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Designing Ergonomic Learning Spaces Based on Kula Babong Local Wisdom at PAUD Restorasi Patisomba

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ABSTRACT

This community service activity is motivated by the importance of the role of learning spaces that support early childhood growth and development, especially in the early childhood education (PAUD) environment. The existence of an ergonomic learning room greatly supports children's physical and cognitive development. This is very important to apply to create a comfortable and effective learning atmosphere. However, in many places, there are still challenges in designing early childhood education spaces that are not only functional but also integrate local cultural values. The ergonomic design concept based on the local wisdom of Kula Babong is a characteristic of the architectural development of educational spaces in certain areas. This mentoring activity was attended by 12 tutors to help early childhood education tutors design a learning space that better supports the physical and psychological aspects of children. In addition, ergonomic learning rooms that accommodate the values of local wisdom and local culture can be a source of inspiration for every child's learning. The implementation of this activity was carried out through a series of design training sessions, case studies, and workshops involving teachers, architecture students, and experts in the field of ergonomics and educational space design. The results of this activity showed that as many as 12 tutors could understand the concept of ergonomic learning rooms and were used to designing ergonomic learning spaces that facilitate children's learning needs.

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INTRODUCTION

The implementation of education at the level of early childhood education requires great attention from various parties, so that the foundation and direction of learning achievement can be realized successfully (Suryani et al., 2024). The legal basis for the implementation of early childhood education refers to government regulations regarding early childhood education standards and guidelines for the development of child-friendly educational facilities and infrastructure (Watini et al., 2025). According to the Regulation of the Minister of National Education of the Republic of Indonesia Number 58 of 2009 concerning Early Childhood Education Standards, facilities and infrastructure in early childhood education must meet several principles: 1) safe, comfortable, bright, and meet the criteria for children's health; 2) according to the child's developmental level; and 3) utilizing the potential and resources that exist in the surrounding environment, including waste or used goods that are still suitable for use (Permendiknas, 2009).

One of the implementations of government regulations in the implementation of early childhood education is to create a conducive learning atmosphere and accommodate the learning needs of students. The availability of facilities and infrastructure in learning is an important factor that determines the learning success of each student (Tiring et al., 2022). Conducive and comfortable learning space conditioning is an important element in the learning success of each student (Farida Payon et al., 2021). In this case, ergonomic principles and the presence of local culture in the design of learning spaces are one of the aspects that must be considered to create a space that is not only safe but also full of meaning (Hardiyanti et al., 2021). Through ergonomic principles, it is hoped that it can provide teachers with a further understanding of the importance of space design that accommodates children's physical, psychological, and cultural aspects in creating an optimal learning environment (Astuti, 2024).

The implementation of education in early childhood education institutions (PAUD) is oriented towards activities that are active and fun for students through games, songs, and environment-based exploration (Hardiyanti et al., 2021). The purpose of implementing early childhood education is solely to support the development and stimulate children's development from an early age age (Tok, 2022). Learning activities in PAUD can be said to be of high quality if the treatment and services provided can accommodate the learning needs of children (Amarul, 2019). One form of service that accommodates children's learning needs is the condition of an attractive, fun learning environment that stimulates children's enthusiasm for learning (Sa'diyah et al., 2024).

PAUD Restorasi Patisomba, one of the early childhood education institutions in Sikka Regency, East Nusa Tenggara(Indonesia, 2025), was established in 2018, initiated by Remigius Nong, as a form of solidarity with the learning needs of the children of farmers, fishermen, and motorcycle taxi drivers (Aquinaldo, 2020). This school is located in Wuring, West Alok District, Sikka Regency, NTT Province, about 12.8 kilometers from the city of Maumere (Google Maps, 2025). Most of the children who attend school at this institution come from farming, fishing, and motorcycle taxi driver families (Boer et al., 2025). Some of the problems faced by this school are the quality of teaching staff or tutors who are still high school graduates, inadequate learning support facilities, unergonomic classroom design, and limited, inadequate internet access. The small number of students because most of them come from poor families, which also hinders the financing and operations of this institution. As a result, some tutors recruited by the manager chose to become volunteers, because the focus of this institution's services is to help the children of the lower class. This condition is supported by monotonous learning activities, less interest in children's learning, a lack of creativity of tutors and PAUD managers in designing

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attractive learning spaces, and a lack of insight and skills of tutors in organizing learning activities in the classroom.

