Empowering ECCE Educators: Improving Understanding, Skills, and Development of the Independent Curriculum, with Teaching Modules and Learning Media Based on *Augmented Reality*

Irfan Fauzi Rachmat[1], Cucu Sopiah[2], Fakhry Fajrin Kurniawan[3], Mumun Munawaroh[4]

[1,2,3] *Universitas Muhammadiyah Cirebon, Indonesia* [4] *IAIN Syekh Nurjati Cirebon, Indonesia*

A B S T R A C T

This Community Service aims to enhance the understanding and skills of teachers at TK Labschool UMC and Daycare UMC regarding the Merdeka PAUD Curriculum and the development of interactive digital media teaching modules using augmented reality. Conducted as an empowerment-based community service, the activities took place at TK Labschool UMC over an intensive period of 2 months with three training sessions. The method involved the entire teacher population, utilizing purposive sampling techniques. The results indicated an improvement in the understanding of the principles of the Merdeka PAUD Curriculum, the ability of teachers to develop a distinctive curriculum for TK Labschool UMC, and their competence in creating teaching modules and integrating augmented reality technology into the learning process. The conclusion affirms that this community service has successfully empowered teachers, resulting in a positive impact on early childhood education.

Keywords: understanding, skills, curriculum development, teaching modules, augmented reality.

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[1] Corresponding Author: Program Studi PG PAUD Universitas Mmuhammadiyah Cirebon; Email: irfan.fauzi@umc.ac.id

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INTRODUCTION

Education is one of the key pillars in the development of a nation, and Community Service Activities, which are part of the Tri Dharma of Lecturers (three main duties of university faculty: education, research, and community service), can serve as a tangible platform for educators to actively contribute to positive changes in the field of education. In this era of globalization, the challenges in developing educational curricula have become increasingly complex, especially at the Early Childhood Education (ECE) level

One initiative aimed at addressing these challenges is the introduction of the "Merdeka Curriculum," an innovation that emphasizes freedom and creativity in early childhood learning. The Merdeka Curriculum responds to the dynamic demands of the times, emphasizing the mastery of 21st-century skills. This curriculum provides educators with the flexibility to create high-quality learning experiences tailored to the needs and learning environments of the students(Eka Retnaningsih et al., 2022).

The Merdeka Curriculum aims to develop students' soft skills and character through projects that strengthen the Pancasila (the philosophical foundation of Indonesia) learner profile. The focus is on essential, relevant, and in-depth content, allowing sufficient time for building students' creativity and innovation in achieving basic competencies such as literacy and numeracy (Kurniati et al., 2022; Ningrum et al., 2023) . The curriculum promotes flexible learning, granting teachers the freedom to adapt instruction based on individual students' progress and development stages, and to make adjustments considering local contexts and content (Rasmani et al., 2023)

Amidst the currents of globalization and technological advancements, it is imperative for education to continually adapt to the progress of these technologies. At every level of education, including Early Childhood Education (ECE), there is a necessity for curriculum innovation. The Merdeka Curriculum emerges as a response to the dynamics of the times, demanding the mastery of 21st-century skills (Kurniati et al., 2022; Ningrum et al., 2023).

The implementation of the Merdeka Curriculum in Early Childhood Education in Indonesia represents a strategic step in aligning with the needs of the times (Rasmani et al., 2023) However, the reality in the field indicates the presence of obstacles, particularly in terms of understanding and implementation by educators. Teachers at TK Labschool UMC face challenges in comprehending the concept of the Merdeka Curriculum for Early Childhood Education, necessitating a more focused and in-depth approach to enhance their understanding.

At the local level, TK Labschool UMC becomes the primary focus of this Community Service activity. This school encounters specific issues, namely the lack of understanding among teachers regarding the Merdeka Curriculum for Early Childhood Education and difficulties in implementing it in the classroom. Limitations in curriculum development and implementation hinder the creation of an optimal learning process.

This Community Service activity aims to address these two issues by providing Merdeka Curriculum training for teachers at TK Labschool UMC. Additionally, we will develop interactive digital media modules using augmented reality as a supporting tool in the learning process.

