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Preliminary Analysis of Masjid Agung Pondok Tinggi Sungai Penuh Edupark's Potential as a Physics Learning Resource Using The Concept Fitting Technique

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ABSTRACT

Edupark integrates tourist attractions with education to make physics learning more contextual and meaningful, but existing edupark research has focused mainly on natural tourism sites, leaving the physics learning potential of protected cultural heritage buildings largely unexplored. This study addresses that gap through a needs analysis the preliminary stage of a broader Research and Development study examining Masjid Agung Pondok Tinggi, a nationally protected heritage building in Sungai Penuh, Jambi, whose architectural ornaments (pillars, minaret, walls, roof, doors, and drum) contain physics concepts relevant to the Merdeka Curriculum. Using the EDUPARK development model limited to the Edupark Finding, Direct Observation, and Understanding of Students, Teachers, and Curriculum Characteristics stages combined with the Concept Fitting Technique, data were collected through questionnaires and interviews with 33 Physics specialisation students and a physics teacher at SMAN 3 Sungai Penuh, alongside direct observation of the mosque. The results show that 78.79% of students have a visual learning style, 87.9% have visited the mosque yet only 45.5% are aware of its physics concepts, and no local wisdom integrated enrichment book has been developed at the school. These findings indicate the need for a Contextual Teaching and Learning based physics enrichment book integrated with the Masjid Agung Pondok Tinggi edupark, which has the potential to support more contextual, visually engaging physics learning while offering physics teachers a concrete, curriculum aligned example of implementing local wisdom based contextual teaching under the Merdeka Curriculum.

Keywords : Edupark; physics enrichment book; concept fitting technique; local wisdom; Contextual Teaching and Learning.

I. INTRODUCTION

Education is a conscious and planned effort to develop students' potential optimally. Law of the Republic of Indonesia Number 20 of 2003 on the National Education System [1] states that national education aims to develop students into faithful, knowledgeable, skilful, creative, and independent individuals. In Indonesia, this goal is currently pursued through the Merdeka Curriculum, which is strengthened by a deep learning approach directing learning toward meaningful, contextual, and real life relevant experiences [2]. The Merdeka Curriculum provides broader space for competency development through the simplification of content into essential materials, allowing teachers to manage learning more flexibly according to students' needs [3], [4].

Meaningful physics learning can be realised through contextual learning, which helps students connect subject matter with real situations so that the knowledge gained becomes easier to understand [5], [6], and which supports the development of twenty first century skills through active, reflective, and critical thinking toward the phenomena being studied [7]. One relevant strategy for delivering such learning is by integrating local wisdom the values, culture, knowledge, and practices of a community that develop over generations and form part of a region's identity [8]. Reported gains from this strategy are not limited to conceptual understanding but extend to students' cultural character and identity [9], [10], suggesting that local wisdom integration serves a dual function: it is a pedagogical tool as much as a means of cultural preservation.

One learning resource that operationalises this dual function is Edupark the use of a tourist attraction or particular environment as a medium of learning that connects educational concepts with direct field experience [11]. It makes concepts concrete through direct observation [12], increases active involvement [13], and, when built on ethnopedagogical elements, supports science-process and twenty-first-century skills [14], [15]. Yet across these studies, "environment" has consistently meant natural or recreational sites caves, waterparks, hot springs [16]–[23] not built cultural heritage, even though heritage buildings may offer a distinct and potentially more legible set of physics concepts, shaped by the practical construction constraints such buildings were built under. Masjid Agung Pondok Tinggi, a nationally registered cultural heritage building in Sungai Penuh, Jambi, is examined in this study as a first test of that potential.

The mosque was designated a national cultural heritage building through the Decree of the Minister of Culture and Tourism Number KM.11/PW.007/MKP/2004, and holds architectural value distinctive to the Kerinci community: its construction uses a traditional wooden joint system without nails, giving it flexibility against earthquake shocks, while its three tiered pyramidal roof locally known as "Bapucouk Satau, Barampek Jure, Betingkat Tigea" symbolises the leadership structure and communal life of the local society. Direct field observation confirmed that this cultural significance coincides with physics content: the mosque's ornaments correspond to a range of physics concepts, summarised in Table 2 [24].

