Widyagogik: Jurnal pendidikan dan Pembelajaran Sekolah Dasar
Journal homepage: https://journal.trunojoyo.ac.id/widyagogik ; ISSN: 2541-5468

Improving Science and Social Studies Learning Outcomes Through 'Pop-Up Book Bentang Alam' Projects to Foster a Growth Mindset in Third-Grade Students

Hudaidah[1*], Talitha Alysia Nasywa Anand[2], Fenny Ambarrulan[3], Resti Astria[4], Ayu Marsilina[5], Mistaf Agung Saputra[6]
[1,2,3,4,5,6]Teacher Professional Education Program, Faculty of Teacher Training and Education, Sriwijaya University, Indonesia
*) Corresponding Author, email: hudaidah@fkip.unsri.ac.id, peserta.38267@ppg.belajar.id

ABSTRACT
Indonesia's low science literacy scores and continued teacher-centered lecturing in elementary Science and Social Studies (IPAS) instruction highlight the need for contextual, student-centered learning, particularly for spatially demanding topics such as landscapes. Although prior studies have separately shown the effectiveness of Project Based Learning (PjBL) and Pop-Up Book media for IPAS, research integrating both as a group project on landscape material in third grade, while examining its contribution to growth mindset, remains limited. This study describes the improvement in IPAS learning outcomes and the contribution of a Pop-Up Book project to growth mindset of Grade III B students at SDN 57 Palembang. A Classroom Action Research design following Kemmis and McTaggart was conducted in a single cycle comprising two meetings with 26 students, as the pre-established success criteria were achieved by the end of that cycle and a second cycle was therefore not required. Data were collected through pre-tests and post-tests, structured observation of growth mindset indicators (1-4 scale), Pop-Up Book product assessment, and documentation, analyzed using mixed methods. Results show average scores increased from 68.85 (diagnostic) to 77.69 (Meeting 1) and 81.35 (Meeting 2), with completion rising from 42.31% to 80.00%. The average growth mindset indicator increased from 62.5% (Good) to 84.6% (Very Good). These findings confirm the PjBL-based Pop-Up Book Landscape project effectively improves cognitive outcomes while fostering growth mindset. This study is limited by the small number of meetings and a sample restricted to one class, so generalization should be cautious. Practically, findings can guide elementary teachers in designing interactive, low-cost IPAS lessons supporting the Merdeka Curriculum. Future research should extend cycle duration and use standardized growth mindset instruments.
Keyword: Project Based Learning; Pop-Up Book; IPAS learning outcomes; growth mindset; bentang alam

Article History:
Received: 17 June 2026; Revised: 31 August 2026; Accepted: 2 September 2026; Published: 26 October 2026

Citation (in APA style 7):
Hudaidah., Anand, T.A.N., Ambarrulan, F., Marsilina, A., & Saputra, A. (2026). Improving Science and Social Studies Learning Outcomes Through 'Pop-Up Book Bentang Alam' Projects to Foster a Growth Mindset in Third-Grade Students . *Widyagogik, 14*(3), 158–180. https://doi.org/10.21107/Widyagogik/v14i3.34964

INTRODUCTION

The quality of science education at the elementary school level is one of the key determinants of a nation's competitiveness in the global era, because strong scientific literacy and evidence-based reasoning acquired from an early age underpin a country's long-term capacity for technological innovation, informed civic participation, and economic productivity (OECD, 2023). Indonesian students' science literacy achievement in the 2022 Programme for International Student Assessment (PISA) reflects a concerning condition: the average science score of Indonesian students reached only 383 points, far below the OECD country average of 485, and even declined by 13 points compared to 2018 (OECD, 2023). This data indicates that the science learning process in Indonesia, including at the elementary school level, has not yet been fully capable of adequately developing students' scientific thinking skills and critical reasoning. In the context of the Merdeka Curriculum, which has begun to be implemented nationally, the Natural and Social Sciences (IPAS) subject at the Elementary School (SD) level is designed as an integrative subject aimed at building students' holistic understanding of natural phenomena and social life in a contextual manner (Kemendikbudristek, 2022a). However, the implementation of meaningful and student-centered IPAS learning continues to face various challenges in the field, particularly regarding teaching methods that remain conventional, namely one-way teacher lecturing, verbal explanation confined largely to textbook content, and minimal use of hands-on, contextual, or manipulative learning media that could otherwise accommodate students' diverse learning styles, and the persistently low student learning outcomes.

The problem of low IPAS learning outcomes does not occur solely at the national level, but is also concretely evident at the school level. Preliminary observations conducted in Class III of SDN 57 Palembang identified that students experience difficulties in understanding and classifying the diverse landscapes of Indonesia and connecting them to the occupations of people in their surrounding environment. This preliminary finding was drawn from classroom observation and an informal interview with the Class III B teacher, and was corroborated by a diagnostic pre-test administered prior to the intervention, in which the class average reached only 68.85 with a mastery rate of just 42.31% (11 of 26 students meeting the KKTP; see Table 4), indicating that the majority of students had not yet grasped the basic concepts of Indonesian landscapes. The learning process that takes place is still dominated by teacher-centered lecture methods, in which the teacher verbally explained landscape material with the aid of the textbook and blackboard notes while students primarily listened and copied information, without engaging in any hands-on, exploratory, or media-assisted activity that would allow them to build direct experience with the material, and as a result, it has not yet optimized the diversity of visual, auditory, and kinesthetic learning styles possessed by students in Class III B. This condition is consistent with the findings of a number of studies indicating that conventional learning models are less effective in enhancing active engagement and student learning outcomes at the elementary school level, compared to innovative, student-centered learning approaches, such as project-based, inquiry-based, and cooperative learning models that actively involve students in constructing their own understanding rather than passively receiving information (Khusnaeni et al., 2025; Palupi & Husamah, 2023). Therefore, a

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learning innovation is needed that is capable of comprehensively and contextually addressing the learning needs of students.

