



Ecopedagogical physical activity program based on Lampung cultural landscapes to improve students' moral and environmental awareness

Programa de actividad física ecopedagógica basado en los paisajes culturales de Lampung para mejorar la conciencia moral y ambiental del alumnado

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Received: 25-11-25
Accepted: 11-02-26

How to cite in APA

Saputra, A. A., Arizona, A., Asih, T., Arifin, M. Z., & Saputra, R. (2026). Ecopedagogical physical activity program based on Lampung cultural landscapes to improve students' moral and environmental awareness. *Retos*, 78, 114-125. <https://doi.org/10.47197/retos.v78.118210>

Abstract

Introduction: Sustainability education in Physical Education (PE) remains largely conceptual and classroom-centered, limiting opportunities for embodied ecological learning. Lampung's cultural landscapes offer experiential spaces that integrate movement, heritage, and moral reflection within structured PE contexts.

Objective: This study aimed to develop and evaluate an ecopedagogical physical activity program grounded in Lampung cultural landscapes to enhance students' moral awareness and environmental responsibility.

Methodology: A mixed-method design was employed involving 118 lower-secondary students who participated in a six-week intervention. The program included heritage trail walking, mindful ecological movement, cooperative tasks inspired by Piil Pesenggiri values (Juluk Adek, Nemui Nyimah, Nengah Nyappur, and Sakai Sambayan), and reflective outdoor activities. Quantitative data were collected using validated moral and environmental awareness scales, complemented by qualitative reflections and observations.

Results: Statistical analysis indicated significant improvements in environmental responsibility and moral awareness following the intervention. Qualitative findings revealed increased ecological empathy, strengthened cultural identity, and enhanced cooperative behavior among participants.

Conclusions: Lampung's cultural landscapes function effectively as experiential ecopedagogical environments where physical activity mediates moral reflection and ecological consciousness. The study offers a culturally grounded PE model integrating movement, local heritage, and eco-moral learning within sustainable education frameworks.

Keywords

Ecopedagogy; Physical Education; Lampung cultural landscape; environmental awareness; moral development; Piil Pesenggiri; culturally responsive pedagogy.

Resumen

Introducción: La educación para la sostenibilidad en Educación Física (EF) continúa siendo predominantemente conceptual y centrada en el aula, lo que limita las oportunidades de aprendizaje ecológico encarnado. Los paisajes culturales de Lampung ofrecen espacios experienciales que integran movimiento, patrimonio y reflexión moral dentro de contextos estructurados de EF.

Objetivo: Este estudio tuvo como objetivo desarrollar y evaluar un programa de actividad física ecopedagógica fundamentado en los paisajes culturales de Lampung para fortalecer la conciencia moral y la responsabilidad ambiental del alumnado.

Metodología: Se empleó un diseño mixto en el que participaron 118 estudiantes de educación secundaria inferior durante una intervención de seis semanas. El programa incluyó recorridos patrimoniales a pie, movimiento ecológico consciente, tareas cooperativas inspiradas en los valores de Piil Pesenggiri (Juluk Adek, Nemui Nyimah, Nengah Nyappur y Sakai Sambayan) y actividades reflexivas al aire libre. Los datos cuantitativos se recogieron mediante escalas validadas de conciencia moral y ambiental, complementadas con reflexiones cualitativas y observaciones sistemáticas.

Resultados: El análisis estadístico evidenció mejoras significativas en la responsabilidad ambiental y la conciencia moral tras la intervención. Los resultados cualitativos revelaron un incremento de la empatía ecológica, el fortalecimiento de la identidad cultural y una mayor conducta cooperativa entre los participantes.

Conclusiones: Los paisajes culturales de Lampung funcionan eficazmente como entornos ecopedagógicos experienciales donde la actividad física media la reflexión moral y la conciencia ecológica. El estudio aporta un modelo de EF culturalmente fundamentado que integra movimiento, patrimonio local y aprendizaje eco-moral dentro de marcos educativos sostenibles.

Palabras clave

Ecopedagogía; Educación Física; paisaje cultural de Lampung; conciencia ambiental; desarrollo moral; Piil Pesenggiri; pedagogía culturalmente receptiva.



