and Do It (Design a Project and Do It)

In this syntax, students are expected to think critically in proposing solutions for designing ulos projects and designing them to be used as science teaching aids in accordance with existing problems, namely project-based learning that contains local wisdom has not been widely developed, and there is still little science material that is integrated with local wisdom). according to the concept. Combining the design steps and making this project overcomes the weakness of the PjBL model in terms of time [26, 27]. By combining this syntax, the time required for project work will be shorter.

3.1.3. Observation project and discussing the outcome (Project Observation and Discussing Project Results)

In this syntax, students are expected to be able to think critically in designing science teaching aids using ULOS, collaborate in arranging a schedule for making science props using ulos for 3 weeks and ensure group members have their respective tasks. This science teaching aid using ulos is designed to overcome the weakness of the PjBL model in terms of cost [28] because it uses flannel fabric which is quite affordable. The weaknesses of the PjBL model in terms of creativity [29, 30] are also overcome because in the ULOS model students are required to be creative in designing the projects they will design.

3.1.4. Solution and reflection (Solution and Reflection)

At this stage, students individually and in groups carry out self-evaluations regarding the process of working on science teaching aids using ulos which is useful for analyzing strengths and weaknesses during project work activities. Next, report the results of the project and share experiences during the activity process from start to finish and reflect on the projects that students have worked on by filling in a reflection sheet.

The development of the ULOS model produces learning tools in the form of ULOS model books, learning modules and RPS. The development of the ULOS model also produces data collection instruments in the form of teacher response questionnaires and assessment rubrics [31]. The model guidebook was created to make it easier for lecturers to understand the stages of the learning model, and to provide guidance to lecturers in managing the learning process. This learning module was created with the aim of making students able to understand the use of teaching aids using ulos to explain science concepts. The RPS is prepared with the aim of providing guidance for lecturers in carrying out the learning process in class [32].

3.2. Learning Device Validation Results

To ensure the quality and feasibility of the ULOS Model Book, a validation process was conducted with the assistance of Augmented Reality. Evaluations were carried out by two expert validators to determine whether the book meets the necessary standards for educational use [33]. The assessment results provide insights into the strengths and areas for potential improvement, ensuring that the book is suitable for supporting cultural education.

Table 4. Results of Recapitulation of ULOS Model Book Validation with the help of Augmented Reality

No	Assessment Aspects	Validator 1	Validator 2	Range(M)	Criteria
1	Format	3.2	3.4	3.3	Can be used
2	Contents	3.5	3.6	3.55	Can be used
3	Language	3	4	3.5	Can be used
	General Assessment				Can be used

Table 4 presents the validation results of the ULOS Model Book assisted with Augmented Reality, evaluated by two validators across three main aspects: format, content, and language. The average score for the Format was 3.3, indicating that the structure and layout of the book are adequate for use without major revisions. The Content received a higher average score of 3.55, suggesting that the material effectively conveys cultural concepts and learning objectives. For Language, the average score was 3.5, confirming that the language used is clear and appropriate for the target audience [34]. Overall, the model book was assessed as suitable for use without significant changes, demonstrating its readiness to support cultural education through an augmented reality approach.

Table 5. Recapitulation Results of Learning Module Validation

No	Assessment Aspects	Validator 1	Validator 2	Range(M)	Kriteria
1	Format	3.0	3.2	3.1	Can be used
2	Contents	3.1	3.5	3.3	Can be used
3	Serving	3.2	3.0	3.1	Can be used
4	Component completeness	3.4	3.6	3.5	Can be used
5	Language	3.3	3.5	3.4	Can be used
	General Assessment				Can be used

Table 5 presents the validation results for the Learning Module, assessed by two validators across five aspects: format, content, serving, component completeness, and language. The Format received an average score of 3.1, indicating adequacy. Content averaged 3.3, showing the material is appropriate and effective. Serving also scored 3.1, reflecting clarity in presentation. Component Completeness scored 3.5, ensuring all elements are included, and Language received 3.4, confirming suitability for the audience. Overall, the module is deemed ready for use without major revisions, effectively supporting the intended learning outcomes.