Project-Based Learning (PjBL) has been widely recognized as one of the most effective pedagogical approaches in improving student learning outcomes, creativity, and engagement. In contrast to conventional learning, PjBL encourages students to actively construct knowledge through the completion of real, meaningful, collaborative projects oriented toward authentic problem-solving. Several studies in Indonesia have demonstrated the effectiveness of PjBL in the context of IPAS learning at the elementary school level. Palupi and Husamah (2023) found a significant improvement in the creativity and IPAS learning outcomes of Grade IV students through PjBL. In line with this, Khusnaeni et al. (2025) reported a meaningful increase in motivation and IPAS learning outcomes through the implementation of PjBL in elementary schools. Nevertheless, studies that specifically integrate PjBL with creative Pop-Up Book products in the context of learning about Indonesian Landscapes in Grade III elementary school, while simultaneously analyzing its impact on the development of students' growth mindset foundations, remain very limited in Indonesian academic literature. The integration of PjBL with a Pop-Up Book product is theoretically warranted for at least three reasons. First, landscape material is inherently spatial and three-dimensional, so a tangible, manipulable product such as a Pop-Up Book allows students to externalize and visualize concepts that are difficult to grasp through verbal explanation alone. Second, constructing a Pop-Up Book satisfies PjBL's core requirement of producing a public, authentic product (Buck Institute for Education, 2019), giving students' collaborative work a genuine purpose and audience beyond the completion of a worksheet. Third, the iterative, hands-on process of designing, cutting, folding, and assembling a Pop-Up Book naturally embeds the cycles of trial, error, and revision theorized to cultivate a growth mindset (Dweck, 2006), so that a single project can simultaneously target cognitive and psychological learning outcomes.

The selection of appropriate learning media plays a crucial role in creating meaningful learning experiences, particularly for Grade III students who are within the age range of 8 to 9 years. Pop-Up Book media is a three-dimensional book that combines visual, textual, and kinesthetic elements, thereby being capable of accommodating the diversity of students' learning styles. Various empirical studies have documented the effectiveness of Pop-Up Book media in improving student learning outcomes at the elementary school level. Simbolon and Fitriyani (2021) demonstrated the existence of a significant influence of Pop-Up Book media usage on the learning outcomes of elementary school students. Arip and Aswat (2021) also reported improvements in science learning outcomes at the elementary school level through the application of Pop-Up Book media via classroom action research. Meanwhile, Afifa and Hanif (2023) specifically found a positive influence of Pop-Up Book media usage on the IPAS learning outcomes of Grade IV elementary school students. Although the findings of these studies are promising, research that positions the Pop-Up Book as a group project product within the PjBL framework in the context of Landscape IPAS learning in Grade III elementary school has yet to be explored.

Aside from pedagogical dimensions and instructional media, students' psychological factors significantly influence learning success. Dweck (2006), through her mindset theory, posits that individuals possessing a growth mindset, defined as the belief that one's ability and intelligence are not fixed traits determined at birth but qualities that

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can be cultivated over time through sustained effort, the deliberate use of effective learning strategies, and constructive learning from mistakes, are better equipped to embrace challenges, persist through difficulties, and attain higher academic achievement. This construct should be distinguished conceptually from critical thinking. Critical thinking refers to a cognitive skill, namely the capacity to analyze, evaluate, and reason through information and arguments in order to reach a sound judgment. A growth mindset, by contrast, refers to a motivational and psychological belief about the malleability of one's own ability. The two constructs are related but distinct: a student may possess strong critical-thinking skills yet still hold a fixed mindset that discourages persistence when a task becomes difficult, whereas a student with a growth mindset is more likely to keep applying critical-thinking and other cognitive skills even after an initial failure, precisely because setbacks are interpreted as opportunities to learn rather than as evidence of a fixed limitation. Furthermore, a large-scale study by Yeager et al. (2019) in the United States, utilizing a nationally representative sample, demonstrated that short, growth mindset interventions significantly improved the academic grades of lower-achieving students and increased enrollment in advanced mathematics courses. In Indonesia, however, studies examining how innovative instructional designs, particularly those rooted in creative projects, can explicitly lay the foundation for a growth mindset, that is, students' belief in their own capacity to improve their abilities through sustained effort and deliberate practice, as opposed to viewing ability as an innate and unchangeable trait, among elementary school students remain scarce. Consequently, this represents a critical research gap that warrants empirical investigation.

Based on a review of prior literature, three primary gaps justify the necessity of this study. First, there is a lack of research explicitly examining pop-up book creation projects as a vehicle for fostering a growth mindset foundation within a Project-Based Learning (PjBL) framework for integrated science and social studies (IPAS) in lower elementary grades in Indonesia. Second, while research concerning PjBL and pop-up media in elementary schools exists, studies systematically integrating both within the context of Indonesian landforms specifically relevant to the local environment of Palembang as a waterfront city with diverse landscapes remain notably rare. Third, empirical exploration regarding differentiated instruction that integrates creative projects to simultaneously enhance cognitive learning outcomes and build growth mindset dispositions in students aged 8–9 years under the *Kurikulum Merdeka* (Independent Curriculum) framework remains limited. These combined gaps provide the primary impetus for conducting the present study.

This study aims to describe and analyze the improvement in integrated science and social studies (IPAS) learning outcomes through the implementation of a "Pop-Up Book Bentang Alam" project utilizing a Project-Based Learning (PjBL) approach for third-grade students at SDN 57 Palembang during the 2025/2026 academic year. Specifically, this research examines: (1) the magnitude and pattern of improvement in students' IPAS learning outcomes, from the diagnostic stage through each meeting of the landscape-themed Pop-Up Book project-based learning intervention; and (2) the specific classroom processes and observable behavioral indicators, namely persistence when facing construction difficulties, willingness to revise work after mistakes, and openness to feedback, through which the pop-up book-based PjBL process serves as a foundation for

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developing students' growth mindsets. The findings of this study are expected to contribute both theoretically and practically to the development of innovative and meaningful IPAS instruction within the framework of the *Kurikulum Merdeka* (Independent Curriculum) implementation in Indonesia.

LITERATURE REVIEW

IPAS Learning within the *Kurikulum Merdeka* Framework

Integrated Science and Social Studies (IPAS) is an integrative subject introduced in the *Kurikulum Merdeka* (Independent Curriculum) framework, representing an amalgamation of Natural Sciences (IPA) and Social Studies (IPS) at the elementary school level. This integration is designed to equip students with a holistic and contextual understanding of natural phenomena and social dynamics (Kemendikbudristek, 2022a). Within the *Kurikulum Merdeka* framework, IPAS instruction is oriented toward developing critical, creative, and collaborative thinking skills relevant to 21st-century demands; this aligns with the *Pelajar Pancasila* (Pancasila Student Profile), which emphasizes the synthesis of cognitive, affective, and psychomotor dimensions (Marisa, 2021).

Research by Pratiwi et al. (2023) demonstrates that an integratively designed IPAS curriculum significantly enhances student engagement because the learning materials bear direct relevance to their immediate environment and daily lives. However, the practical implementation of IPAS instruction still faces substantial challenges, particularly regarding a tendency toward textbook-centered didactic delivery that underutilizes concrete experiences. In a study across twelve elementary schools in Java, Wardani and Suparno (2022) found that the dominance of lecture-based methods in IPAS classrooms resulted in low conceptual comprehension among students, particularly in topics requiring direct visualization and exploration, such as landforms, ecosystems, and social interactions.