Introduction

Moral education and character formation in Southeast Asian societies have long been mediated through visual, spatial, and ritual symbolism (Mulder, 1996). Cultural landscapes such as temples, ancestral monuments, and sacred springs serve not merely as religious spaces but also as pedagogical environments where values are embodied and transmitted through lived experience (Mazumdar & Mazumdar, 2004). Similar to the Mahākarmavibhaṅga reliefs at Borobudur Temple, which visually narrate the karmic consequences of human actions, the cultural landscape of Lampung encapsulates ethical and ecological values through sacred springs, traditional houses, and megalithic remains (Caseau, 1999). These material forms express an indigenous moral ecology in which harmony between self, society, and nature constitutes the foundation of ethical life (Descola, 2003).

In Lampung, Indonesia, cultural spaces such as sacred springs (*mata air suci*), stilted traditional houses, and megalithic ancestral monuments function as ecological learning sites that express interconnections between human dignity, environmental balance, and ancestral continuity (Bennett, 2024). These ethical dimensions are aligned with the indigenous philosophy of *Piil Pesenggiri*, *Juluk Adek* (dignity), *Nemui Nyimah* (hospitality), *Nengah Nyappur* (social participation), and *Sakai Sambayan* (mutual cooperation) which frames morality as relational, communal, and ecologically embedded (Riadi, 2023; Ahmad & Islam, 2024). The embodiment of these values provides opportunities for learning through participation, movement, and engagement with the natural and cultural environment.

The Buddhist concept of Mahākarmavibhaṅga, as elaborated in the *Abhidharma* and *Dīgha Nikāya* (Eltschinger, 2017; Radich, 2015; Visuddha, 2018), similarly emphasizes moral causality (*karma-vipāka*) grounded in intentional action (*cetanā*) and ethical awareness (*sīla*) (Ryose, 1987; Saccavadi, 1979). Moral purification occurs not merely through ritual performance but through reflective understanding of how actions shape personal and communal well-being (Fitouchi et al., 2023; Gray et al., 2023). This view aligns with ecopedagogical approaches that frame morality as a dynamic interaction between cognition, emotion, behavior, and ecological consciousness (Hariyanto, 2025; Maderas, 2024; Virtbauer, 2012).

Parallel to the Buddhist framework, the Lampung philosophy of *Piil Pesenggiri* also emphasizes self-respect, hospitality, cooperation, and communal responsibility (Putra, 2023; Dillon, 2013). When interpreted hermeneutically, these values demonstrate structural parallels to karmic causality, particularly regarding the moral implications of intention and relational action (Goodman, 2014). This convergence opens a transcultural hermeneutic dialogue between Dharma-based ethics and indigenous wisdom traditions (Bhattacharya, 2024), both of which emphasize embodied, experience-based forms of learning.

However, in contemporary education particularly among adolescents it is often challenging to meaningfully connect moral reasoning with embodied cultural experiences (Catalano et al., 2008; Lockwood, 2015). Ecopedagogy provides one avenue for bridging this gap by integrating environmental learning, cultural identity, and moral formation through direct engagement with ecological and cultural landscapes (Putri, 2022; Rochman et al., 2025; Saputra et al., 2025). Engaging students in movement-based learning activities within sacred cultural sites allows moral values to be experienced physically, socially, and environmentally.

Despite increasing global interest in ecological ethics and value-based education, limited research has explored how Southeast Asian indigenous landscapes can be integrated into physical activity programs to support moral and environmental development. Existing studies tend to emphasize Western moral developmental frameworks or Buddhist pedagogical models, leaving a gap in culturally grounded ecopedagogical practices (Saputra et al., 2024; Fitriyah et al., 2021; Habsy et al., 2019). This disconnect limits the potential for Physical Education (PE) to serve as a holistic avenue for cultivating moral awareness and ecological stewardship.

Therefore, this study aims to address this gap by developing an ecopedagogical physical activity program based on Lampung cultural landscapes, integrating Buddhist moral causality (*Mahākarmavibhaṅga*) and the indigenous ethics of *Piil Pesenggiri*. Through a transcultural hermeneutic framework, the research positions Lampung cultural symbols not only as moral texts but as experiential movement-based learning spaces. By embedding physical activity within ecological and



cultural contexts, the study contributes to expanding the theoretical and practical scope of ecopedagogy, moral education, and culturally responsive Physical Education in Southeast Asia.