The use of augmented reality in teaching modules can provide a more engaging and interactive learning experience. This technology stimulates student interest and engagement, creating a more dynamic and enjoyable learning environment. Augmented reality allows the integration of digital elements into the physical world, enriching the learning materials (ARSLAN et al., 2020; Chao, 2018; Videnovik et al., 2020). Students can access additional information, simulations, or virtual objects that support a deeper understanding of concepts. Augmented reality enables the visualization of abstract concepts in real-world contexts (Alqahtani & Kavakli-Thorne, 2020; Hwang et al., 2015; Koutromanos et al., 2016; Yousef, 2021) This helps students better understand challenging concepts that may be difficult to grasp through conventional methods, particularly in subjects like science or mathematics..

MATERIALS AND METHODS

This community service activity falls under the category of community-based empowerment, supported by the Ministry of Education, Culture, Research, and Technology under the Directorate General of Higher Education. The focus of this service activity is on empowering teachers at TK Labschool UMC and Daycare UMC through Merdeka Curriculum training for Early Childhood Education and the development of interactive digital media modules using augmented reality.

The community service activity is conducted at TK Labschool UMC. The training program spans an intensive 2-month period with three sessions. Each training session has a duration of 8 hours, conducted regularly according to the agreed-upon schedule.

Table 1. Schedule of Training Activities

No.	Tanggal	Kegiatan
1	August 31, 2023	Implementation of Training and Coaching to Enhance Teachers' Understanding of the Merdeka PAUD Curriculum
2	October 15, 2023	Socialization of the Merdeka PAUD Curriculum
3	November 25, 2023	Development of Teaching Modules and Creation of Interactive Learning Media Based on Augmented Reality

The participants in this community service activity are comprised of all teachers from TK Labschool UMC and Daycare UMC. The total number of participants is 8 teachers, including 1 school principal. The sampling technique employed is purposive sampling, where all teachers involved in the teaching activities at TK Labschool UMC and Daycare UMC are considered subjects or partners in the community service. This approach ensures that all teachers involved in the Merdeka PAUD Curriculum and the development of augmented reality-based teaching modules are part of this community service.

Data Collection Techniques

Data collection involves observation, interviews, and document analysis. Observation is used to understand the real conditions in the field, interviews are conducted to gather direct perspectives and understanding from the teachers, and document analysis is performed to gather information related to existing curricula and teaching materials. Data collection takes place during the training activities.

Data Analysis

Collected data will be analyzed qualitatively. The analysis will include identifying teachers' understanding of the Merdeka PAUD Curriculum, the challenges they face in its implementation, and their responses to the training and developed modules. Qualitative analysis will provide in-depth insights into the impact of this community service.

Data Presentation

Data will be presented descriptively and visually. The analysis results will be presented in a narrative form explaining the main findings from the Merdeka PAUD Curriculum training and the implementation of interactive digital media modules using augmented reality. Graphs and tables will be used to visualize findings more clearly and comprehensively

RESULTS AND DISCUSSION

The results of community service activities show a significant transformation in the understanding and characteristics of service subjects, namely UMC Labschool Kindergarten teachers and UMC Daycare teachers. During the Curriculum Merdeka PAUD training, it was seen that the teachers became more understanding of the principles underlying the curriculum. They not only gain theoretical understanding, but are also able to relate the concept to the practical context in the classroom. The results can be explained through the following sub-chapters:

Teachers' Early and Final Understanding of the Independent ECCE Curriculum:

Collection of Teacher's Early Understanding Data:

Data collection was carried out by conducting interviews and distributing questionnaires. The questionnaire is attached https://forms.gle/Si1Zbgpwr8k2ZANQ8. The questionnaire has 5 dimensions with 15 questions / indicators.