For this reason, the team chose this PAUD institution as the target partner of the activity by paying attention to the social aspects of the community, where most of the students come from the lower middle class of society, so that assistance to teachers or tutors can contribute to improving the quality of learning and mastering the development of information technology today(Norahmi et al., 2024). In terms of accessibility, this school is easy to reach and has the opportunity to become an advanced school with development opportunities and service approaches launched by the government.

As for overcoming the problems faced by PAUD Restorasi Patisomba partners, the proposing team offers several activity solutions, namely (a) Socialization of ergonomic learning space concepts and designs and prioritizing local wisdom values such as Kula Babong and so on; (b) Training on the design of ergonomic learning space concepts and designs; and (c) Assistance and implementation of ergonomic learning room design.

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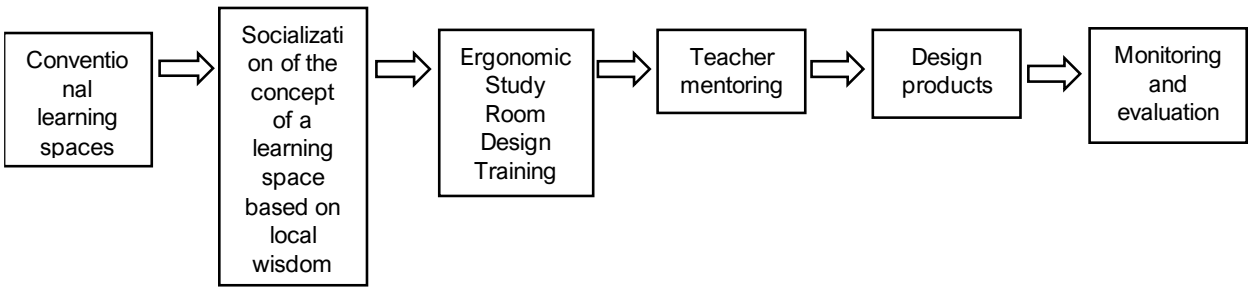

FIGURE 1. Troubleshooting solution framework

The main purpose of this activity is to provide training and assistance to PAUD teachers in designing an ergonomic learning space based on local wisdom in Kula Babong, so as to create a space that not only meets ergonomic standards but also reflects local identity and culture. The implementation of this activity was carried out through a series of design training sessions, case studies, and workshops involving teachers, architecture students, and experts in the field of ergonomics and educational space design. It is hoped that this activity can encourage PAUD teachers to be more creative and sensitive to the importance of space design that can facilitate children's learning needs, while maintaining a rich local cultural identity.

METHOD

The method of implementing this service activity describes the solutions offered to overcome the problems faced by partners, as presented in Table 2.

TABLE 1. Production Key Indicators

Problems	Activities	Period
Availability of inadequate learning support facilities and infrastructure (unergonomic learning rooms)	Providing socialization to tutors and PAUD managers about the concept and design of ergonomic learning spaces for children	2 Days

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Problems	Activities	Period
The educational qualifications of the tutors are still low (still high school graduates) so that knowledge insight is still lacking and mastery of teaching methods is still very conventional.	Provide training and assistance to tutors and managers related to school-based learning management to strengthen tutor capacity and opportunities for the development of teaching or learning methods	1 Day
Digital mastery and literacy are still minimal due to limited internet access and communication, so that teachers' innovation and creativity are hampered	Providing training and assistance to tutors and PAUD managers related to digital literacy and opportunities to innovate or be creative in learning activities	1 Day
The contextualization of learning has not accommodated the values of local wisdom	Providing training and assistance to tutors and PAUD managers on the importance of integrating local wisdom values in learning	1 Day

Socialization

Socialization was given to tutors and PAUD managers about the concept and design of ergonomic learning spaces for children. The purpose of this activity is to give tutors and managers an overview of the design of an ergonomic learning space that can stimulate an active and fun learning process. This activity lasted for 1 day.