Because these physics concepts are embedded in a local wisdom object rather than derived from a textbook, no existing government published material can represent them as they are: the standard textbook, being organised sequentially by curriculum phase, has not integrated regional local wisdom as a learning resource [25], even though connecting academic content to students' real experience is what makes learning meaningful [26], [27]. A local wisdom based enrichment book is therefore the appropriate format not merely as an alternative to the textbook, but because Regulation of the Minister of Education and Culture Number 8 of 2016 defines enrichment books as non text materials free from the curriculum's required sequence of objectives, content, and presentation [28], [29]. This flexibility happens to also resolve a structural problem specific to the mosque's concepts: they are distributed unevenly across curriculum phases for example, the minaret's concept of measurement belongs to Phase E while its concept of pressure on solids belongs to Phase F [3] so a sequence bound textbook could not accommodate them even if it wanted to. The enrichment book format is thus doubly motivated, by the nature of local wisdom content in general and by this specific curriculum mapping constraint.

A preliminary needs analysis was carried out with students and the physics teacher of SMAN 3 Sungai Penuh to test whether this rationale holds in practice, examining learning style, prior exposure to enrichment books, and awareness of the mosque's physics content. Consistent with the premise that meaningful learning requires students to connect real environmental experience with academic concepts [30], the analysis pointed to an unmet need: physics learning at the school remains textbook bound, and the environment's contextual potential has not been utilised. This established the basis for a Contextual Teaching and Learning (CTL) integrated enrichment book, CTL being a model that connects academic content to students' lived reality through seven syntax components constructivism, inquiry, questioning, learning community, modelling, reflection, and authentic assessment [31], [32]. Based on this background, this study aims to conduct a preliminary analysis of the potential of Masjid Agung Pondok Tinggi as a physics edupark learning resource, as the basis for designing a CTL integrated physics enrichment book for senior high school.

II. METHOD

This research is a Research and Development (R&D) study using the EDUPARK development model, which aims to integrate local wisdom with physics phenomena and concepts found in the ornaments of Masjid Agung Pondok Tinggi. The EDUPARK model consists of seven stages: Edupark Finding (E), Direct Observation (D), Understanding of Students, Teachers, and Curriculum Characteristics (U), Preliminary Design by Concepts Fitting Technique (P), Auto Assessment (A), Recommendation from Expert (R), and Kick Off Publish (K) [33]. This article reports the preliminary analysis results, covering the Edupark Finding, Direct Observation, and Understanding of Students, Teachers, and Curriculum Characteristics stages (the EDU stage of the model).

The subjects of this study were students and a physics teacher of SMAN 3 Sungai Penuh. The student subjects comprised all 33 students of class XI.A taking the Physics specialisation, selected using total sampling, while the teacher subject was the physics subject teacher at the same school. The object of this research was the design of a Contextual Teaching and Learning integrated physics edupark enrichment book based on Masjid Agung Pondok Tinggi for senior high school. Prior to data collection, formal permission was obtained from the school through an official research permit letter, and participation of students and the teacher was voluntary.

The Edupark Finding stage involved selecting a tourism site or regional potential that had not previously been studied for this purpose, based on criteria such as containing scientific concepts, being well known to the public, being located near a school, and being easily accessible. Based on these criteria, Masjid Agung Pondok Tinggi in Sungai Penuh, Jambi, was selected as the study site. Fig. 1 presents the geographical location of the study site within Sungai Penuh City, Jambi Province, supporting the description of the research setting and facilitating readers in identifying where the Edupark based observation was conducted.