Table 6. RPS Validation Recapitulation Results

No	Assessment Aspects	Validator 1	Validator 2	Range(M)	Criteria
1	Format	3.0	3.2	3.1	Can be used
2	Material presented	3.2	3.2	3.2	Can be used
3	Language	3	4	3.5	Can be used
4	Time	3.4	3.2	3.3	Can be used
5	Serving model	3.0	3.0	3.0	Can be used
6	Assessment	3.2	3.4	3.3	Can be used
7	Facilities and tools learning	3.0	3.0	3.0	Can be used
	General Assessment				Can be used

Table 6 presents the RPS Validation Results, evaluated by two validators across seven aspects: format, material presented, language, time, serving model, assessment, and learning tools. Format received an average score of 3.1, and Material Presented scored 3.2, both deemed adequate. Language scored 3.5, ensuring clarity, while Time received 3.3, indicating the schedule is practical. Serving Model and Assessment averaged 3.0 and 3.3, respectively, confirming their appropriateness. Learning Tools also scored 3.0, reflecting adequate support. Overall, the RPS is ready for use with no major revisions needed.

3.3. Results of Research Instrument Validation

The validation of the Lecturer Response Questionnaire was conducted to ensure its reliability and effectiveness in collecting relevant feedback. This process involved an evaluation by two expert validators to determine whether the questionnaire meets the necessary standards for academic research.

Table 7. Recapitulation Results of Lecturer Response Questionnaire Validation

No	Assessment Aspects	Validator 1	Validator 2	Range(M)	Criteria
1	Format	3.2	3.2	3.2	Can be used
2	Contents	3.3	3.1	3.2	Can be used
3	Construction	3.0	3.2	3.1	Can be used
5	Language	3.2	3.4	3.3	Can be used
	General Assessment				Can be used

Table 7 presents the validation results for the Lecturer Response Questionnaire, evaluated across four aspects: format, content, construction, and language. Format received an average score of 3.2, indicating it is suitable for use. Content scored 3.2, showing that the material is appropriate and effective. Construction averaged 3.1, confirming the structure is well-designed. Language scored 3.3, ensuring clarity and readability. Overall, the questionnaire is ready for use without requiring significant revisions.

Table 8. Recapitulation Results of Assessment Rubric Validation

No	Assessment Aspects	Validator 1	Validator 2	Range(M)	Criteria
1	Format	3.2	3..4	3.3	Can be used
2	Contents	3.3	3.5	3.4	Can be used
3	Language	3.2	3.4	3.3	Can be used
	General Assessment				Can be used

Table 8 presents the validation results for the Assessment Rubric, evaluated by two validators. Each aspect was scored, with all aspects rated as ”Can be used”. The first aspect received an average score of 3.3, indicating it is suitable without significant revisions. The second aspect scored 3.4, reflecting that it meets the criteria effectively. The third aspect also averaged 3.3, confirming it is appropriate for use. Overall, the rubric is ready for implementation without major changes.

Table 9. Results of Lecturer Response Questionnaire Recapitulation

No	Statement	Score
1	The use of learning models supports the achievement of learning indicators and objectives.	3
2	The use of learning tools supports the achievement of learning indicators and objectives.	3
3	Learning stages are arranged systematically.	3
4	I am very interested in this ULOS Model development model assisted by Augmented Reality.	4
5	Learning with the ULOS Model development model assisted by Augmented Reality is easy to implement.	3
6	The ULOS model development model assisted by Augmented Reality is able to make the learning process more challenging.	4
7	Learning with the development of the ULOS model assisted by Augmented Reality increases knowledge in learning innovation.	4
8	Learning with the development of the ULOS model assisted by Augmented Reality makes students happy and interested in culture	4
9	The ULOS learning model assisted by Augmented Reality makes students dare to express their ideas and opinions	3
10	Learning with the ULOS model assisted by Augmented Reality helps stimulate students creativity.	3
11	Learning with the ULOS model assisted by Augmented Reality helps increase students knowledge and skills regarding Batak culture	4
12	The learning process using modules provides benefits for me and the students.	4