Theoretically, effective IPAS instruction must grounded in the principles of meaningful learning posited by Ausubel (1968), wherein new knowledge must be systematically anchored to a student's pre-existing cognitive structures. Within the context of the *Kurikulum Merdeka*, this principle translates into a deep learning approach encompassing three core dimensions: mindful, meaningful, and joyful learning (Kemendikbudristek, 2022b). These three synergistic dimensions demand instructional designs that move beyond informative content delivery to construct authentic, student-centered learning experiences.

Learning Characteristics of Third-Grade Elementary School Students

An understanding of students' cognitive developmental characteristics serves as an essential foundation for designing effective instruction. Piaget’s theory of cognitive development posits that students aged 7–11 years operate within the concrete operational stage, during which they can perform logical mental operations but remain heavily reliant on concrete objects and direct experiences as learning mediums (Piaget, 1952; Santrock, 2018). At this stage, third-grade students, typically aged 8–9 years, are not yet fully capable of processing abstract concepts unless supported by physical representations that can be directly observed and manipulated.

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The implications of Piaget's theory for IPAS instruction are highly significant. For instance, landform topics encompass spatial and visual concepts, such as the distinct characteristics of mountains, lowlands, coasts, and rivers, that are difficult for students to comprehend solely through verbal descriptions or static two-dimensional images. Research by Nurhayati and Afriansyah (2021) confirms that the utilization of three-dimensional instructional media for third-grade elementary students significantly enhances conceptual understanding compared to conventional two-dimensional media, as it allows students to interact directly with physical representations of the subjects. Alongside Piagetian theory, Vygotsky's constructivist learning theory is equally relevant in this context, particularly his concept of the Zone of Proximal Development (ZPD), which underscores the critical role of social interaction and pedagogical scaffolding in supporting children's cognitive development (Vygotsky, 1978).

Furthermore, empirical evidence from Wahyuni et al. (2023) regarding the learning styles of elementary school students in Indonesia reveals significant diversity in students' modality preferences. Their findings indicate that approximately 38% of students are visual learners, 28% are auditory, and 34% are kinesthetic. This variance necessitates instructional approaches that can simultaneously accommodate all three modalities through differentiated, multi-sensory lesson designs.

Project Based Learning (PjBL) in Contemporary Education

Project-Based Learning (PjBL) is a student-centered instructional model wherein learners actively explore real-world problems, develop essential skills, and construct knowledge through the completion of meaningful projects (Larmer et al., 2015). Distinct from conventional instructional models, PjBL positions the final product as the primary vehicle for achieving learning objectives rather than a mere byproduct of instruction. According to the Buck Institute for Education (2019), high-quality PjBL is characterized by eight core elements: a challenging problem or question, a need to know, student voice and choice, sustained inquiry, authenticity, reflection, critique and revision, and a public product presentation.

A robust body of empirical research confirms the effectiveness of PjBL in comprehensively enhancing student learning outcomes and competencies. A meta-analysis conducted by Condliffe et al. (2017) across sixty studies on PjBL revealed that this model consistently yields higher content comprehension, critical thinking skills, and collaborative capabilities compared to traditional instructional methods. Within the context of Indonesian elementary education, a study by Sari and Hidayat (2022) demonstrated that implementing PjBL in science instruction significantly increased student learning outcomes by 23.4% and learning motivation by 31.7%. Echoing these findings, Fauzi and Widjajanti (2023) reported that integrating PjBL with differentiated instruction accommodates the diverse learning styles and academic needs of students more effectively.

Within the Kurikulum Merdeka framework, PjBL is explicitly emphasized through the Projek Penguatan Profil Pelajar Pancasila (P5, or Project for Strengthening the Pancasila Student Profile), which requires educational institutions to implement cross-curricular project-based learning (Kemendikbudristek, 2022a). This underscores that PjBL is no longer merely an optional methodological choice; rather, it has become an integral national

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educational policy mandate that obligates educators to possess the competence to design and execute authentic, effective project-based instruction.

Pop-Up Books as Instructional Media

A pop-up book is a type of paper-based, three-dimensional instructional medium that utilizes paper engineering techniques, such as folds and cuts, to create illustrations that move, stand, or appear in three dimensions when a page is opened (Bluemel & Taylor, 2012). As an educational tool, pop-up books possess unique characteristics that distinguish them from conventional print media, specifically their ability to present information through a visually rich, interactive format that allows for physical manipulation by the user. According to Sabuda (2012), pop-up books seamlessly integrate narrative elements, illustrations, and tactile interaction into a cohesive medium, thereby fostering an immersive and memorable learning experience for students.

Numerous recent studies have confirmed the instructional efficacy of pop-up books. In a study involving fourth-grade elementary students in Surabaya, Mulyani and Purwanti (2023) found that utilizing pop-up books for ecosystem topics increased conceptual understanding by 42.3% and learning motivation by 38.6% compared to a control group using conventional textbooks. Similarly, research by Anggraini and Septiani (2022) demonstrated that pop-up books created collaboratively by students were significantly more effective at increasing long-term knowledge retention than those used merely as media for passive consumption. This finding implies that the active process of constructing a pop-up book holds pedagogical value equal to, if not greater than, its utility as a static presentation tool.

From the perspective of multimodal learning theory, pop-up books simultaneously activate multiple information-processing channels specifically visual, spatial, and kinesthetic pathways which aligns with Mayer's (2009) Cognitive Theory of Multimedia Learning (CTML). This theory posits that learning designs leveraging concurrent verbal and visual representations produce a deeper conceptual understanding than instruction relying on a single modality. Within the context of landform topics, pop-up books can represent topographic characteristics in a three-dimensional visual space that conventional two-dimensional media cannot replicate, making them a highly potent tool for helping third-grade students build robust and accurate conceptual frameworks.

Growth Mindset within the Instructional Context

The concept of a growth mindset, introduced by Dweck (2006) following over three decades of longitudinal research, refers to an individual's belief that intelligence and abilities are malleable qualities that can be developed through dedication, hard work, and learning from failure. Conversely, a fixed mindset reflects the belief that capabilities are static and cannot be substantially altered. Dweck (2006) demonstrated that an individual's mindset orientation exerts a profound influence on their response to challenges, persistence through obstacles, and long-term motivational trajectories.