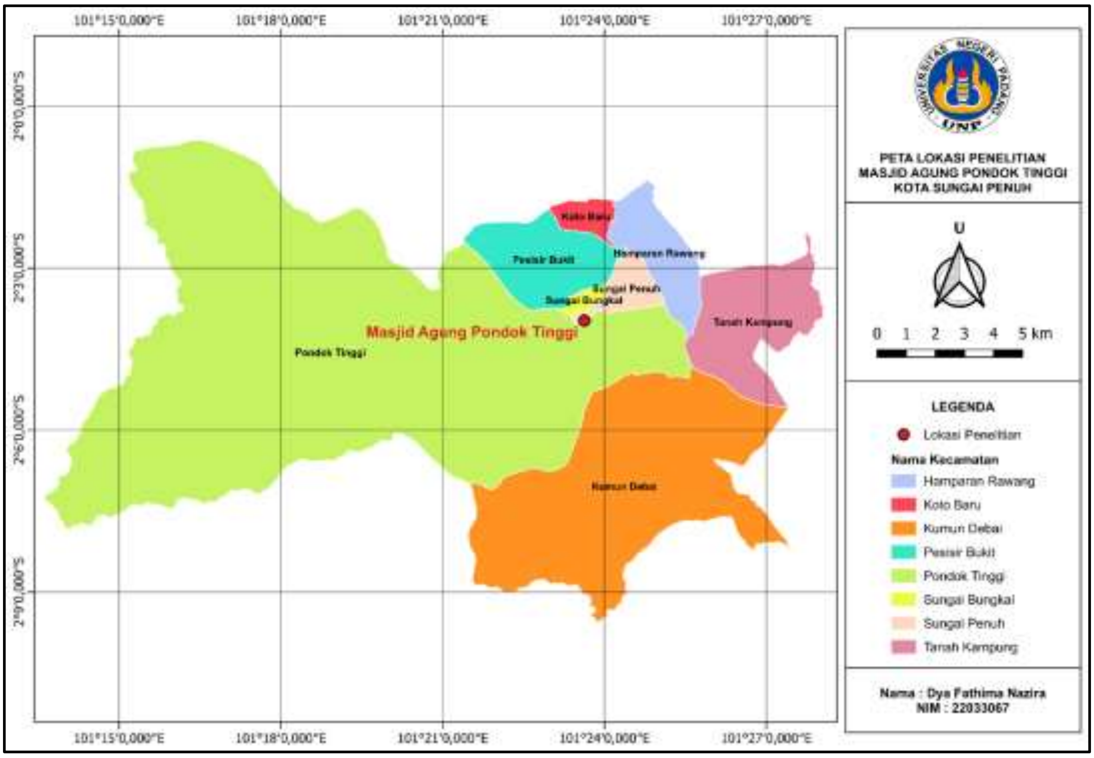

Fig. 1. Location of Masjid Agung Pondok Tinggi, Sungai Penuh City, Jambi Province, Indonesia

The Direct Observation stage involved on-site observation of the mosque's structure and ornaments to identify the physics concepts they contain, assisted by an observation matrix sheet. Physics concepts identified on each ornament were matched against the essential materials of the Merdeka Curriculum Phase E and F Physics Learning Outcomes [3], following the Concept Fitting Technique flow (Fig. 2), before being compiled into Table 2.

The Understanding of Students, Teachers, and Curriculum Characteristics stage consisted of three components: (a) teacher analysis, conducted through a direct interview with the physics teacher covering the curriculum, learning model, teaching materials used, and utilisation of local heritage sites as learning resources; (b) student analysis, conducted through questionnaires covering learning style, use of teaching materials, and knowledge of Masjid Agung Pondok Tinggi as a potential edupark, distributed to the 33 Physics specialisation students; and (c) curriculum analysis, conducted by reviewing the applicable Merdeka Curriculum regulations to determine the position of enrichment books within the curriculum.

The instruments used were an Edupark finding observation sheet, a concept-matrix observation sheet, student questionnaires, and a teacher interview guide, adapted from [33]. The student questionnaires were adapted from an indicator based grid established in [33], with each item derived directly from a defined indicator to ensure content validity. The questionnaires used a four-point Likert scale. The identification of physics concepts followed the Concept Fitting Technique flow shown in Fig. 2, which maps physics concepts based on the Merdeka Curriculum (Step 1), regional potential analysis (Step 2), and edupark analysis of Masjid Agung Pondok Tinggi (Step 3), converging into the integrated physics material for the Masjid Agung Pondok Tinggi edupark (Step 4).

