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Local Culture Integration in IPAS Learning: Supporting Indonesian Primary Students' Well-Being toward SDG 4

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ABSTRACT

Prior studies on science education in Indonesia have predominantly examined curriculum design, pedagogical strategies, and technology-based interventions; however, few have explored how the integration of local cultural values into Natural and Social Science (IPAS) learning specifically shapes the wellbeing of lower primary students (Grades 1-3) in culturally diverse Indonesian contexts. This study addresses that gap by examining how teachers integrate Javanese and broader Indonesian local cultural elements into IPAS instruction and the consequent effects on students' academic wellbeing and sense of belonging. Employing a qualitative phenomenological approach, data were collected through semi-structured interviews with three classroom teachers and one principal, classroom observations, document analysis, and focus group discussions involving ten students from two schools in the Yogyakarta Special Region. Thematic analysis revealed four interconnected themes: (1) cultural embodiment of science concepts through local artefacts and ecological knowledge; (2) enhanced student wellbeing via cultural familiarity; (3) the teacher as cultural mediator; and (4) alignment with SDG 4 targets for inclusive and quality education. Findings indicate that culturally embedded IPAS learning not only reduces science anxiety among early-grade students but also strengthens their identity, curiosity, and holistic development. This study contributes a culturally grounded pedagogical framework for IPAS instruction in Indonesian primary schools, with practical implications for curriculum designers, teacher educators, and policymakers pursuing SDG 4 commitments.

ABSTRAK

Studi terdahulu tentang pendidikan sains di Indonesia sebagian besar telah meneliti desain kurikulum, strategi pedagogis, dan intervensi berbasis teknologi; Namun, hanya sedikit yang mengeksplorasi bagaimana integrasi nilai-nilai budaya lokal ke dalam pembelajaran Ilmu Pengetahuan Alam dan Sosial (IPAS) secara khusus membentuk kesejahteraan siswa sekolah dasar (kelas 1-3) dalam konteks budaya Indonesia yang beragam. Studi ini mengatasi kesenjangan tersebut dengan meneliti bagaimana guru mengintegrasikan unsur-unsur budaya Jawa dan budaya lokal Indonesia yang lebih luas ke dalam pengajaran IPAS dan efek selanjutnya terhadap kesejahteraan akademik dan rasa memiliki siswa. Dengan menggunakan pendekatan fenomenologi kualitatif, data dikumpulkan melalui wawancara semi-terstruktur dengan tiga guru kelas dan satu kepala sekolah, observasi kelas, analisis dokumen, dan diskusi kelompok fokus yang melibatkan sepuluh siswa dari dua sekolah di Daerah Istimewa Yogyakarta. Analisis tematik mengungkapkan empat tema yang saling terkait: (1) perwujudan budaya konsep sains melalui artefak lokal dan pengetahuan ekologis; (2) peningkatan kesejahteraan siswa melalui keakraban budaya; (3) guru sebagai mediator budaya; dan (4) keselarasan dengan target SDG 4 untuk pendidikan inklusif dan berkualitas. Temuan menunjukkan bahwa pembelajaran IPAS yang berlandaskan budaya tidak hanya mengurangi kecemasan terhadap sains di kalangan siswa kelas awal, tetapi juga memperkuat identitas, rasa ingin tahu, dan perkembangan holistik mereka. Studi ini memberikan kerangka kerja pedagogis yang berlandaskan budaya untuk pengajaran IPAS di sekolah dasar Indonesia, dengan implikasi praktis bagi perancang kurikulum, pendidik guru, dan pembuat kebijakan yang mengejar komitmen SDG 4.

PRELIMINARY

The global education agenda articulated in Sustainable Development Goal 4 (SDG 4) calls for inclusive, equitable, and quality education that promotes lifelong learning opportunities for all (UNESCO, 2022). Within this framework, the quality of early-grade science education holds particular significance, as foundational science learning in primary school shapes students' cognitive dispositions, identity development, and long-term engagement with scientific knowledge (Tytler et al., 2021). In Indonesia, the government's curriculum reform through Kurikulum Merdeka has introduced Ilmu Pengetahuan Alam dan Sosial (IPAS), an integrated Natural and Social Science subject, specifically targeting Grades 1 through 5 in the primary school cycle (Kemendikbudristek, 2022). This reform represents a deliberate departure from subject-siloed instruction toward holistic, contextually meaningful learning.