Within educational settings, research by Yeager and Dweck (2020) confirms that students possessing a growth mindset exhibit higher academic performance, stronger resilience against setbacks, and greater intrinsic motivation compared to their fixed-mindset peers. Furthermore, a neuroscientific study conducted by Moser et al. (2011)

provided empirical evidence that a growth mindset literally shapes how the brain processes errors: individuals with a growth mindset demonstrate heightened neural activity in response to mistakes, indicating active cognitive engagement in learning from failure. Within the context of project-based learning (PjBL), such as a pop-up book construction project, students are naturally confronted with a series of technical and conceptual challenges, spanning design planning, material selection, and product revision. Consequently, these challenges serve as an ideal pedagogical vehicle for cultivating growth mindset dispositions.

Research by Rissanen et al. (2019) regarding growth mindset interventions in elementary schools indicates that instructional approaches that explicitly celebrate the learning process, praise effort over performance outcomes, and provide constructive formative feedback are effective in shifting students' mindset orientations from fixed to growth. In the context of Indonesian elementary education, Prasetyo and Utaminingsih (2023) reported that integrating growth mindset principles into project-based learning significantly enhanced students' learning resilience and mitigated anxiety when confronting challenging tasks. These findings underscore the critical importance of treating the psychological dimension of a growth mindset as a systematically and intentionally designed learning outcome, rather than an incidental byproduct expected to occur naturally. For the purposes of this study, students' growth mindset foundation was operationalized through five observable indicators adapted from Dweck (2006) and Rissanen et al. (2019): (1) not giving up easily when facing difficulties, (2) willingness to try again after making mistakes, (3) openness to accepting criticism and suggestions from teachers or peers, (4) demonstrating effort and perseverance in completing tasks, and (5) expressing the belief that ability can be developed through effort. These five indicators can further be grouped into three broader dimensions that are commonly used in the growth mindset literature, namely persistence in the face of challenges, responses to obstacles or failure, and willingness to revise one's work based on feedback (Dweck, 2006; Rissanen et al., 2019). These three dimensions provided the theoretical basis for the structured observation instrument used in this study (see Table 2), ensuring that the psychological construct of growth mindset was measured through concrete, observable classroom behaviors rather than through self-report alone, thereby reducing the risk of response bias among young children who may not yet be able to accurately introspect and report on their own motivational states.

Landform Topics within Third-Grade IPAS Instruction

A landform refers to the physical configuration of the Earth's surface, encompassing diverse natural features such as mountains, lowlands, plateaus, coasts, valleys, and rivers along with the ecological and socio-economic characteristics inherent to each (Zonneveld, 2012). Within the third-grade IPAS curriculum, as outlined in the Learning Outcomes (Capaian Pembelajaran) of the Kurikulum Merdeka, instruction on Indonesian landforms extends beyond the mere identification of geomorphological features. It actively requires students to understand the interplay between landform characteristics and the livelihoods or professions of the communities residing within those regions (Kemendikbudristek, 2022b). This conceptual complexity necessitates an instructional approach capable of

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fostering relational comprehension rather than a superficial, rote memorization of factual data.

Research by Hendrawati and Rosyidi (2022) regarding landform instruction in third-grade elementary classrooms identified several prevalent learning difficulties. These include challenges in distinguishing the visual characteristics between different types of landforms, an inability to logically connect topographical features with local economic activities, and a lack of comprehension regarding the geographical distribution of landforms across the Indonesian archipelago. These difficulties stem largely from the limitations of conventional instructional media, which typically rely on static, two-dimensional textbook images that lack interactive exploratory elements. The utilization of physically manipulative three-dimensional media, such as pop-up books, is projected to mitigate these limitations by providing more accurate spatial representations and a more engaging learning experience for students.

Literature Synthesis and Research Gaps

A comprehensive review of the aforementioned literature reveals three broad areas of scholarly consensus relevant to this study. First, there is a robust consensus that Project-Based Learning (PjBL) consistently yields superior learning outcomes compared to conventional instruction, particularly regarding conceptual comprehension and the cultivation of 21st-century skills (Condliffe et al., 2017; Fauzi & Widjajanti, 2023; Sari & Hidayat, 2022). Second, the utilization of three-dimensional, multi-sensory instructional media including pop-up books is empirically proven to support conceptual understanding among elementary school students operating within the concrete operational stage (Mayer, 2009; Mulyani & Purwanti, 2023; Nurhayati & Afriansyah, 2021). Third, fostering a growth mindset is recognized as a crucial psychological learning dimension that must be explicitly integrated into educational interventions to achieve a sustainable, long-term impact (Dweck, 2006; Prasetyo & Utaminingsih, 2023; Yeager & Dweck, 2020).

Nevertheless, this literature review also exposes several significant empirical lacunae. First, research specifically examining the integration of pop-up book construction projects with landform topics for third-grade students under the Kurikulum Merdeka framework remains critically scarce, despite the substantial pedagogical synergy this combination offers. Second, the vast majority of existing studies focus exclusively on cognitive learning outcomes, neglecting to explicitly measure or analyze how such projects contribute to the formation of a growth mindset as an equally vital psychological outcome. Third, scholarly inquiries that integrate learning-style-based differentiated instruction strategies into the design of pop-up book creation projects are notably absent from the reviewed literature, even though accommodating diverse student learning modalities is an explicit mandate of the Kurikulum Merdeka (Kemendikbudristek, 2022b; Wahyuni et al., 2023). Collectively, these identified gaps provide a compelling justification for conducting the present study.

Conceptual Framework and Research Questions

Based on the preceding literature synthesis, this study establishes a conceptual framework that integrates four primary constructs: (1) the learning characteristics of third-grade students operating within the concrete operational stage (Piaget, 1952); (2) Project-Based

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Learning (PjBL) as a pedagogical framework that drives active engagement and knowledge construction through real-world projects (Larmer et al., 2015); (3) pop-up books as project artifacts leveraging interactive, three-dimensional visual representations aligned with the principles of the Cognitive Theory of Multimedia Learning (Mayer, 2009); and (4) a growth mindset as a psychological outcome expected to develop through the challenges and iterative processes of project construction (Dweck, 2006). These four constructs are interconnected through hypothesized causal pathways, wherein the implementation of PjBL via a pop-up book project on landform topics is predicted to simultaneously enhance integrated science and social studies (IPAS) learning outcomes and strengthen the foundation of students' growth mindsets.