Training

Training and mentoring activities for tutors and managers with the aim of providing an overview and understanding of school-based learning management for strengthening tutor capacity and opportunities for the development of teaching or learning methods. In addition, training and mentoring activities related to digital literacy and opportunities to innovate or create in learning activities, as well as the importance of integrating local wisdom values in learning. The training activities will last for 2 days.

Application of Technology

The technology applied in this service activity is the mastery of web-based ergonomic design models and classroom design based on environmental architecture. Tutors and managers are trained and accompanied to master the design of a learning room that is flexible, creative, and fun for a children's learning atmosphere. The concept of graphic design is one way to design a cool room, arouse motivation to learn, and provide comfort for children and tutors.

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Mentoring and Evaluation

Mentoring activities were carried out by the implementation team of the service to tutors and managers of partner schools for 3 meetings so that the process of adaptation and internalization of the material could be digested by the training and mentoring participants. The team also assists teachers in introducing graphic design applications, environment-based ergonomic design, and learning space concepts that accommodate local wisdom values. The implementation team will also monitor and evaluate the process of service activities that run from start to finish. Monitoring is carried out by the team to monitor the participation of participants so that the impact of activities can be implemented properly in schools.

Program Implementation and Sustainability Evaluation

The evaluation program for the implementation of the program that has been implemented is obtained through a questionnaire that must be filled out by partners. The questionnaire was filled out after the service program was implemented. This aims to find out to what extent the success of the program is achieved. In addition to filling out questionnaires, it is also recorded and evaluated the obstacles faced by partners during the program implementation activities. This is to identify and find out the obstacles and solutions that are carried out to solve them.

The number of participants involved in this activity is 12 people, including PAUD tutors, which can be detailed as follows.

TABLE 2. Participants

No.	Initials of Tutors	Role	Assignments
1	MVR	Tutor	Participating in socialization, training, and mentoring activities from the activity team
2	MTB	Manager	Participating in socialization activities, training, mentoring from the activity team, and facilitating tutors
3	AKA	Tutor	Participating in socialization, training, and mentoring activities from the activity team
4	ET	Tutor	Participating in socialization, training, and mentoring activities from the activity team
5	LS	Tutor	Participating in socialization, training, and mentoring activities from the activity team
6	MWL	Tutor	Participating in socialization, training, and mentoring activities from the activity team
7	MKN	Tutor	Participating in socialization, training, and mentoring activities from the activity team

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No.	Initials of Tutors	Role	Assignments
8	EAD	Tutor	Participating in socialization, training, and mentoring activities from the activity team
9	KD	Tutor	Participating in socialization, training, and mentoring activities from the activity team
10	IT	Manager	Participating in socialization activities, training, mentoring from the activity team, and facilitating tutors
11	RN	Manager	Participating in socialization activities, training, mentoring from the activity team, and facilitating tutors
12	FBD	Tutor	Participating in socialization, training, and mentoring activities from the activity team

Meanwhile, to measure the level of understanding of the tutors of the socialization material provided and the opportunities to improve their abilities in the future, the team provided a questionnaire containing several questions and statements as presented in Table 3.

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TABLE 3. Questionnaire Guide

Directions :

Answer the following questions by giving a check mark (v) according to your experience and understanding. Give your statement too!

No.	Questions	Answers				
		Infrequently	***Less***	***Often***	***Occasional***	***Never***
1	Have you ever developed or modified the design of children's learning rooms that support their learning comfort and safety?					
2	Have you ever used various learning approaches in the classroom that accommodate students' freedoms?					
3	Have teachers ever guided children to learn more intensively from the surrounding environment?					
4	Do you always use various local wisdom values as teaching materials in the classroom?					
		Very helpful	***Less helpful***	***Quite helpful***	***Not helpful***	***Not know***
5	What are the benefits that teachers receive in this activity?					
6	Give your statement! What is your message and impression after participating in this socialization and training activity?					

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RESULT

The implementation of the stages of the community service program activities began with an initial survey of the location of the activity. The purpose of this survey activity is to map the main problems experienced by partner schools, take a close look at learning activities in schools, and make a list of problems that are the target of service activities. In detail, the types of problems, solutions, and solution targets carried out in the service activities are as follows.