13	The content of the material in the module makes students more enthusiastic about participating in the learning process.	3
14	ULOS learning assisted by Augmented Reality is different from direct learning or learning with a process and problem approach.	4
15	The ULOS learning model assisted by Augmented Reality is worth maintain ing in this subject	4
Amount		52
Persentage		86.6%

Table 9 presents the results of the Lecturer Response Questionnaire, evaluating 15 statements on the effectiveness of the ULOS learning model assisted by Augmented Reality. Most statements received scores of 3 or 4, with high marks for aspects like engagement, creativity, and ease of implementation. Statements regarding the model ability to make learning more challenging and interesting also scored well, reflecting strong approval. With a total score of 52 and a percentage of 86.6%, the results show that lecturers found the model practical and effective. The high scores suggest that the ULOS model supports learning objectives, boosts student engagement, and fosters creativity, making it a valuable educational tool.

3.4. Effectiveness Test Results

Table 10. Recapitulation Results of Group 1-6 Assessment Rubrics

No	Stages	Avarage Score
1	Planning	4
2	Implementation	4
3	Results/Products	3
Amount		11
Presentage		91.6%

Table 10 shows the Effectiveness Test Results, summarizing the assessment of six groups across three stages: planning, implementation, and results/products. The Planning and Implementation stages both received an average score of 4, indicating high effectiveness, while the Results/Products stage score 3, reflecting moderate effectiveness in the final outputs. With a total score of 11 and an effectiveness percentage of 91.6%, the results suggest that the ULOS learning model was very effective in engaging students and achieving the desired learning objectives, particularly in the planning and implementation stages.

Figure 1. Results of the 6 Group ULOS Miniature Project

Figure 1 presents the results of the ULOS Miniature Project completed by six student groups. Each group creatively integrated ULOS cultural elements into their projects, demonstrating the model effectiveness in fostering cultural appreciation and hands-on learning. The visual outcomes reflect the students engagement with the project, showcasing both their educational and creative processes, which enhanced their understanding and appreciation of ULOS traditions. This project allowed students to apply their knowledge of ULOS in a practical, collaborative setting, reinforcing cultural values while encouraging teamwork and creativity.

3.5. Discussion

The research results show that the ULOS-based learning model assisted by Augmented Reality is effective in increasing students understanding, appreciation and creative skills. Figure 1 displays the outcomes of the ULOS Miniature Project conducted by 6 student groups. Each group creatively integrated ULOS cultural elements into their projects, demonstrating the model educational impact by fostering deeper cultural appreciation and hands-on engagement. The detailed miniature projects reflect both the educational and creative processes that enhanced students understanding and love for ULOS as a cultural artifact. Increasing cultural understanding and appreciation of local culture shows that this approach is successful in embedding cultural values in the learning process. Some of the challenges faced during the research included limited resources and the time required to complete the project. Students also face difficulties in accessing information and materials related to ULOS. However, this challenge can be overcome with good cooperation between students, lecturers and the cultural community. A professional learning program model to improve the competencies of students with special needs involves an innovative approach that prioritizes inclusive practices. This program focuses on equipping educators with the skills and knowledge needed to effectively support diverse learners [35]. This research has important implications for education and cultural preservation. This is also in line with research conducted by [9] which states that involving prospective teachers with local culture in their training programs will increase their cultural responsiveness and equip them to better teach cultural values to their students in the future. With the ULOS-based learning model, student teachers can become effective cultural preservation agents. While this model is centered on Indonesian culture, its framework can be adapted for teaching cultural heritage in other global contexts, such as teaching indigenous textile arts in Peru or Aboriginal art in Australia. However, challenges may arise in regions with limited access to AR technology, requiring adaptation of the model to local technological capacities.