Furthermore, this conceptual framework accounts for a specific implementation context: the students of Grade III B at SDN 057 Palembang, who exhibit diverse visual, auditory, and kinesthetic learning styles. Differentiated instruction strategies are integrated into the project design to ensure optimal engagement for all students according to their distinct learning modalities. Consequently, this study aims not only to generate effective instructional designs and artifacts but also to offer deeper theoretical insights into the precise mechanisms through which PjBL, pop-up media, and growth mindset cultivation converge within elementary-level IPAS instruction in Indonesia. Driven by the identified research gaps and the established conceptual framework, this study is formulated to address the following research questions:

1. How does the implementation of Project-Based Learning through a landform-themed pop-up book construction project improve the IPAS learning outcomes of Grade III B students at SDN 057 Palembang?
2. In what ways does the process of designing, constructing, and presenting a Pop-Up Book that is created directly by the students themselves as their own group project product, rather than one that is used by the teacher merely as a ready-made instructional medium, as a vehicle for project-based learning, contribute to fostering a growth mindset foundation among Grade III B students at SDN 057 Palembang?

METHOD

This research is a Classroom Action Research (CAR) study adopting the cyclical model proposed by Kemmis and McTaggart (1988), which consists of four iterative stages: planning, acting, observing, and reflecting. The CAR approach was selected because it aligns with the research objectives, namely to systematically improve the learning process and outcomes through planned and reflective actions (Arikunto et al., 2015). This research was planned to be conducted over a maximum of two cycles, with each cycle comprising two meetings (2 × 35 minutes per meeting), following standard CAR procedure in which a subsequent cycle is implemented only if the predetermined success criteria (Table 3) have not yet been met in the preceding cycle. In this study, all success criteria were achieved by the end of Cycle I; consequently, a second cycle was not required, and Cycle I, which comprised Meeting 1 and Meeting 2, constituted the complete implementation reported in this article.

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Table 1. Design of the Classroom Action Research Cycle

Meeting	Activity	Observation Focus
Meeting 1 (2 x 35 minutes)	Introduction to landscape material & design planning	Collaboration activities and initial growth mindset indicators
Meeting 2 (2 x 35 minutes)	Physical construction of the Pop-Up Book, Pop-Up Book presentation, reflection	Improvement in learning outcomes, final growth mindset indicators

Source: Adapted from Kemmis and McTaggart (1988)

The research was conducted in class III B of SDN 57 Palembang during the even semester of the 2025/2026 academic year. The research subjects were all 26 students in class III B (12 males and 14 females), aged 8–9 years. The subjects were determined using a purposive technique, given that this class had been identified as experiencing problems with low learning outcomes in Science and Social Studies (IPAS), particularly on the topic of natural landscapes, based on the results of initial observations and diagnostic score data. The researcher acted as an observer, while the classroom teacher served as the instructor.

In each cycle, the planning stage includes developing a PjBL-based Teaching Module, creating a Pop-Up Book project worksheet, designing assessment instruments, and preparing project materials. The implementation stage applies the six PjBL syntax steps according to the Buck Institute for Education (2019), namely: (1) presenting a driving question about the diversity of Indonesia's landscapes; (2) collaboratively planning the project in heterogeneous groups; (3) creating a project completion schedule; (4) monitoring project progress by the teacher accompanied by formative feedback; (5) assessing the Pop-Up Book product; and (6) evaluating the learning experience through reflection. Learning differentiation is implemented by assigning roles within groups based on students' learning modalities (visual, auditory, and kinesthetic), so that each group member can contribute optimally according to their strengths.

Data collection was conducted using four complementary techniques. First, written tests in the form of a pre-test (diagnostic score) and post-tests at each meeting to measure the improvement in IPAS (Natural and Social Sciences) learning outcomes. The test instruments were developed based on the IPAS Learning Outcomes (CP) for Grade III under the Merdeka Curriculum, covering aspects of identifying types of landscapes and the relationship between landscapes and people's livelihoods, with a Learning Objective Achievement Criterion (KKTP) of 75. Second, structured observation using an observation sheet with a 1–4 scale to record learning activities and early indicators of students' growth mindset foundations, including aspects of persistence in facing technical challenges, willingness to revise work based on feedback, and responses to failure or mistakes during the project-making process (Dweck, 2006; Rissanen et al., 2019). Third, product assessment using a holistic rubric covering four aspects, namely the accuracy of landscape content, design creativity, the technical quality of three-dimensional construction, and presentation skills. Fourth, documentation through field notes and activity photographs to support data triangulation.

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Table 2. Data Collection Techniques and Instruments

Technique	Instrument	Data Obtained
Written test	Pre-test & post-test questions (multiple choice & essay)	IPAS learning outcome scores on landscape material
Observation	Structured observation sheet (scale 1–4)	Learning activities & growth mindset indicators (persistence, response to obstacles, willingness to revise)
Documentation	Field notes, activity photographs	Learning process & growth mindset development

Source: Designed by the researcher

Data were analyzed using a mixed-methods approach. Quantitative data in the form of learning outcome scores were analyzed by calculating the class average score and the classical mastery percentage at each assessment stage. The improvement in learning outcomes was measured by comparing the diagnostic score, the Meeting 1 post-test score, and the Meeting 2 post-test score, all within Cycle I. Qualitative data from observation sheets and field notes were analyzed descriptively following the Miles and Huberman (1994) model, comprising the stages of data reduction, data display, and conclusion drawing. The credibility of the data was ensured through source triangulation (tests, observations, product assessments, and documentation) as well as method triangulation.

The research is declared successful if all the action success criteria listed in Table 3 are met. If these criteria have not been achieved by the end of Cycle I, the research will proceed to the next cycle with improvements to the learning design based on the results of reflection.

Table 3. Action Success Kriteria

Aspect	Success Indicator	Target
Science Learning Outcomes	Percentage of students achieving the Minimum Competency Completion Threshold (KKTP ≥ 75)	≥ 75% of total students
Class Average Score	Mean post-test score	≥ 75
Learning Activity	Mean score on the learning activity observation sheet	Minimum "Good" category (≥ 75%)
Growth Mindset Foundation	Mean score of growth mindset indicators from observation	Improvement from Meeting 1 to Meeting 2 (within Cycle I)

Source: Adapted from the KKTP criteria of SDN 57 Palembang and Arikunto et al. (2015)

FINDINGS

This results section presents the findings obtained from the analysis of the learning outcome data of Class III B students at SDN 057 Palembang on the topic of Landscapes through the implementation of Project Based Learning (PjBL) with a Pop-Up Book-making project. The data were analyzed to answer two research questions, namely: (1) how the implementation of PjBL through a Pop-Up Book-making project on landscapes can improve students' IPAS learning outcomes, and (2) how the Pop-Up Book-making project, as a

vehicle for project-based learning, contributes to the formation of the foundations of students' growth mindset.