TABLE 4. Problems, solutions, and solution targets

Problems	Solution	Completion Targets
Availability of inadequate learning support facilities and infrastructure (unergonomic learning rooms)	Providing socialization to tutors and PAUD managers about the concept and design of ergonomic learning spaces for children	All 12 tutors and PAUD managers (100%) were able to understand the material on the concept and design of an ergonomic learning space for children.
The educational qualifications of the tutors (still high school graduates) are still low, so the insight of knowledge is still lacking and the mastery of teaching methods is still very conventional.	Provide training and assistance to tutors and managers related to school-based learning management to strengthen tutor capacity and opportunities for the development of teaching or learning methods	All 12 tutors and PAUD managers (100%) can plan the development of school-based learning management to strengthen the capacity of tutors and design teaching methods that are interesting and able to be implemented for children.
Digital mastery and literacy are still minimal due to limited internet access and communication, so that teachers' innovation and creativity are hampered	Providing training and assistance to tutors and PAUD managers related to digital literacy and opportunities to innovate or be creative in learning activities	All 12 tutors and PAUD managers (100%) can innovate and creatively design teaching materials using various digital devices in learning.
The contextualization of learning has not accommodated the values of local wisdom	Providing training and assistance to tutors and PAUD managers on the importance of integrating local wisdom values in learning	All 12 tutors and PAUD managers (100%) can apply various local wisdom values of the Sikka community in learning.

Meanwhile, the implementation stage is divided into several stages, namely socialization activities, training, practice and mentoring, as well as monitoring and evaluation.

Stages of Implementation

Socialization

On the first day, the Community Service Team (PkM), consisting of 5 members (3 lecturers and 2 students) departed for the location of the activity, namely PAUD Restorasi Patisomba. After checking all the tools and materials for the implementation of the activity, the team of lecturers and students departed in the morning by traveling approximately 24 minutes from Nusa Nipa University. After arriving at the destination and being welcomed by the principal and teachers, the team then prepared an activity room, assisted by the two students and the school's administrative staff.

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On the first day's material, the team presented socialization on the Role of Visual Communication in Early Childhood Learning Room Design (Forming an Optimal Learning Environment Through Messages). This material was presented by the team member, namely Dr. Jonas K.G.D. Gobang, S.Fil., M.A., explained about the presence of a PAUD child as the nation's hope, so that his personality and learning environment need to be carefully prepared, through PAUD education services that are comfortable, efficient, and accommodate the freedom of his way of learning. All the socialization participants seemed enthusiastic about the socialization material on the first day and asked the team many questions.

FIGURE 2. First day activities (Thursday, July 17, 2025)

Training

The second day's material was presented by a team leader, Yohanes Pieter Pedor Parera, ST., M.Ars., about the Concept and Principles of Ergonomic Learning Room Design in Learning Based on Local Wisdom Kula Babong. In this session, it was explained about design principles that can improve the health and achievement of students were explained, focusing on the comfort and efficiency of students, and adaptive design according to the development of students' learning needs.

FIGURE 3. Activities of the second day (Friday, July 18, 2025)

Practice and Mentoring

On the third day, the material was presented by a team member, Alexius Boer, ST., MT., with the topic of Ergonomic Learning Room Design Practice Based on Local Wisdom 'Kula Babong'. In this material, it is explained practically about the practice of designing a simple space that supports the activeness of PAUD students. In this session, the team, in groups, directly accompanied the teachers to start learning to design the concept of an ergonomic learning space and prioritize the principle of freedom of learning based on elements of local culture. As for this classroom design training, the team used the SketchUp application, which is an intuitive 3D modeling application that allows someone to create and edit 2D and 3D models.

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FIGURE 4. Third day activities (Saturday, July 19, 2025)

Monitoring and Evaluation

Monitoring and evaluation were carried out from July 21 to July 22, 2025, to measure teachers' understanding as participants in activities and monitor teachers' activities in designing simple and ergonomic learning spaces in accordance with the learning needs of PAUD students. The results of the team's mentoring, monitoring, and evaluation of teachers' understanding at PAUD Restorasi Patisomba can be described in the following table.