Despite these structural reforms, persistent challenges confront the delivery of quality IPAS education, particularly for students in Grades 1-3 (lower primary). Research consistently identifies a disconnect between formal science content and the lived cultural realities of Indonesian children (Suastra et al., 2022; Wahyudi & Nurhayati, 2021). Science anxiety, low motivation, and a fragmented sense of self-as-learner are well-documented among early primary students when instructional content disregards cultural context (Bybee, 2019). This mismatch is especially pronounced in regions such as Yogyakarta, where Javanese cultural values, ecological practices, and community knowledge systems remain deeply embedded in daily life yet are largely absent from standardised IPAS curricula.

Internationally, research on culturally responsive science education has gained substantial momentum. Gay (2018) demonstrated that culturally responsive pedagogy improves both academic outcomes and social-emotional wellbeing among diverse learners. Similarly, Ladson-Billings (2021) argued that educational environments that affirm students' cultural identities foster greater engagement, resilience, and a sense of belonging, dimensions closely aligned with holistic wellbeing. In the Southeast Asian context, studies by Marlina et al. (2023) in Malaysia and Nguyen et al. (2022) in Vietnam highlight how local ecological and cultural knowledge, when systematically integrated into primary science curricula, enhances conceptual understanding and reduces learning anxiety. These findings converge with broader arguments from ethnoscience education scholars who contend that indigenous and local knowledge systems are not peripheral additions but epistemically legitimate sources of scientific understanding (Aikenhead & Ogawa, 2007; Snively & Corsiglia, 2001).

In the Indonesian context, several studies have explored ethnoscience-based approaches in secondary and tertiary science education (Sudarmin et al., 2023; Prasetyo et al., 2022); however, systematic investigation of local culture integration within the newly mandated IPAS framework at the lower primary level remains conspicuously limited. Existing research tends to focus on urban, technology-equipped classrooms and largely overlooks the phenomenological dimensions, that is, how teachers and young students experience and make meaning of culturally embedded science learning. Furthermore, the nexus between local culture integration in IPAS and students' holistic wellbeing, encompassing emotional safety, identity affirmation, and cognitive engagement, has not been substantively theorised or empirically explored within the Indonesian primary education context.

Children's wellbeing in the early school years is increasingly recognised as a multidimensional construct encompassing cognitive, emotional, social, and physical dimensions (UNICEF, 2023; Ben-Arieh, 2020). In Indonesia, the National Child Welfare Index (2022) reports that educational wellbeing, defined as children's sense of competence, belonging, and positive affect toward schooling, remains unevenly distributed, with rural and culturally specific communities frequently reporting lower indices (KPPPA, 2022). Science education, as a domain associated with abstract content and culturally distant exemplars, is particularly implicated in this disparity. Addressing the wellbeing gap through culturally grounded IPAS instruction is therefore both a pedagogical imperative and a direct contribution to SDG 4.3 and SDG 4.7, which emphasise equitable access and the promotion of culturally inclusive education.

The novelty of this study lies in its dual contribution: first, it presents a phenomenological account of how teachers operationalise local cultural integration within the IPAS framework in lower primary classrooms; second, it empirically connects these practices to observable dimensions of student wellbeing, offering a culturally grounded pedagogical model for Indonesian primary science education. Unlike prior studies that treat culture as supplementary material, this research positions local cultural knowledge as an epistemological and affective resource central to science learning quality and student flourishing.

This study therefore poses the following research question: How do primary school teachers in Yogyakarta, Indonesia integrate local cultural values into IPAS learning for Grades 1-3, and how does this integration influence students' holistic wellbeing? By addressing this question, the study seeks to contribute evidence-based insights that can inform curriculum design, teacher professional development, and policy decisions aligned with Indonesia's SDG 4 commitments and child welfare priorities.