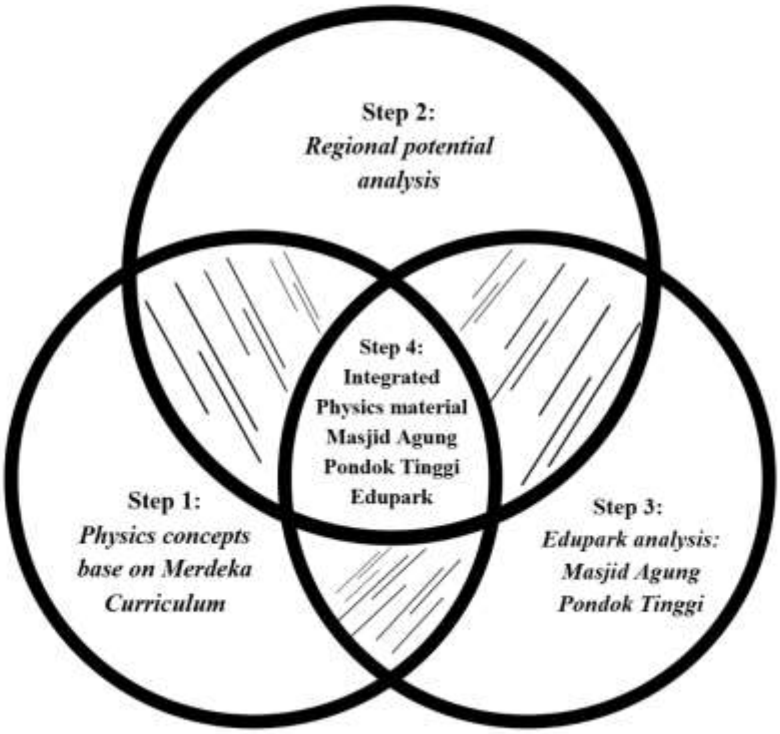

Fig. 2. Concept fitting technique flow in identifying physics concepts of Masjid Agung Pondok Tinggi.

Data were analysed descriptively using percentages. Quantitative data from the questionnaires were processed using Equation (1).

$$score = \frac{total\ score}{\max score} \times 100\% \quad (1)$$

where the total score is the sum of scores obtained across respondents for a given indicator, and the maximum score is the highest possible cumulative score for that indicator. The resulting percentage was then matched against the categories in Table 1 to determine the qualitative interpretation of each indicator.

Table 1. Percentage category for needs analysis

Percentage (%)	Category
76 – 100	Good
51 – 75	Sufficient
26 – 50	Poor
0 – 25	Very Poor

(Modified from Riduwan, 2009:89) [34]

III. RESULTS AND DISCUSSION

Direct observation of Masjid Agung Pondok Tinggi identified physics concepts distributed across six main ornaments, summarised in Table 2. Each concept was identified by matching the ornament's physical characteristics against the essential materials of the Merdeka Curriculum Physics Learning Outcomes for Phase E and F [3], following the Concept Fitting Technique flow (Fig. 2).

The wall, for instance, is associated with four concepts in Table 2 because its panel structure genuinely performs four distinct physical functions simultaneously: each wooden panel distributes the roof's load to the foundation (pressure and force distribution, P = F/A), the assembled panels remain motionless under combined vertical and horizontal loads (static equilibrium), the wood itself conducts heat between the mosque's interior and exterior (thermal conductivity), and its perforated ventilation openings drive airflow through temperature induced pressure differences (air pressure and fluid flow). Similarly, the roof combines the inclined plane geometry of its slope with three simultaneous heat transfer mechanisms in its zinc sheeting conduction, convection, and radiation together with thermal expansion under daily temperature cycles. These examples show that a concept list spanning several entries is not an arbitrary grouping, but reflects the fact that a single architectural element in a real structure typically performs several interacting physical functions at once, each traceable to a distinct, measurable physical property of the ornament.

Table 2. Identification of physics concepts on the ornaments of Masjid Agung Pondok Tinggi

Ornament	**Physics Concepts**	**Figure**	**Classroom Application**
Pillars	Static equilibrium; pressure; weight and normal force; Newton's laws		Draw the pillar's free body diagram; calculate normal force and pressure for a given load and cross section
Minaret	Measurement and inclination; potential energy; pressure on solids		Measure the staircase's dimensions; calculate its incline angle and the potential energy gained climbing it
Walls	Pressure and force distribution; thermal conductivity; air pressure and fluid flow; static equilibrium of walls		Explain the convective airflow pattern using the wall's ventilation openings
Roof	Inclined plane and slope; temperature change; heat transfer; sound and heat damping		Calculate the roof's slope angle; discuss its heat transfer behaviour under sunlight and at night

Ornament	Physics Concepts	Figure	Classroom Application
Doors	Torque (moment of force); moment of inertia; Newton's laws; mechanical energy		Compare the force needed to open the door at different distances from the hinge
Drum	Sound waves and resonance; membrane vibration and kinetic energy; closed pipe organ column vibration; membrane tension and elasticity	 	Calculate the expected fundamental frequency from each drum's measured length; compare with perceived pitch

Based on interviews with the physics teacher, it was found that SMAN 3 Sungai Penuh has implemented the Merdeka Curriculum, but physics learning still relies solely on the standard textbook published by the Ministry, and no edupark based or local wisdom integrated enrichment book has ever been developed or used. When asked whether existing materials included examples connected to local potential, the teacher confirmed that available materials do not yet contain examples based on local regional potential, and that a local wisdom based enrichment book had never been developed; the barriers cited were time constraints, limited references based on local potential, and alignment with the mandated curriculum. The teacher also reported that opportunities to bring students to observe real physics phenomena outside the classroom, including at heritage or tourism sites around the school, have been very limited. This aligns with a report that teachers often experience difficulty developing contextual teaching materials that connect physics concepts with real life phenomena around students [35], and indicates that the absence of edupark based materials reflects constraints in teacher time and reference availability rather than a lack of awareness of the mosque's potential, since the teacher separately confirmed recognising its nail free joinery as physics relevant.