TABLE 5. Monitoring and evaluation of teachers' understanding

No.	Indicators	Responds	Percentage (%)
1	Teachers develop or modify children's learning room designs that support their learning comfort and safety	8	83,33
2	Teachers use a variety of learning approaches in the classroom that accommodate students' freedoms	12	100
3	Teachers receive benefits from these activities and implement them into classroom learning	12	100
4	Teachers guide children to learn more intensively from the surrounding environment	12	100
5	Teachers always use various local wisdom values as teaching materials in the classroom	12	100
6	The teacher hopes that there will be further assistance related to the concept and practice of ergonomic classroom design	12	100

In Table 2 above, the questionnaire distributed by the activity team was filled out by all participants (teachers) who participated in the service activity. The results of the survey from the questionnaire distributed were that all teachers (8 people or 83.33%) often develop or modify children's learning room designs that support their learning comfort and safety; 12 teachers (100%) like to use various learning approaches in the classroom that accommodate students' freedom; 12 teachers (100%) benefited from this activity and implemented it into classroom learning; 12 teachers (100%) guide children to learn more intensively from the surrounding environment; 12 teachers (100%) always use various local

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wisdom values as teaching materials in the classroom; and 12 teachers (100%) hope that there will be further assistance related to the concept and practice of ergonomic classroom design. Based on these results, it can be concluded that this activity has a positive impact on teachers' understanding and their efforts to design spaces ergonomically and support children's learning needs.

FIGURE 5. Atmosphere of assistance to PAUD teachers Restorasi Patisomba

DISCUSSION

This community service activity is carried out in the form of socialization, training and mentoring to teachers so that some of the positive impacts received include: (a) All teachers have understood the design and concept of ergonomic classrooms; (b) All teachers are familiar with the use of internet facilities as a medium of information, communication and learning of current scientific trends, including the development of learning spaces that accommodate the learning needs of students; and (c) All teachers master the various values of local wisdom in Sikka Regency that are available in the community so that it is easy to integrate them into school activities.

Based on the positive impact obtained above, it can be seen that all teachers are very open to various technological developments in learning, especially using digital platforms as a means of learning. By developing the concept of an ergonomic learning room based on local wisdom in Sikka Regency, teachers at PAUD Restorasi Patisomba can innovatively develop their own abilities and be creative in managing learning activities in the classroom later.

The overview of technology and innovations implemented in this activity is the production of an ergonomic concept and design of early childhood learning spaces, and raises the value of the local wisdom of Kula Babong in accordance with the learning needs of children. An ergonomic learning room can stimulate children's enthusiasm for learning, arouse students' curiosity and exploration, and create harmony in teamwork (Yanuarsari, 2025). The existence of a flexible and open learning space, designed with the peculiarities of local culture, can encourage children's innovation and creativity to learn and interact well in the classroom. In line with the concept and design of ergonomic learning spaces supported by elements of local wisdom of Kula Babong, its implementation in schools can also accommodate these values in comfortable and inspiring learning room activities for children and teachers. Kula Babong's values, such as cooperation (Eni & Mansur, 2024), consensus deliberation (Nuwa & Nasa, 2022), and solidarity, can be realized through ergonomic space design. The principles and values of Kula Babong in learning also refer to the existence of mutually conducive communication between teachers and students (Gobang, 2024), so that it focuses on achieving the goal of active and fun learning activities (Novita et al., 2025).

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FIGURE 6. Early childhood learning room model with ergonomic design: floor plan and interior of the room. The design uses the SketchUp app, an intuitive 3D modeling app

In line with the principles and objectives of implementing service activities that encourage the achievement of teachers' understanding and improvement of their skills in designing selfish learning spaces, several studies highlight the importance of increasing teachers' capacity(Suparman et al., 2025) and competence in mastering information technology and its elaboration for the benefit of learning in the classroom (Dewi et al., 2024). Research by Mahira (2018) found that the factors that play a role in supporting children's development here are the quality of teachers, learning activity programs, and physical environment. The physical environment is the child's learning room, along with teaching and learning facilities (AdistiSafrilia & Razqyan Mas Bimatyugra Jati, 2025). Good learning room facilities can play an important role as a support for teaching and learning activities, so that teaching and learning activities can run optimally (Chasanah et al., 2024). In addition, a good learning space for early childhood learning accommodates children's learning needs with the principle of learning while playing or playing while learning (Septyaningrum et al., 2023).