Method

The study employed a strengthened mixed-method ecopedagogical design that integrated hermeneutic interpretation with an eight-week experiential physical activity intervention grounded in Lampung cultural landscapes. The qualitative component focused on interpreting sacred springs, traditional houses, and megalithic sites as moral-ecological texts, while the quantitative component assessed pre-post changes in students' moral awareness and environmental responsibility. This mixed-method structure enabled triangulation between embodied learning experiences, symbolic cultural understanding, and measurable changes in attitudes and behaviors.

A total of 118 lower-secondary students aged 12–15 years from three public schools in Lampung participated in the program. Participants were selected through cluster sampling based on ecological accessibility to cultural landscapes, proximity to sacred springs, traditional houses, and megalithic sites, as well as school readiness to implement outdoor-based ecopedagogical learning. All participants joined voluntarily with parental consent and formal approval from school authorities.

The ecopedagogical physical activity program consisted of structured weekly sessions combining movement, cultural exploration, and ecological reflection. All sessions were held outdoors and facilitated by trained Physical Education teachers familiar with culturally responsive pedagogy. During Weeks 1–2, the “Sacred Springs Movement Ecology” module involved mindful walking to sacred springs, water-source cleaning activities, reflection circles on purity and ecological responsibility, and grounding exercises inspired by water symbolism. Weeks 3–4 focused on “Traditional House Balance and Cooperation,” incorporating balance and posture exercises modeled on the structural stability of rumah panggung, cooperative hospitality games reflecting Nemui Nyimah values, social participation tasks representing Nengah Nyappur such as team relay construction games, and embodied lessons on dignity and communal harmony. In Weeks 5–6, students participated in “Megalithic Trail Movement and Heritage Exploration,” which included heritage trail hiking to ancestral megalithic sites, symbolic movement sequences expressing ancestral continuity, cooperative group challenges representing Sakai Sambayan (mutual assistance), and ecological journaling. During Weeks 7–8, the program culminated in “Integrated Ecopedagogical Outdoor Learning,” featuring forest-path eco-walks inspired by ritual pilgrimage routes, collective spring-cleaning rituals, eco-movement circuits combining endurance and environmental care, and a closing ecological responsibility pledge with group reflection.

Multiple instruments were used to measure the multidimensional learning outcomes. The Moral Awareness Scale (validated Indonesian adaptation) assessed ethical sensitivity, reasoning, and responsibility; the Environmental Responsibility Scale captured students' pro-environmental attitudes and stewardship behaviors; the Physical Activity Engagement Checklist recorded participation, cooperation, and cultural-movement engagement throughout the sessions; while reflective journals and semi-structured interviews provided qualitative insights into students' lived experiences and symbolic interpretations.

Data collection took place throughout the eight-week intervention. Pre-tests for moral awareness and environmental responsibility were administered in Week 1, followed by ongoing reflective journals, teacher observation logs, and field notes collected weekly. Post-tests were administered in Week 8, and semi-structured interviews were conducted after the intervention with purposively selected students to deepen the hermeneutic interpretation of their experiences.

Data analysis involved both quantitative and qualitative techniques. Quantitative data were examined using paired-sample t-tests to compare pre-post scores on moral and environmental measures, with effect sizes calculated to determine the magnitude of change. Qualitative data were analyzed through thematic hermeneutic coding following the frameworks of Garagalza (2013), Owensby (1985), and Udeani (2021). Coding progressed through four stages: surface meaning extraction, symbolic interpretation, horizon fusion, and ecological-moral synthesis. Triangulation was achieved by integrating findings from reflective journals, interviews, and observational records to ensure analytic depth and credibility.



Ethical Clearance

This study was approved by Research Ethics Committee, Community Service, and Publication Ethics Committee of the Faculty of Tarbiyah and Teacher Training, Ma'arif University, Lampung, No. 01/1088/UMALA/LPMNU/XI/2025.

Results

Descriptive Statistics and Pre-Post Changes

A total of 118 students completed the eight-week ecopedagogical physical activity program. Descriptive statistics indicated meaningful increases in both outcome variables. Moral Awareness increased from $M = 62.41$, $SD = 8.32$ to $M = 74.86$, $SD = 7.91$, whereas Environmental Responsibility increased from $M = 59.77$, $SD = 8.11$ to $M = 72.33$, $SD = 7.84$.