The results of the student questionnaire on learning style are presented in Table 3.

Table 3. Results of Student Learning Style Questionnaire

Learning Style	Number of Students	Percentage (%)
Visual	26	78.79
Auditory	2	6.06
Kinaesthetic	4	12.12
Visual–Auditory	0	0.00
Visual–Kinaesthetic	1	3.03
Visual–Auditory–Kinaesthetic	0	0.00

Table 3 shows that the majority of students (78.79%) have a visual learning style, categorised as “Good” according to Table 1, indicating that most students can more easily receive and process information through sight, such as images, diagrams, and written text. This finding reflects a self reported preference rather than a fixed trait that determines learning success; recent meta-analytic evidence indicates that matching instructional format to self reported learning style preference does not reliably improve learning outcomes, a pattern some reviews characterise as an unsupported "meshing hypothesis," though the empirical picture remains contested rather than fully settled [36]. Nonetheless, the preference remains a relevant design consideration: printed media containing pictures, diagrams, and infographics [37] may improve engagement and accessibility for this cohort, even though such alignment alone does not guarantee improved conceptual mastery. Accordingly, the enrichment book to be designed emphasises visual elements, such as photographs of the mosque's ornaments and supporting diagrams, as a way to support engagement rather than as a guarantee of learning gains.

The results of the questionnaire on the use of teaching materials are presented in Table 4

Table 4. Results of questionnaire on use of teaching materials

Statement	Number of Students	Percentage (%)
Aware that enrichment books exist	17	51.5
Have never used an enrichment book	20	60.6

As shown in Table 4, just over half of students (51.5%) are aware that enrichment books exist as a category of teaching material, while the majority (60.6%) have never actually used one in their physics learning. This gap between awareness and use suggests that enrichment books, even where known to students, are not being actively integrated into classroom practice at SMAN 3 Sungai Penuh consistent with the teacher's confirmation that no edupark based or local wisdom integrated enrichment material has been developed or assigned. The underuse of enrichment books in this context is therefore more plausibly linked to their absence from the school's existing teaching resources than to a lack of student interest, since enrichment books are supplementary by design and their availability depends entirely on active development by teachers or institutions [28], [29].

The results of the questionnaire on students' knowledge of Masjid Agung Pondok Tinggi are presented in Table 5.

Table 5. Results of Questionnaire on Students' Knowledge of Masjid Agung Pondok Tinggi

Statement	Percentage (%)
Have visited Masjid Agung Pondok Tinggi	87.9
Are aware that Masjid Agung Pondok Tinggi contains physics concepts	45.5

Table 5 reveals that most students (87.9%) have visited Masjid Agung Pondok Tinggi, yet less than half (45.5%) are aware that the mosque contains applicable physics concepts. A closer reading of students' open-ended responses helps explain this gap: students who reported visiting the mosque predominantly described the experience in recreational or atmospheric terms as offering a calmer, "fresher" alternative to the classroom rather than as an opportunity for structural observation. Even among students who did report awareness of specific concepts, most independently referenced the same single feature, the mosque's nail free wooden joinery, while few mentioned other ornaments such as the wall ventilation or drum acoustics. This suggests that repeated visits to the mosque have been oriented toward its religious and recreational function rather than its physical structure, so that familiarity with the location has not translated into scientific observation without deliberate instructional guidance reinforcing [30]'s argument that meaningful learning requires real experiences to be actively connected to academic concepts, rather than assuming that exposure alone is sufficient. This is consistent with findings from other edupark preliminary studies, which likewise report that students visit local heritage sites frequently but rarely recognise the scientific concepts embedded in them [10].