The design of a learning room with the principle of ergonomics based on RULA analysis on CATIA software can create a design for the creation of an effective learning space for students. For learning spaces that are limited in size and dimensions, the principle of ergonomics can be applied by considering the aspects of flexibility, effectiveness of learning activities, and space for ideas for students (Widodo et al., 2016). The principles and design of ergonomics are also found in the concept of ergonomic character chairs for elementary school-age children, as researched by Rofian et al. (2024), which are the products of research and service development results with innovative goals that take into account the comfort and safety of children.

The scope of ergonomics in the arrangement of learning spaces is based on several types, namely physical ergonomics, cognitive ergonomics, and organizational ergonomics (Hidayati, 2018). Physical ergonomics is concerned with the scope of anatomy, anthropometry, musculoskeletal systems,

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kinesiology, biomechanics, metabolic systems, and physiology related to physical work (Abdul Latip et al., 2025). Cognitive ergonomics deals with the scope of psychology, sensing, the nervous system, hormones, and cognition, including perception, memory, thinking, and motor responses related to mental work (Araújo & Soares, 2024). While organizational ergonomics is a scope related to organizational structure, organizational policies, organizational processes, and organizational culture related to work between humans in socio-technical systems.

One of the applications of learning by prioritizing ergonomic concepts and designs can imitate Beyond Center and Circle Times (BCCT). BCCT is a teaching method for early childhood developed based on theoretical studies and empirical experience (Robecca et al., 2020). This method is a development of the Montessori, High Scope, and Pegglo Emilia methods. This method was developed by the Creative Centre for Childhood Research and Training (CCCRT), Florida, USA. Three BCCT principles must be considered, all of which are closely related to ergonomic principles in the scope of learning (Pende, 2024), namely: a) The entire learning process is based on theory and empirical experience(Riska et al., 2024), b) Each learning process must be aimed at stimulating all aspects of children's intelligence (plural intelligence) through planned and directed play and the support of educators (teachers/cadres/pamong) in the form of 4 types of footholds, c) Placing the arrangement of the play environment as a starting foothold that stimulates children to be active, creative, and continue to think by exploring their own experiences.

In the end, the concept and design of ergonomic learning spaces can be combined with elements of local wisdom that grow in community life (Yufrinalis & Hero, 2023). The Kula Babong ergonomic learning room model, based on local wisdom, is one of the efforts to juxtapose the nuances of local wisdom that need to be known, known, lived, and inherited by generations in a sustainable manner (Regi et al., 2025). The arrangement of a dynamic and flexible learning space and carrying an atmosphere of cooperation or consensus deliberation, as contained in the meaning of Kula Babong values, can create exploratory, critical, adaptive, and continuous learning activities to achieve good learning outcomes and quality.

CONCLUSION

The assistance activities of PAUD teachers in designing ergonomic learning spaces based on the local wisdom of Kula Babong show that the physical environment has an important role in supporting the quality of early childhood learning. The space is arranged by taking into account the principles of ergonomics, natural lighting, air circulation, and the use of local materials, able to create a more comfortable and healthy learning atmosphere. The integration of local wisdom not only strengthens cultural identity but also provides a contextual learning experience, close to children's daily lives, while encouraging them to love their culture and environment from an early age.

As a follow-up, it is recommended that PAUD teachers continue to develop skills in designing and arranging learning spaces adaptively according to the needs of children and the times. The presenting team plans to develop similar activities in other PAUD schools using various approaches that raise various values of local wisdom. Collaboration between educators, architects, and education policy makers needs to be strengthened in order to create ergonomic, child-friendly, and sustainable learning space standards. In addition, there needs to be support in the form of ongoing training, the provision of practical guidance, and the facilitation of the safe and affordable use of local materials. Thus, the design of early childhood learning spaces not only supports children's development holistically but also contributes to environmental architectural practices rooted in local wisdom.

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