Improvement of Students' IPAS Learning Outcomes Through the Pop-Up Book Project

The implementation of Project Based Learning through a landscape-themed Pop-Up Book-making project was carried out over two meetings within Cycle I. At each meeting, students were guided to design, construct, and present a Pop-Up Book depicting various types of landscapes and their characteristics. Learning outcome data were obtained from the diagnostic (pretest) score before the lesson, as well as from the scores in Meeting 1 and Meeting 2 after the project implementation.

The analysis results show a gradual increase in students' average scores from the diagnostic stage to Meeting 2. At the diagnostic stage, the class average was 68.85, with a mastery percentage of 42.31% (11 of 26 students achieved the KKTP). After the implementation of Meeting 1, the class average increased to 77.69, with a mastery percentage of 76.00% (19 of 25 students present). At Meeting 2, the class average increased further to 81.35, with the mastery percentage reaching 80.00% (20 of 25 students). The complete comparison of students' learning outcomes is presented in Table 4.

Table 4. Students' Learning Outcomes Improvement (Diagnostic, Meeting 1, and Meeting 2)

Infomation	Diagnostic	Meeting 1	Meeting 2
Mean Score	68,85	77,69	81,35
Highest Score	90	100	100
Students Meeting KKTP	11	19	20
Students Not Meeting KKTP	15	6	5
Completion Rate	42,31%	76,00%	80,00%

Source: Researcher's Processed Data

Based on Table 4, it can be seen that the improvement in students' learning outcomes occurred consistently at each learning stage. The average increase from the diagnostic stage to Meeting 1 was 8.84 points, while from Meeting 1 to Meeting 2 there was an increase of 3.66 points. Overall, there was an average increase of 12.5 points from the diagnostic stage to Meeting 2. The highest score achieved by students also increased from 90 at the diagnostic stage to 100 at Meeting 1, and remained consistent at 100 in Meeting 2.

In addition, the number of students who achieved the Learning Objective Achievement Criterion (KKTP) with a minimum score of 75 also increased significantly, from 11 students at the diagnostic stage to 19 students at Meeting 1, and further increasing to 20 students at Meeting 2. Conversely, the number of students who had not yet achieved the KKTP decreased from 15 students to 6 students at Meeting 1, and to 5 students at Meeting 2. The improvement in the learning outcomes of Class III B students can be visualized in the form of a diagram in Figure 1.

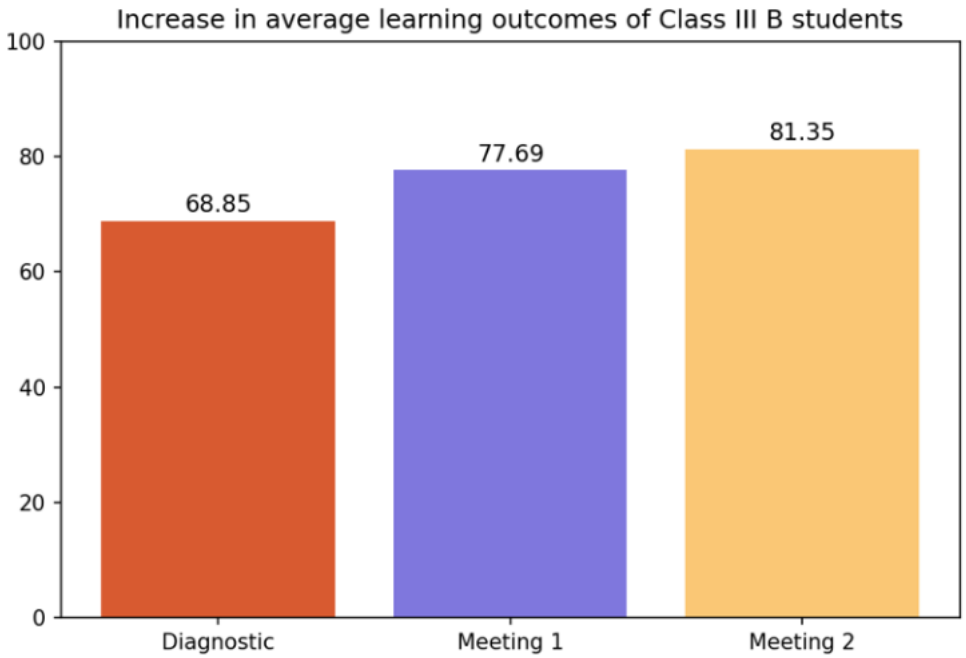


Figure 1. Diagram of the Increase in the Average Learning Outcomes of Class III B Students

Based on Figure 1, it can be seen that there was a consistent upward trend in students' average learning outcomes from the diagnostic stage, to Meeting 1, and to Meeting 2. This indicates that the implementation of Project Based Learning through the landscape Pop-Up Book-making project had a positive impact on the understanding of IPAS concepts among Class III B students at SDN 057 Palembang. Students who, at the diagnostic stage, had largely not yet achieved the KKTP, showed improved understanding of the landscape material after actively engaging in the design and creation of the Pop-Up Book in Meeting 1 and Meeting 2, particularly in identifying types of landscapes and their characteristics.

During the project work process, students engaged in drawing, cutting, gluing, and arranging the layers of the Pop-Up Book depicting natural features such as mountains, plains, beaches, and rivers. These activities not only trained students' motor skills but also strengthened their conceptual understanding, as they first had to comprehend the characteristics of each landscape before being able to visualize it in three-dimensional form. This is in line with the principles of project-based learning, which emphasize hands-on learning experiences, making the concepts learned more concrete and easier for students to remember.

Contribution of the Pop-Up Book Project to Students' Growth Mindset Foundation

In addition to its impact on cognitive learning outcomes, the implementation of the Pop-Up Book-making project was also observed to contribute to the formation of the growth mindset foundation among Class III B students. Observations of students' attitudes and behaviors were conducted by the researcher and the classroom teacher during the project work process in Meeting 1 and Meeting 2, using an observation sheet covering five growth mindset indicators, namely: (1) not giving up easily when facing difficulties, (2) being willing to try again after making mistakes, (3) accepting criticism and suggestions positively, (4)

showing effort and hard work in completing the project, and (5) believing that ability can develop through effort. The observation results are presented in Table 5.