Data Analysis of Teacher's Initial Comprehension

From the results of the curriculum evaluation, a qualitative analysis was then carried out to see the 5 dimensions asked. The results of the evaluation can be seen through the following table:

Table 2. Findings of Questionnaire Results and Teacher Interviews

Part	Key Findings
Understanding the Independent Curriculum	The majority of teachers describe the Merdeka Curriculum as an approach that provides freedom in learning, is centered on children's interests, and liberates students. The objectives include the development of character and general competence. Apparently, the curriculum is designed to give autonomy to educators and learners.
Curriculum Implementation	Respondents applied a variety of strategies, including a variety of play, to create varied learning. Significant changes occurred in learning methods, student enthusiasm increased, and there was a shift from a structured learning model to a student-centered model.
Challenges in Implementation	Challenges include lack of consistent information, changes in teaching models, student confusion, and difficulty preparing teaching media. Solutions include finding additional information, a commitment to continuous learning, habituation, and searching for resources in the surrounding environment. Support is needed from schools, institutions, and parents.
Support and Collaboration	Schools provide support through training, access to information, guidance, and facilitation of educators' needs. Collaboration between teachers focuses on discussions, Q&A sessions with students, and joint planning.
Results and Impact of the Independent Curriculum	Positive impact involves increasing creativity, developing independence, student activeness, and forming critical thinking skills. The effectiveness of the curriculum is measured by aligning with the school's vision, encouraging critical thinking, making learning fun, and helping to build children's characteristics.

In developing their own curriculum, teachers are able to create characteristics and characteristics that are in accordance with the learning environment at TK Labschool UMC. This reflects teachers' ability to adapt the principles of the ECCE Independent Curriculum to the uniqueness and specific needs of their institution. The process of developing this curriculum is colored by creativity and active participation from teachers, creating a curriculum that is not only relevant but also in accordance with the vision and mission of TK Labschool UMC.

Preparation of the Curriculum Development Team and Results of the Independent Curriculum PAUD TK Labschool UMC.

Curriculum Development Team Formation:

After the teacher has received curriculum socialization, and has also increased understanding of the Merdeka curriculum, the next step is to form a Curriculum Development team. The curriculum development team has been compiled, and has been attached to the Merdeka TK Labschool UMC curriculum, (Curriculum attached)

Curriculum Development Process

The steps taken by the team in compiling and developing the Merdeka PAUD curriculum can be shown through the following flow chart :
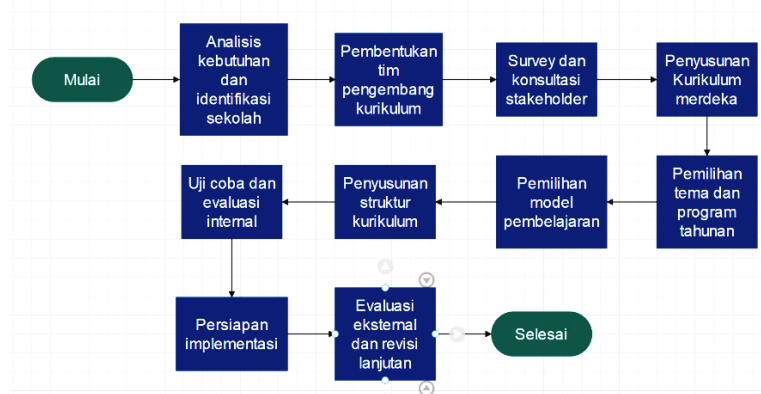

Figure 1. Flowchart of PAUD Independent Curriculum Preparation Flowchart

Evaluation and Implementation

The preparation of this curriculum has been realized through a series of careful stages. The process begins with curriculum development by a team of developers, who then engage teachers in a series of collaborative meetings. In order to compile this, PG PAUD UMC lecturers participated in providing valuable guidance. The speakers or resource persons who attended the training also played an important role in aligning the curriculum with the specific characteristics of the institution, so that the final result was more appropriate and in accordance with the needs and identity of the institution.

And after curriculum development is carried out, the expected curriculum documents are compiled. Attached curriculum document: Document KOSP Merdeka TK Labschool UMC.

Figure 2. KOSP TK Labschool UMC Document

Making Teaching Modules for Each Teacher:

Teacher Participation in Making Teaching Modules

Furthermore, the results of this service also show that teachers are not only consumers of the curriculum, but also producers. They are able to compile quality teaching modules that are relevant to the needs of early childhood learning at Labschool UMC Kindergarten. The ability of teachers in compiling this teaching module not only covers aspects of the material, but also involves integrating technology, especially in the form of interactive digital media based on augmented reality.