They not only teach academic knowledge, but also cultural values to students. Training is needed for lecturers to teach with a culture-based approach. One of the challenges in implementing the ULOS learning model across various educational contexts lies in ensuring equitable access to AR technology. In regions with limited technological infrastructure, alternative methods such as 2D simulations or low-cost AR tools could be explored, possibly in collaboration with local tech initiatives. This training may include contextual learning techniques and the use of local cultural resources in teaching. Universities need to provide adequate resources to support culture-based projects. This includes materials, literature, and access to cultural communities. Increasing collaboration with local cultural communities can enrich students learning experiences and provide more authentic insight into local culture. Continuous evaluation needs to be carried out to improve and develop culture-based learning models. Feedback from students and lecturers can be used to improve learning effectiveness. With proper implementation and development, the ULOS-based learning model can make a significant contribution to increasing love of culture among student teachers and preserving Indonesian culture.

4. MANAGERIAL IMPLICATIONS

To improve cultural education, institutions can use technology, train faculty, and collaborate with local communities. These steps help preserve cultural heritage and enhance students learning experiences. The following points outline key strategies to achieve this:

- Integrating Augmented Reality (AR) in Cultural Education, educational institutions should consider using AR technology in teacher training programs to make cultural learning more engaging. Implementing culture-based models like the ULOS AR-assisted learning model not only preserves cultural heritage but also enhances students critical and creative skills.

- Enhancing Faculty Skills in Culture-Based Learning Models, providing training for faculty in culture-based teaching methods can improve students knowledge and skills in local heritage. This ensures that

faculty are equipped to deliver interactive, culturally relevant instruction, enhancing future teachers abilities to impart cultural values.

- Partnering with Local Cultural Communities, institutions can collaborate with local cultural communities to provide authentic resources for students, enriching the learning experience and fostering a deeper understanding of local culture. Such partnerships enhance students cultural appreciation and engagement through real-world exposure.

5. CONCLUSION

This research demonstrates that the ULOS-based learning model is an effective approach for fostering a love of culture among student teachers. The findings emphasize the significant role of Augmented Reality (AR) in cultural education, offering a novel method to bridge traditional and modern teaching techniques. This model not only preserves cultural heritage but also enhances students creative and critical thinking skills in a 21st-century learning environment. Student teacher candidates showed significant improvement in their understanding of Batak culture and ULOS cloth after engaging with the ULOS-based learning model. Additionally, their appreciation of local culture increased, with more students expressing positive attitudes and a deeper connection to their cultural heritage. Through ULOS-based projects, students successfully developed creative and innovative skills, producing various works that demonstrated their ability to integrate cultural elements into the learning process.

Moreover, students displayed increased motivation and participation in the learning process. Contextual learning, rooted in local culture, made the experience more engaging and encouraged active involvement. The ULOS learning model fostered positive attitudes and a deeper appreciation for local culture among student teachers, who reported feeling more connected to their cultural roots and expressed a desire to help preserve them. The results indicate that the ULOS-based learning model effectively meets its learning objectives. The integration of cultural elements into the educational process offers a more meaningful and applicable learning experience. Despite the positive outcomes, challenges such as limited resources and the time required for project completion need to be addressed. However, strong cooperation between students, lecturers, and cultural communities can help overcome these challenges. By continually improving and expanding its implementation, the ULOS learning model can further enhance cultural appreciation among prospective teachers and students across Indonesia. This model not only enriches the educational experience but also plays a vital role in preserving the nation cultural heritage.

6. DECLARATIONS

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Conceptualization: AS, FF, AR, SD, LL and NL; Methodology: AS; Software: AS; Validation: AS; Formal Analysis: AS, FF, AR, SD, LL and NL; Investigation: AS, F, AR, SD, LL and NL; Resources: TH; Data Curation: AS; Writing Original Draft Preparation: AS and FF; Writing Review and Editing: AS, FF, AR, SD, LL and NL; Visualization: AS; All authors, AS, FF, AR, SD, LL and NL, have read and agreed to the published version of the manuscript.

6.3. Data Availability Statement

The data presented in this study are available on request from the corresponding author.

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6.5. Declaration of Conflicting Interest

The authors declare that they have no conflicts of interest, known competing financial interests, or personal relationships that could have influenced the work reported in this paper.

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