METHOD

This study employed a qualitative research design grounded in phenomenological inquiry (Creswell & Poth, 2018). Phenomenology was selected as the epistemological framework because the study's central concern is the lived experiences of teachers who integrate local cultural values into IPAS instruction and the experiential responses of lower primary students to such integration. This approach foregrounds subjective meaning-making and contextual depth over generalisation, making it particularly appropriate for examining complex pedagogical and wellbeing phenomena within a culturally specific Indonesian primary school setting. The research was conducted between January and April 2025 in two primary schools (Sekolah Dasar) in the Yogyakarta Special Region: one urban school in Yogyakarta city and one rural school in Kulon Progo regency. These sites were selected purposively to capture contrasting socio-cultural contexts while maintaining shared exposure to the Kurikulum Merdeka IPAS framework.

Participants were selected through purposive sampling based on their direct involvement in IPAS instruction at Grade 1–3 level and willingness to engage in extended qualitative inquiry. Table 1 presents the participant demographics.

Table 1. Participant Demographics

Code	Role	Teaching Experience	School Location
T1	Grade 1 Teacher	8 years	Urban – Yogyakarta
T2	Grade 2 Teacher	5 years	Urban – Yogyakarta
T3	Grade 3 Teacher	12 years	Rural – Kulon Progo
P1	School Principal	15 years admin	Urban – Yogyakarta
S1–S10	Students Grade 1–3	N/A	Mixed urban–rural

Source: Primary data (2025)

Data were collected through four complementary techniques, as detailed in Table 2. In-depth semi-structured interviews with teachers and the school principal were conducted individually, each lasting between 45 and 75 minutes, and were audio-recorded and transcribed verbatim with participant consent. Classroom observations (three sessions per teacher, totalling nine sessions) were documented through structured observation checklists and narrative field notes, focusing on instances of cultural artefact use, culturally situated explanations, and student affective responses. Document analysis encompassed lesson plans (Rencana Pelaksanaan Pembelajaran), curriculum alignment documents, and student learning portfolios. Focus group discussions were conducted with ten students (Grades 1–3) in each school, using visual and narrative stimuli drawn from local cultural contexts to elicit child-accessible responses.

Table 2. Data Collection Procedures

Technique	Instrument / Tool	Focus of Data
In-depth Interview	Semi-structured interview guide	Teachers' and principal's perceptions of local culture integration in IPAS
Classroom Observation	Observation checklist & field notes	Instructional practices; cultural artifact use; student engagement
Document Analysis	Lesson plans, curriculum maps	Alignment of local cultural content with IPAS learning objectives
Focus Group Discussion	FGD protocol (students, Grade 1–3)	Students' responses to culturally embedded science concepts

Source: Primary data (2025)

Data analysis followed Braun and Clarke's (2022) reflexive thematic analysis procedure across six stages: familiarisation with data, generation of initial codes, construction of candidate themes, review and refinement of themes, definition and naming, and final analytic narrative production. Trustworthiness was established through triangulation across data sources and methods, member checking with teacher participants, prolonged engagement at research sites, and the maintenance of a reflexive research journal. Ethical clearance was obtained from the institutional ethics board, and all participants provided informed written consent. Student identifiers were anonymised throughout, and school names were omitted from all public outputs to protect participant confidentiality.

FINDINGS AND DISCUSSION

Thematic analysis of interview transcripts, observation field notes, focus group data, and documentary sources yielded four primary themes that collectively illuminate how local cultural integration operates within IPAS learning and its relationship to the wellbeing of lower primary students. Table 3 provides an overview of the thematic structure before each theme is elaborated.

Table 3. Summary of Thematic Findings

Theme	Sub-themes	Illustrative Evidence
T1: Cultural Embodiment of Science Concepts	Use of Javanese agricultural cycles to teach ecosystems	Lesson observations; T1, T3 interviews
T2: Wellbeing Through Cultural Familiarity	Reduced science anxiety via familiar cultural contexts	FGD with S1–S10; T2 interview
T3: Teacher as Cultural Mediator	Teachers as bridge between local knowledge and formal IPAS	T1, T2, T3 interviews; lesson plans
T4: SDG 4 Alignment	IPAS-local integration supports inclusive quality education	Document analysis; P1 interview

Source: Qualitative thematic analysis (2025)