Content and Structure of Teaching Modules

The preparation of this teaching module is enriched with the help of ChatGPT, where each teacher can independently create a variety of learning themes and interesting topics. This diversity provides an opportunity for teachers to continue exploring innovative ideas every day without running out of inspiration. Learning modules are arranged using predefined templates and systematics, reflecting the characteristics of the Merdeka curriculum. This module incorporates clear learning outcomes, involves foundation phases, presents concept maps, and applies steps that characterize project-based or problem-based learning methods. In addition, this module also offers diversity by providing four main types of activities in one learning day.
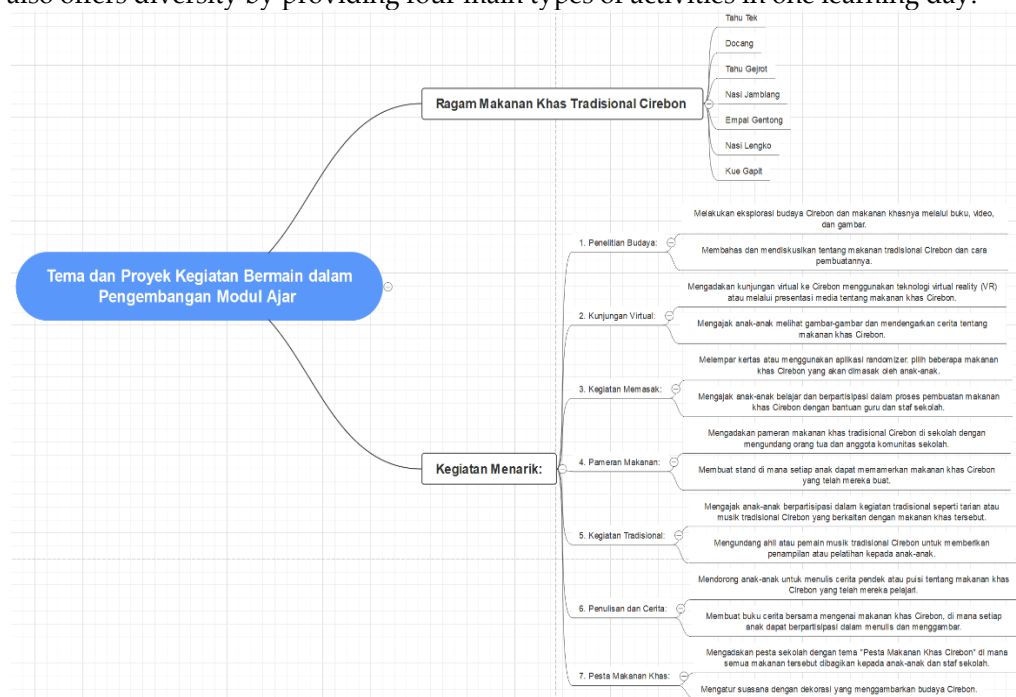

Figure 3. Concept Map and Examples of Teaching Module Development Projects

The above is a concept map of interesting topics and activities that have been designed by teachers at Labschool UMC. Each topic has been elaborated into a series of teaching modules that will be applied by teachers in learning activities.

Making Interactive Learning Media Based on Augmented Reality

Learning Media Making Process

The development of interactive digital media is one of the important points in the results of this activity. Teachers successfully overcame barriers and implemented *augmented reality technology* in early childhood learning. Thus, the interaction between teachers, students, and technology becomes harmonious, creating an interesting and innovative learning atmosphere.