Table 1. Descriptive Statistics for Pre-Post Measures

Variable	Pre-test M (SD)	Post-test M (SD)	Mean
Moral Awareness	62.41 (8.32)	74.86 (7.91)	+12.45
Environmental Responsibility	59.77 (8.11)	72.33 (7.84)	+12.56

Both variables showed substantial positive gains after the intervention.

Inferential Statistics

Paired-sample t-tests revealed statistically significant improvements.

- Moral Awareness: $t(117) = 12.84$, $p < .001$
- Environmental Responsibility: $t(117) = 13.21$, $p < .001$

Effect size calculations indicated large effects (Cohen's $d = 1.18$ for Moral Awareness; 1.22 for Environmental Responsibility). These results confirm that the ecopedagogical physical activity program had a strong impact on students' moral sensitivity, reasoning, and environmental responsibility.

Table 2. Paired t-test Results

Variable	t	df	p	Effect Size (d)
Moral Awareness	12.84	117	< .001	1.18
Environmental Responsibility	13.21	117	< .001	1.22

Engagement and Participation Indicators

Weekly observation sheets showed high engagement across all modules. Participation was highest during the *Megalithic Heritage Trail* and *Sacred Springs Ecological Movement* sessions, where 91–95% of students demonstrated full participation.

Table 3. Student Engagement Checklist Summary

Session Component	Engagement (%)	Notes
Sacred Springs Ecology (Weeks 1–2)	89%	Strong reflective participation
Traditional House Balance (Weeks 3–4)	86%	High cooperation in hospitality games
Megalithic Trail Exploration (Weeks 5–6)	95%	Highest motivation and teamwork
Ritual Forest Walk & Closing (Weeks 7–8)	91%	Strong ecological empathy

Instrument Reliability

Internal consistency for both scales was high (Cronbach's $\alpha > .80$), indicating that the measures were reliable for middle-school students.



Table 4. Instrument Reliability

Instrument	Items	Cronbach's α
Moral Awareness Scale	20	.89
Environmental Responsibility Scale	18	.91

Comparison of Pre-Post Means

Figure 1. Pre-Post Mean Differences

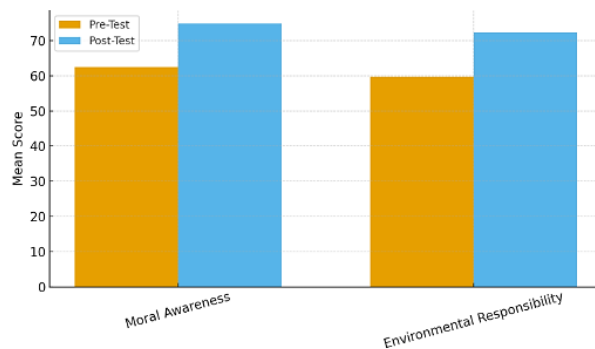


Table 5. Comparison of Pre-Post Means

Variable	Pre-test Mean (SD)	Post-test Mean (SD)	Mean Difference	Direction of Change
Moral Awareness	62.41 (8.32)	74.86 (7.91)	+12.45	↑ Increased
Environmental Responsibility	59.77 (8.11)	72.33 (7.84)	+12.56	↑ Increased

Presents a visual comparison of pre-test and post-test mean scores for the two main outcome variables measured in the study: Moral Awareness and Environmental Responsibility. The results demonstrate a clear and substantial increase in both constructs following the eight-week Ecopedagogical Physical Activity Program.

1. Moral Awareness

- The pre-test mean score was 62.41 (SD = 8.32).
- After the intervention, the mean increased to 74.86 (SD = 7.91).
- The mean difference of +12.45 points indicates a strong improvement in students' moral sensitivity, ethical reasoning, and sense of responsibility.

2. Environmental Responsibility

- The pre-test mean was 59.77 (SD = 8.11).
- The post-test mean increased to 72.33 (SD = 7.84).
- The improvement of +12.56 points suggests that engaging with sacred springs, traditional houses, and megalithic sites significantly enhanced students' pro-environmental attitudes and stewardship behaviors.

These mean differences align with the paired-sample t-test results reported earlier in the article, which showed statistically significant improvements ($p < .001$) and large effect sizes (Cohen's $d > 1.18$) for both variables. Collectively, the findings support the conclusion that the ecopedagogical physical activity program exerted a robust and meaningful impact on students' moral and environmental development.