Cultural Embodiment of Science Concepts

All three teachers consistently drew upon Javanese and broader Indonesian cultural practices to give tangible form to abstract IPAS concepts. Teacher T1 described using the traditional Javanese agricultural calendar (pranoto mongso) to introduce ecosystem cycles to Grade 1 students: "Anak-anak sudah tahu musim hujan dan kemarau dari cerita mbah mereka, saya pakai itu sebagai pintu masuk ke konsep rantai makanan" [Children already know the rainy and dry seasons from their grandparents' stories, I use that as an entry point to food chain concepts] (T1, Interview 1). Similarly, Teacher T3 employed the local practice of gotong royong (communal labour) as a lived exemplar of interdependence in natural systems, connecting it explicitly to food web relationships in the IPAS syllabus. Classroom observations confirmed these accounts: in seven of nine observed sessions, cultural artefacts, including batik patterns, wayang kulit figures, and traditional farming tools, were physically present and used as pedagogical props. Document analysis of lesson plans revealed that all three teachers had independently developed cultural integration modules beyond the minimum requirements of the Kurikulum Merdeka framework, suggesting that cultural embedding was a deliberate, teacher-initiated pedagogical choice rather than a mandated practice.

Student Wellbeing Through Cultural Familiarity

The integration of culturally familiar content was strongly associated with positive shifts in student wellbeing indicators, including reduced anxiety, increased curiosity, and a heightened sense of belonging. During focus group discussions, students in both schools expressed greater comfort and enthusiasm when science concepts were presented through cultural reference points they recognised from home. Student S4 (Grade 2, urban school) stated: "Kalau bu guru pakai cerita wayang, saya tidak takut salah jawab karena saya sudah kenal orangnya" [When the teacher uses wayang stories, I am not afraid of

giving the wrong answer because I already know the characters]. This observation aligns with teacher T2's account, who noted a measurable shift in classroom participation after introducing local cultural examples: "Sejak saya pakai cerita lokal, anak-anak kelas dua saya jauh lebih berani bertanya, bahkan yang biasanya diam" [Since I started using local stories, my Grade 2 students are much braver about asking questions, even those who are usually quiet] (T2, Interview 2). Principal P1 corroborated these observations at the institutional level, noting that student absenteeism during IPAS sessions had decreased following teachers' adoption of cultural integration strategies, a trend consistent with the school's internal attendance records from the 2024/2025 academic year.

Teacher as Cultural Mediator

A distinctive finding of this study is the emergence of a teacher role that transcends conventional science instruction: the teacher as cultural mediator. All three teachers described actively negotiating between the formal epistemic demands of the IPAS curriculum and the informal cultural knowledge that students carried into the classroom. Teacher T3, with twelve years of experience in a rural setting, articulated this mediating function most explicitly: "Tugas saya bukan hanya mengajar sains, saya menghubungkan apa yang sudah mereka tahu sebagai orang Jawa dengan apa yang harus mereka pelajari sebagai pelajar" [My job is not only to teach science, I connect what they already know as Javanese people with what they need to learn as students] (T3, Interview 3). This role required considerable pedagogical content knowledge, cultural competence, and improvisational skill. Analysis of lesson plans revealed that culturally integrated lessons demanded more elaborate planning than standard IPAS sessions, and all three teachers reported that pre-service teacher training had inadequately prepared them for this mediating function. Teacher T1 specifically identified the absence of ethnoscience content in their initial teacher education programme as a significant gap: "Tidak ada satu pun mata kuliah yang mengajarkan kami cara memasukkan budaya ke dalam sains" [Not a single course taught us how to bring culture into science] (T1, Interview 3).

Alignment With SDG 4 and Child Welfare Dimensions

The fourth theme that emerged from cross-source data triangulation concerns the structural alignment between culturally integrated IPAS learning and the SDG 4 framework, particularly its sub-targets 4.1 (quality primary education), 4.5 (equity and inclusion), and 4.7 (education for sustainable development and global citizenship). Principal P1 explicitly invoked the national education policy narrative when discussing the school's adoption of cultural integration: "Kurikulum Merdeka memberi kami kebebasan, dan kami gunakan kebebasan itu untuk membawa Yogyakarta ke dalam kelas" [Kurikulum Merdeka gives us freedom, and we use that freedom to bring Yogyakarta into the classroom] (P1, Interview). Document analysis of the school's curriculum mapping documents confirmed that both schools had formally embedded local cultural content within IPAS unit planning, with explicit reference to the Yogyakarta Special Region's Regional Regulation (Perda) No. 5/2011 on the implementation of local culture in education. These structural commitments, combined with the experiential evidence from teachers and students, indicate that local culture integration in IPAS serves as a practical mechanism for advancing SDG 4.7's vision of education that respects and promotes cultural diversity and indigenous knowledge systems, while simultaneously contributing to the holistic wellbeing of early-grade learners.