The overall pattern across these preliminary findings points to three educational implications, rather than simply restating the individual results reported above. First, because a self-reported visual learning preference does not by itself guarantee improved outcomes when matched to material format [36], the practical implication is narrower than commonly assumed: image rich, illustration based material may lower the barrier to engagement with the content, without being treated as a determinant of learning success on its own. Second, the consistent finding that enrichment books remain underused despite being formally available as a curriculum category points to a structural rather than a motivational barrier: without a developed, locally grounded example, this avenue for content differentiation under the Merdeka Curriculum [3] simply goes unused, regardless of teacher intention. Third, the disconnect between students' physical familiarity with the mosque and their conceptual awareness of it demonstrates that an edupark's educational value is not inherent to the location itself, but is instead constructed through deliberate pedagogical mediation meaning the design of the enrichment book, rather than the choice of site alone, is what will determine its educational impact.

The seven stage syntax of Contextual Teaching and Learning offers one plausible framework for this mediation, though its contribution should not be assumed uncritically. Constructivism and inquiry, for example, depend on structured scaffolding to be effective; without it, contextual activities such as an unguided visit to the mosque risk reproducing the same superficial familiarity already observed in this study's findings, rather than fostering deeper conceptual understanding. Whether CTL syntax genuinely improves conceptual mastery as distinct from improving engagement or motivation alone remains an empirical question that this preliminary study cannot answer, since no instructional material has yet been developed or tested.

This preliminary analysis has several limitations. The needs analysis was conducted with a single class (33 students) and one teacher at one school, limiting the generalisability of the findings to other contexts. The identification of physics concepts, while cross-checked against the curriculum, ultimately reflects the researchers' own interpretation of each ornament, which other observers might frame differently. Because this article reports only the Edupark Finding, Direct Observation, and Understanding stages of the EDUPARK model, it does not yet provide evidence on whether the resulting enrichment book will achieve its intended learning outcomes; that evaluation is reserved for the later Auto Assessment and Recommendation from Expert stages.

Taken together, these findings indicate the need to design a Contextual Teaching and Learning-based physics enrichment book integrated with the Masjid Agung Pondok Tinggi edupark. Such a book has the potential to support more contextual, visually engaging, and culturally connected physics learning, though this potential remains to be empirically evaluated in the subsequent design and validation stages of this research. These findings are in line with previous edupark preliminary studies in West Sumatra and Jambi, which similarly report that local educational tourism destinations possess unutilised physics learning potential and that teachers have not developed edupark-based enrichment materials despite students' interest in contextual, environment based learning [20], [21], [10], [22], [23]. The results of this preliminary analysis are therefore used as the basis for the Preliminary Design by Concepts Fitting Technique stage, in which the six ornament based physics concepts of Masjid Agung Pondok Tinggi will be integrated into a physics enrichment book employing the seven syntax components of the Contextual Teaching and Learning model [31].

IV. CONCLUSION

This preliminary analysis shows that Masjid Agung Pondok Tinggi has substantial potential as a physics edupark, with concepts identified across six ornaments pillars, minaret, walls, roof, doors, and drum spanning mechanics, thermodynamics, and wave phenomena. This range is notable: rather than offering a narrow set of illustrative examples, the mosque's structure engages a broad span of introductory physics, distributed across both Phase E and Phase F of the Physics Learning Outcomes.

However, this potential currently goes unrealised at SMAN 3 Sungai Penuh. Physics learning relies solely on the standard government textbook, no local wisdom based enrichment material has been developed, and although most students are familiar with the mosque (87.9% have visited it), less than half recognise its physics content (45.5%). Alongside the finding that most students favour a visual learning style yet have never used an enrichment book, these results together point to the same underlying issue raised earlier in this article: physics learning at the school remains textbook bound, and the environment's contextual potential has not been utilised. For teachers, this indicates that proximity to a rich local learning resource is not sufficient on its own; realising its educational value requires a purpose built material that explicitly connects the site's features to curriculum concepts, rather than relying on incidental exposure through students' everyday familiarity with the location.

These findings indicate a clear need for a Contextual Teaching and Learning-integrated physics enrichment book based on the Masjid Agung Pondok Tinggi edupark, which has the potential to make physics learning more contextual, visually engaging, and connected to students' local cultural heritage, presenting curriculum-relevant physics concepts through locally grounded, image-rich content suited to students' visual learning preference. Future research should proceed to the subsequent stages of the EDUPARK model Preliminary Design, Auto Assessment, and Recommendation from Expert to develop, validate, and empirically evaluate the enrichment book's actual effect on students' conceptual understanding, an outcome this preliminary study has not yet measured.

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