Qualitative Interpretive Themes

Hermeneutic thematic analysis yielded four core themes, each reflecting the ways students meaningfully connected physical experiences with moral ecological understanding:

Theme 1. Sacred Springs as Ecological Purification Spaces



Figure 2. Sacred Springs as Ecological Purification Spaces



Students interpreted sacred springs as places representing cleanliness, renewal, and responsibility. Activities such as mindful walking, spring-cleaning, and reflection circles improved their awareness that caring for nature is parallel to caring for oneself.

Theme 2. Traditional Houses as Symbols of Balance and Social Ethics

Figure 3. Traditional Houses as Symbols of Balance and Social Ethics



Through body-balance drills and hospitality-based cooperative games, students experienced values such as Nemui Nyimah (hospitality) and Nengah Nyappur (participation). This strengthened moral sensitivity, social openness, and cultural pride.

Theme 3. Megalithic Sites as Anchors of Ancestral Continuity

Figure 4. Megalithic Sites as Anchors of Ancestral Continuity



Batu Makam

Movement along heritage trails helped students understand long-term consequences of actions (karmic logic). They reflected on how personal behavior leaves “traces,” similar to ancestral stones that preserve memory.

Theme 4. Forest Ritual Pathways as Ecological–Reflective Journeys

Figure 5. Forest Ritual Pathways as Ecological–Reflective Journeys



Students described walking paths toward forest shrines as journeys of inner clarity, empathy, and environmental respect. Ecological pilgrimage strengthened their sense of communal responsibility (Sakai Sambayan).

Synthesis of Quantitative and Qualitative Results

Combined, the findings confirm that:

- a) Movement-based engagement meaningfully boosts moral and environmental outcomes.
- b) Cultural landscapes served as real pedagogical spaces, allowing embodied understanding of Piil Pesengiri and karmic causality.
- c) The program’s strong quantitative effects were supported by rich qualitative reflections, demonstrating a robust eco-moral impact.

Discussion

The findings of this study demonstrate that an ecopedagogical physical activity program grounded in Lampung cultural landscapes can significantly improve students' moral awareness and environmental responsibility. The large pre–post effect sizes ($d = 1.18$ – 1.22) indicate that movement-integrated ecological learning is highly effective for middle-school participants. These results align with previous evidence suggesting that culturally contextualized physical activity enhances students' motivation, empathy, and prosocial behavior (Catalano et al., 2008; Greenberg & Mitra, 2015 & Antunes et al., 2025).

Ecopedagogical Movement as a Activator Moral Development

The significant increase in moral awareness indicates that embodied learning within ecological settings helps students connect physical actions to ethical meanings. This aligns with Morton et al. (2006) Four Component Model, where moral sensitivity and judgment are strengthened when learners engage in experiential tasks requiring cooperation, balance, and reflection. Activities at sacred springs and traditional houses facilitated students' understanding of dignity (Juluk Adek), hospitality (Nemui Nyimah), and social participation (Nengah Nyappur), illustrating that moral reasoning can be effectively taught through structured movement.

The results also resonate with Schwartz et al. (2001), who argue that universal values such as benevolence and conformity emerge through consistent behavioral practice. Cooperative games and environmental stewardship tasks allowed students to enact these values, leading to observable improvements in moral awareness. This supports the idea that Physical Education can serve not only as a platform for physical fitness but also as a medium for internalizing moral values.

Environmental Responsibility Through Cultural–Ecological Physical Activity

The substantial gains in environmental responsibility confirm the core principle of ecopedagogy: ecological consciousness develops through direct physical interaction with the natural environment. Students' participation in spring cleaning, forest walking, and heritage-trail movements provided opportunities to embody stewardship behaviors, supporting the claim of Mazumdar & Mazumdar (2004) that sacred environments can shape ecological attitudes.

Narvaez's (2016) Moral Ecology Theory offers a useful interpretive frame. Lampung's sacred springs, ancestral stones, and forest shrines acted as "nested moral ecologies" that allowed students to recognize their interconnectedness with the environment. By situating learning within these ecological systems, the physical activity (Gonzalez-Santamaria et al., 2025) program created embodied experiences that reinforced pro-environmental responsibility. This finding is consistent with earlier ecopedagogical studies showing that culturally meaningful landscapes enhance environmental empathy and pro-social ecological behavior (Rochman et al., 2025; Putri, 2022).