Table 3. Stages of Making Augmented Reality Learning Media

No.	Stages	Description
1	Preliminary Preparation	- Download and install the Assemblr Edu app on the device you want to use.
		- Sign up or sign in using the account you created.
2	Learning Objective Setting	- Identify learning objectives to be achieved using AR media.
		- Define the concept or topic to be integrated into the learning media.
3	3D Object Design and Creation	- Choose 3D objects that fit the learning concept.
		- Use Assemblr Edu's design features or import a pre-prepared 3D model.
4	Interactive Content Compilation	- Add text, images, or additional information that supports student understanding.
		- Set the layout and placement of interactive elements on 3D objects.
5	Additional Media Integrations	- Include multimedia elements such as video, sound, or animation to provide a more immersive experience.
		- Make sure additional media supports the desired learning concept.
6	Preparation of Information and Instructions	- Add information or instructions for users on how to access and use AR media.
		- Provide a clear and easy-to-understand guide.
7	Trial and Correction	- Test the AR media that has been created.
		- Identify and fix potential issues or flaws in the user experience.
8	AR Media Publications	- Select the appropriate publishing option, for example, saving to a private gallery or sharing to the Assemblr Edu community.
		- Make sure AR media is accessible to the intended user.
9	Integration into the Learning Process	- Inform students about the availability and access of AR media.
		- Integrate AR media into the learning process according to the lesson plan.
10	Evaluation and Updates	- Evaluate the effectiveness of AR media in achieving learning objectives.
		- Update or improve AR media based on feedback and evaluation results.

Teacher Implementation and Response

Overall, the results of this activity show that teachers at TK Labschool UMC have experienced significant developments in understanding the principles of the Merdeka PAUD curriculum, are able to develop their own curriculum, and have succeeded in compiling teaching modules and integrating augmented reality technology in learning. This transformation is not only at the individual level, but also contributes to changes in the learning environment at TK Labschool UMC as a whole.

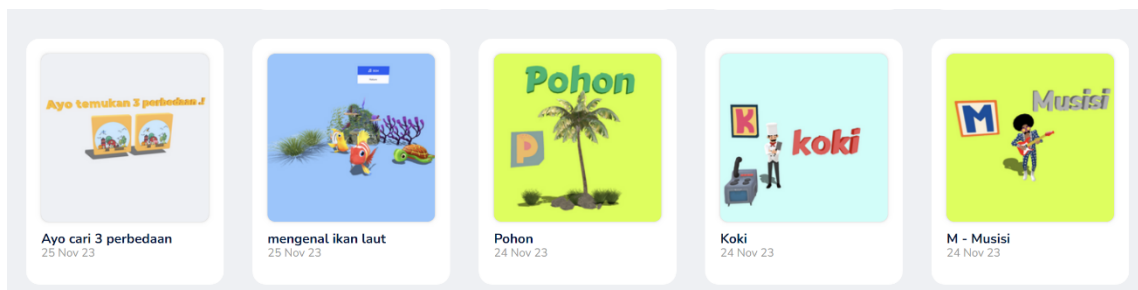**Figure 3. Augmented Reality Media Implementation Process**

Figure 4. Teacher's Work

Teacher's work made with Asemblr AR Studio. Making letter card media with Augmented Reality technology.

Interpretation of Community Service Results

The results of community service showed significant achievements in the understanding and skills of UMC Labschool Kindergarten teachers and UMC Daycare teachers related to the PAUD Independent Curriculum and the development of interactive digital media using *augmented reality*. The various reasons underlying these results can be explained as follows:

Strengthening Theoretical Understanding

Through the Curriculum Merdeka PAUD training, teachers gain a strong theoretical understanding of the principles of the curriculum. The structured and in-depth delivery of training materials provides a solid foundation for teachers to understand the key concepts in the Independent ECCE Curriculum.

Active Participation of Teachers in Curriculum Development

The results show that teachers' active participation in curriculum development has a positive impact on curriculum understanding and application at the local level. The uniqueness and characteristics of TK Labschool UMC are reflected in the curriculum developed, creating a distinctive educational identity as a pilot laboratory for kindergarten schools in the watubelah education environment of Cirebon Regency, and in accordance with the needs of students.