Table 5. Observation Results of Students' Growth Mindset Indicators

Indikator Growth Mindset	Meeting 1 (%)	Meeting 2 (%)	Category
Persistent in facing difficulties when designing a Pop-Up Book	62,5	84,6	Good
Willing to retry after experiencing errors/failures	58,3	80,8	Good
Receptive to peer and teacher feedback in a constructive manner	66,7	88,5	Very Good
Demonstrates effort and perseverance in completing projects	70,8	92,3	Very Good
Believes that abilities can be developed through effort	54,2	76,9	Good
Mean	62,5	84,6	Very Good

Source: Researcher's and Classroom Teacher's Observation Data

Based on Table 5, it can be seen that all growth mindset indicators showed an increase in percentage from Meeting 1 to Meeting 2. The indicator with the most notable increase was "willing to try again after making a mistake/failure," which rose from 58.3% to 80.8%, followed by the indicator "not giving up easily when facing difficulties in assembling the Pop-Up Book," which rose from 62.5% to 84.6%. On average, the percentage of growth mindset indicators increased from 62.5% in Meeting 1, categorized as Good, to 84.6% in Meeting 2, categorized as Very Good.

In Meeting 1, some students still appeared hesitant and gave up easily when facing difficulties in cutting or assembling the parts of the Pop-Up Book that formed the three-dimensional mechanisms. Several students also tended to ask the teacher for help directly without first attempting to try on their own. However, in Meeting 2, a significant change in attitude was observed, where students were more confident in trying again when their work did not yet meet expectations, more open to accepting input from their group members, and showed greater effort to complete the Pop-Up Book project with better results.

This change in attitude indicates that the Pop-Up Book-making project not only functioned as a learning medium to improve students' understanding of IPAS concepts regarding landscapes, but also served as a vehicle that encouraged students to develop a growth mindset. Through the process of trying, experiencing failure, correcting mistakes, and trying again, students gradually built the belief that abilities and skills can be improved through effort and hard work, rather than being something fixed.

Overall, the research results show that the implementation of Project Based Learning through the landscape Pop-Up Book-making project successfully improved the IPAS learning outcomes of Class III B students at SDN 057 Palembang, as indicated by the increase in the average score and the KKTP mastery percentage from the diagnostic stage to Meeting 2. In addition, this project also made a positive contribution to the formation of students' growth mindset foundation, as indicated by improvements in all attitude

indicators, including persistence in not giving up, willingness to try again, openness to criticism, effort and hard work, and the belief that ability can develop through effort.

DISCUSSION

Implementation of Project Based Learning through Pop-Up Book in Improving IPAS Learning Outcomes

The research findings show that the implementation of Project Based Learning (PjBL) through the landscape-themed Pop-Up Book-making project successfully improved the IPAS learning outcomes of Class III B students at SDN 057 Palembang in a gradual manner, namely from an average of 68.85 at the diagnostic stage to 77.69 at Meeting 1 and 81.35 at Meeting 2, with the KKTP mastery percentage increasing from 42.31% to 80.00%. This improvement indicates that students' active involvement in designing, constructing, and presenting the Pop-Up Book product provided a more concrete learning experience compared to conventional learning that relies solely on verbal explanations and reading texts.

This result is consistent with the findings of Nugroho et al. (2024), who applied PjBL with Pop-Up Book media in IPAS learning on the topic of Nusantara Cultural Heritage in Grade V, where students' learning outcomes increased significantly from Cycle I to Cycle II after the use of this media. Similar findings were also reported in a study on the application of PjBL with Pop-Up Book media on the topic of Flora and Fauna Diversity in Indonesia, where students' average learning outcomes increased from 68.3 in Cycle I to 86.1 in Cycle II, accompanied by an increase in mastery from 50% to 88.9%. The consistent pattern of improvement found in these studies strengthens the argument that the combination of the PjBL approach with visual-manipulative media such as Pop-Up Books consistently contributes to improving IPAS learning outcomes at the elementary school level, not limited to a particular topic or grade level.

The improvement in learning outcomes in this study can be explained through the characteristics of PjBL, which highlight eight essential elements, one of which is inquiry-based learning that stimulates students' curiosity and the use of 21st-century skills such as critical thinking, communication, collaboration, and creativity. In line with this, project-based learning has also been reported to enhance students' self-confidence, motivation to learn, creative ability, and belief in their own capabilities. In the context of this study, the process of creating the landscape Pop-Up Book required students to first understand the characteristics of each natural feature before translating it into a three-dimensional visual form, so that the conceptual understanding built was not merely the result of memorization, but the result of knowledge construction through hands-on experience.

Furthermore, the increase in learning mastery from 42.31% at the diagnostic stage to 80.00% at Meeting 2 indicates that the Pop-Up Book project was effective in accommodating students' learning needs at the concrete operational stage, as emphasized in various studies on the development of Pop-Up Book media for IPAS learning, where three-dimensional visual media has been shown to improve the conceptual understanding of elementary school students who still require concrete representations of abstract concepts. This finding is also relevant to the results of a study on the implementation of PjBL-based media in IPAS learning at SDN Plumpung 1, which showed an improvement in

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the learning outcomes of Grade IV students following the implementation of PjBL assisted by Pop-Up Book media in the 2022/2023 academic year.

Nevertheless, the increase from Meeting 1 to Meeting 2 (3.66 points) was relatively smaller compared to the increase from the diagnostic stage to Meeting 1 (8.84 points). This can be interpreted as an indication that the largest surge in understanding occurred during the initial phase of project introduction, when students first experienced the transition from conventional learning methods to a more active and collaborative project-based learning approach. At Meeting 2, the more moderate increase was likely due to the process of consolidating and refining the understanding that had already been formed previously, so that the improvement tended to slow down while remaining consistently positive. The implication is that a longer project duration or the addition of varied tasks within the Pop-Up Book project could be considered to optimize achievement in subsequent meetings.

The remaining 5 students (20%) who had not yet achieved the KKTP at Meeting 2 also warrant important attention. This condition indicates that although PjBL through the Pop-Up Book project was generally effective, there were variations in individual students' abilities that required further attention, particularly for students with lower initial abilities. This is consistent with findings that the development of learning media based on local wisdom and projects needs to be accompanied by individual support so that all students can achieve the expected learning mastery. Therefore, additional support or remedial activities for students who have not yet achieved mastery represent an important follow-up step so that the benefits of PjBL can be felt equally by all students.

Contribution of the Pop-Up Book Project to Students' Growth Mindset Foundation

The second finding of this study shows that all growth mindset indicators increased from Meeting 1 to Meeting 2, with the average rising from 62.5% (categorized as Good) to 84.6% (categorized as Very Good). The most notable increases occurred in the indicators "willing to try again after making a mistake/failure" (58.3% to 80.8%) and "not giving up easily when facing difficulties" (62.5% to 84.6%). These results illustrate that the Pop-Up Book-making project not only had an impact on students' cognitive aspects, but also on affective aspects in the form of students' attitudes and mindsets toward the learning process itself.