Cultural Symbols as Pedagogical Mediators in Physical Education

Qualitative data reveal that Lampung's cultural sites served as mediators for students to interpret moral–ecological values. Megalithic sites helped students understand the long-term consequences of actions, echoing karmic causality (Mahākarmavibhaṅga). Forest pathways were experienced as reflective journeys that strengthened ecological mindfulness and communal responsibility. These interpretations align with Descola's (2003) concept of moral ecology, where cultural symbols and environmental interaction shape moral identity.

Integrating Piil Pesenggiri values into physical activity also contributed to the development of cooperative and prosocial behavior. High engagement levels (86–95%) across modules indicate that students were highly motivated when tasks were culturally meaningful. This supports previous findings that culturally responsive pedagogy enhances participation and character development in sport and PE contexts.

The Role of Physical Activity in Supporting Embodied Learning

The integration of movement-based tasks balance exercises, heritage walking, cooperative relay, and eco-movement circuits demonstrates that physical activity can function as an experiential cognitive af-



fective learning tool. Literature emphasizes that structured PA can enhance self-regulation, social bonding, teamwork, and emotional resilience. The present findings expand this by showing that culturally embedded PA can also enhance moral and environmental learning outcomes.

The strong quantitative improvements combined with rich qualitative reflections indicate that embodied ecopedagogy effectively bridges the gap between moral theory and lived experience. Movement, cultural symbolism, and ecological reflection together created a holistic learning environment where sport-based activities served both physical and moral purposes.

Implications for Physical Education and Sports Pedagogy

This study contributes to sport pedagogy in several ways:

1. Culturally Grounded PE

Incorporating local heritage into PE sessions increases motivation, cooperation, and value internalization.

2. Embodied Ecopedagogy

Physical activity conducted in ecological landscapes fosters moral reflection and environmental awareness more effectively than classroom-based instruction.

3. Holistic Competency Development

The program strengthens physical, social, moral, and ecological competencies simultaneously aligning with the multidisciplinary aims of Physical Education.

4. Applicability for Curriculum Innovation

The model offers practical strategies for integrating cultural landscapes into PE curriculums, supporting sustainable and place-based education.

Conclusions

This study demonstrates that an ecopedagogical physical activity program grounded in Lampung cultural landscapes can effectively enhance students' moral awareness and environmental responsibility. Quantitative analysis showed significant improvements in both constructs, supported by large effect sizes, indicating that structured movement-based learning in ecological and cultural settings provides meaningful behavioral and attitudinal growth. Qualitative findings further reinforce that sacred springs, traditional houses, and megalithic sites serve as powerful experiential learning environments that stimulate reflection, cooperation, and ecological empathy.

The results highlight the pedagogical potential of integrating local cultural heritage into Physical Education. Movement activities inspired by Piil Pesenggiri values such as cooperation, dignity, and mutual assistance enabled students to embody prosocial behavior while strengthening cultural identity. Likewise, ecological tasks such as spring cleaning, forest walking, and heritage exploration supported the development of environmental stewardship. These combined outcomes affirm that PE can function not only as a platform for physical development but also as a transformative space for eco-moral education.

Acknowledgements

Researchers with the Indonesia Bangkit Scholarship Registration Number (BU04-231-0000287) and LPDP Registration Number (020220232023000210), the Indonesian Education Scholarship Registration Number (202231103675), the Indonesian Education Scholarship Registration Number (202209092258), the Indonesia Bangkit Scholarship Registration Number (BU04-231-0000311) and the LPDP Registration Number (020220232023000222), the Indonesian Education Scholarship Registration Number (202209091379) would like to thank the Beasiswa Indonesia Bangkit (BIB) Kementerian Agama dan Beasiswa Pendidikan Indonesia (BPI) Kementerian Pendidikan Tinggi, Ilmu



Pengetahuan, dan Teknologi (Kemdiktisaintek) in collaboration with the Lembaga Pengelola Dana Pendidikan (LPDP) Kementerian Keuangan Republik Indonesia. Pusat Pembiayaan dan Asesmen Pendidikan Tinggi (PPAPT) and Dana Abadi Pendidikan Indonesia.

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