Empowering Teachers as a Curriculum Development team

The concept of teacher empowerment as a curriculum producer encourages teachers to take a more active role in the learning process. These results are in line with theories that emphasize the importance of teacher involvement in curriculum development to improve the quality of learning. There are several theories that emphasize the importance of teacher involvement in curriculum development to improve the quality of learning. One of them is constructivist theory, which emphasizes student-centered learning and allows students to build their own knowledge through experience and reflection (Steffe et al., 2012). This theory emphasizes the role of teachers as facilitators and companions in the learning process (Richardson, 2005; Xu, 2019).

Another theory that emphasizes the importance of teacher involvement in curriculum development is the collaborative learning theory. This theory emphasizes the importance of cooperation between teachers and students in achieving learning objectives (Manora et al., 2023). In this theory, teachers act as facilitators and companions in the learning process, while students act as the main actors in learning(Kualitas et al., 2023; Manora et al., 2023).

In addition, problem-based learning theory also emphasizes the importance of teacher involvement in curriculum development. This theory emphasizes problem-centered learning and allows students to solve problems through experience and reflection (Sulaeman, 2015). In this theory, the teacher acts as a facilitator and companion in the learning process (Gao et al., 2022; Salvador et al., 2022).

All these theories emphasize the importance of teacher involvement in curriculum development to improve the quality of learning. In all these theories, teachers act as facilitators and companions in the learning process, while students act as the main actors in learning.

Technology Integration in Learning

The success of teachers in compiling teaching modules and developing interactive digital media based on augmented reality reflects their adaptability to technological developments. The integration of technology is not only an additional aspect, but also as an urgent need in the era of global education transformation.

Teachers who successfully integrate technology in learning reflect a constructivist approach, in which learning is considered as the result of knowledge construction by students (Supardan, 2016). Teaching modules and interactive media give students the opportunity to be actively involved in the construction of their own knowledge (Nurhidayati, 2017).

The success of teachers in adopting educational technologies such as augmented reality in accordance with the concept of ICT in Education (Wibowo,2022). It recognizes

that the use of technology can improve the accessibility, quality, and effectiveness of learning.

Some research suggests that the integration of technology in learning can improve student motivation, engagement, and understanding of concepts (Said et al., 2023). Teachers who are able to utilize augmented reality in teaching modules can enrich students' learning experiences and facilitate a deeper understanding of concepts.

Teachers who successfully develop augmented reality-based interactive digital media and teaching modules demonstrate a good understanding of how to integrate technology (T), pedagogy (P), and content knowledge (CK). They are able to align technology with effective learning content and teaching strategies.

Teaching modules and interactive digital media tend to support active learning and student engagement. This is consistent with research showing that learning that actively engages students can improve information retention and concept understanding (Hayati et al., 2023; Hayati, n.d.; Stit & Giri Bima -Ntb, 2021).

Figure 5. Group Photo after Training Activities

CONCLUSION

This community service has succeeded in achieving the goals that have been set, namely increasing the understanding and skills of UMC Labschool Kindergarten teachers and UMC Daycare teachers related to the PAUD Independent Curriculum and the development of interactive digital media using augmented reality. Teachers not only understand the principles of the curriculum, but are also able to develop a curriculum that reflects the unique characteristics of TK Labschool UMC. In addition, the results show the ability of teachers to compile teaching modules and integrate augmented reality technology in early childhood learning.

There needs to be increased technical support, especially in the implementation of augmented reality technology. Advanced training and practical guidance can help teachers to be more confident and proficient in integrating such technology into daily learning activities. The teacher empowerment process must be continuous as teachers can attend regular workshops, seminars, or discussion forums can be a platform to share experiences, discuss challenges, and identify solutions together. This will maintain teacher enthusiasm and motivation in curriculum development and technology utilization.

Not only that, collaboration with external parties, such as higher education institutions or technology industry practitioners, can provide additional resources and

support. External parties can assist in the provision of technical resources, support the development of teaching modules, and provide new insights into current trends in early childhood education. It is necessary to conduct continuous evaluation and monitoring of curriculum implementation and the use of technology in learning. This evaluation can help identify potential improvements, measure the impact of change, and ensure continued progress.

Given the limited time in this activity, it is advisable to develop supporting materials in the form of guides or manuals for teachers. This material can contain step-by-step instructions on developing a curriculum and using augmented reality technology.

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