This finding strengthens the view that project-based learning can serve as a vehicle for fostering growth mindset, as projects place students in situations that demand repeated effort, correction of mistakes, and the completion of tasks through to the end. More specifically, the Pop-Up Book medium appears to make a distinctive contribution to this process, one that extends beyond what a generic PjBL project would offer. This distinctive contribution can be explained as follows. A Pop-Up Book relies on precise paper-engineering mechanisms, namely folds, hinges, and pull-tabs that must align correctly in order for the three-dimensional landscape to function as intended. Consequently, students in this study frequently encountered visible, low-stakes construction failures, for example a fold that would not stand upright, a hinge that tore, or a layer that did not open smoothly, and each of these failures had to be diagnosed and corrected immediately in order for the physical product to work as intended. Unlike more abstract or purely written project outputs, in which errors are often invisible or only detectable through teacher assessment, these construction failures in the Pop-Up Book project were immediately visible and physically manipulable. This allowed students to observe, on their own, a direct and tangible link between the corrective effort they invested and the resulting improvement in

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the product. Such a concrete and immediate feedback loop is theorized to function as a key mechanism through which the Pop-Up Book project, specifically, cultivated in students the belief that ability and skill can be improved through effort (Dweck, 2006). This mechanism plausibly distinguishes the contribution of the Pop-Up Book project from that of PjBL projects in general, particularly those that do not involve this kind of iterative, hands-on physical construction and therefore do not offer students the same degree of immediate, self-evident feedback on their own effort. In line with this, a study on the implementation of a growth mindset-based curriculum confirms that the application of a growth mindset-based approach is effective in enhancing students' academic resilience, although the study also noted challenges in the form of students' initial resistance to changing their mindset. A similar pattern was observed in this study, where in Meeting 1 some students still displayed a tendency to give up easily and rely on the teacher's help, but in Meeting 2 this attitude gradually shifted toward greater independence and confidence in trying again.

From the perspective of PjBL elements, this change in attitude is also consistent with the view that project-based learning can help increase student engagement, improve problem-solving skills, and foster student creativity through planning and producing a product within a set time limit, while also building students' self-confidence. The process of creating the Pop-Up Book, which involves the stages of designing, drawing, cutting, gluing, and testing three-dimensional folding mechanisms, naturally presents moments of small failures (such as pieces that do not fit or folds that do not work), which students must then correct either on their own or with the help of group members. This repeated experience is believed to be the growth point for the foundation of a growth mindset, namely the belief that ability can develop through effort rather than being something fixed.

The increase in the indicator "accepting criticism and suggestions from friends/teachers positively" (66.7% to 88.5%) also indicates that group work in the Pop-Up Book project encouraged the formation of a culture of constructive mutual feedback. This is relevant to the characteristics of PjBL, which require students to share skills, collaborate, and reflect together, so that students become more confident in speaking with others, including adults, and experience strengthened social skills. Thus, the contribution of the Pop-Up Book project to growth mindset does not stand alone, but is interrelated with the strengthening of social and collaborative skills, which is also part of the learning objectives of IPAS in the Merdeka Curriculum.

However, the increase in the indicator "believing that ability can develop through effort," which only reached 76.9% at Meeting 2 (up from 54.2%), indicates that this core belief of growth mindset is still in its early stages of formation and has not yet been fully internalized by all students. This is understandable, considering that fostering a growth mindset is a long-term process that cannot be fully achieved through just two learning sessions. The implication is that strengthening growth mindset through similar learning projects needs to be carried out continuously and integrated across various subjects, not only in IPAS learning on the topic of landscapes.

Research Implications

Theoretically, the results of this study reinforce the conceptual framework that PjBL with Pop-Up Book media is effective in improving IPAS learning outcomes while also

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contributing to the formation of the growth mindset foundation of elementary school students, complementing previous findings that generally focused only on improving cognitive learning outcomes or critical thinking skills. Practically, these findings can serve as a reference for Grade III teachers in designing more interactive IPAS learning by utilizing simple manipulative media such as Pop-Up Books, which are relatively easy to make using inexpensive materials available within the school environment.

In terms of policy and curriculum development at the school level, these results support the need to integrate simple product-based projects into IPAS learning under the Merdeka Curriculum, not only to achieve cognitive targets in the form of KKTP mastery, but also to build students' character and mindset in facing learning difficulties. For future research, it is recommended to extend the duration of the cycles, broaden the scope of IPAS material integrated with the Pop-Up Book project, and use more standardized growth mindset instruments so that results can be measured more deeply and compared with a control group.

CONCLUSION

This study demonstrates that the implementation of Project-Based Learning (PjBL) through a landform-themed pop-up book project progressively and consistently improves the integrated science and social studies (IPAS) learning outcomes of Grade III B students at SDN 057 Palembang. This steady improvement, observed from the pre-instructional diagnostic phase to the final project execution, addresses the first research question: active student engagement in designing, constructing, and presenting three-dimensional visual products fosters a more concrete understanding of landform concepts compared to conventional instruction. Beyond cognitive benefits, the pop-up book project significantly contributes to laying a foundation for students' growth mindsets. This is reflected in positive shifts across all observed indicators: resilience when facing difficulties, a willingness to persevere after failure, openness to constructive criticism and feedback, diligence in task completion, and an emerging belief that abilities can be developed through effort. These findings address the second research question, confirming that product-based projects can serve as an effective vehicle for cultivating a growth mindset, even if the internalization process is in its early stages and requires ongoing reinforcement. Overall, these findings underscore that combining a PjBL approach with simple manipulative media, such as pop-up books, yields dual benefits: enhancing academic achievement while simultaneously strengthening student character and mindset. This dual impact aligns closely with the objectives of IPAS instruction within the *Kurikulum Merdeka* framework, which prioritizes holistic competency and student profile development over mere cognitive learning outcomes. Practically, these insights offer a valuable reference for third-grade teachers and other elementary educators in designing interactive, contextualized, low-cost, and easily implemented IPAS lessons using accessible school environment materials. Furthermore, institutional policymakers can leverage these findings to systematically integrate product-based projects into the curriculum. Given that a segment of students did not achieve full mastery and certain growth mindset indicators require further optimization, future research should consider extending the project duration and the number of implementation cycles. Subsequent studies could also expand this framework to other IPAS topics and grade levels, incorporate

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individualized scaffolding for lower-achieving students, and utilize standardized growth mindset instruments to measure mindset development more deeply alongside a control group comparison.

ACKNOWLEDGEMENT OF ARTIFICIAL INTELLIGENCE (AI) USE

During the preparation of this manuscript, the authors used an AI tool (Grammarly) for language editing and grammar checking. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the accuracy, originality, integrity, and validity of the manuscript.

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