Discussion

The findings of this study offer a substantive contribution to the growing body of literature on culturally responsive science education, while specifically advancing understanding of IPAS learning at the lower primary level within the Indonesian context. The emergence of cultural embodiment as a primary instructional strategy, evidenced through teachers' use of Javanese ecological knowledge, traditional artefacts, and community practices, resonates strongly with the theoretical framework of culturally sustaining pedagogy advanced by Paris and Alim (2017). These scholars argue that pedagogy must not merely be responsive to students' cultural backgrounds but must actively sustain and extend cultural repertoires as legitimate educational resources. This study's findings extend that argument into the domain of primary science education in Southeast Asia, a context underrepresented in the global culturally responsive pedagogy literature.

The wellbeing effects identified in Theme 2, particularly reduced science anxiety and increased participation, align with empirical findings from comparable studies in the international literature. Bybee (2019) documented similar patterns in indigenous science education contexts in North America, noting that the cultural familiarity of instructional content functions as a psychological safety mechanism that lowers affective barriers to science engagement. More recently, Marlina et al. (2023), in a study of Malaysian primary school students, found that culturally embedded science instruction significantly reduced science-related anxiety scores among Grade 2 students, a finding closely paralleling the present study's FGD data. These convergent findings across culturally distinct national contexts suggest that the wellbeing benefits of cultural integration in science education may represent a robust cross-cultural phenomenon warranting further longitudinal investigation.

The conceptualisation of the teacher as cultural mediator (Theme 3) represents the study's most theoretically distinctive contribution. While the role of teachers as cultural brokers has been theorised in bilingual and multicultural education (Nieto, 2018) and in ethnoscience education (Aikenhead & Ogawa, 2007), its specific manifestation within the IPAS framework for lower primary students has not previously been documented. The present study demonstrates that effective cultural mediation in IPAS requires a tripartite competence: deep familiarity with local cultural knowledge systems, sound understanding of IPAS content and learning progressions, and the pedagogical creativity to construct meaningful bridges between these domains. The teachers' own reports of feeling inadequately prepared for this role by pre-service education raise important implications for teacher education reform in Indonesia, a concern echoed by Suastra et al. (2022), who found that Indonesian science teachers frequently lacked ethnoscience knowledge as a component of their pedagogical content knowledge.

The alignment of culturally integrated IPAS learning with SDG 4 targets, as evidenced both in teachers' practices and institutional documentation, is particularly significant given Indonesia's formal commitment to achieving SDG 4 by 2030 (Bappenas, 2022). The study's findings suggest that local culture integration is not merely a pedagogical enrichment strategy but a structural mechanism for advancing educational equity and quality at the classroom level. This interpretation is consistent with UNESCO's (2022) position paper on culture and education, which argues that culturally responsive education systems are more likely to achieve SDG 4.5 (eliminate gender and wealth disparities in education) and SDG 4.7 (promote global citizenship and sustainable development education) than those that disregard cultural context. The school-level policy commitments documented in this study, including curriculum mapping aligned with Yogyakarta's regional cultural regulation, represent a promising model for institutional embedding of SDG 4.7 principles in Indonesian primary education.

In dialogue with prior Indonesian studies, the present findings both confirm and extend existing knowledge. Prasetyo et al. (2022) demonstrated the effectiveness of ethnoscience approaches in secondary chemistry education, while Sudarmin et al. (2023) developed a theoretical model of ethnoscience integration for tertiary science teacher education. The present study contributes the primary school dimension, specifically the lower primary level, that was largely absent from this literature. The phenomenological approach adopted here also provides a qualitative depth that complements the predominantly quantitative or quasi-experimental designs of prior Indonesian ethnoscience studies, offering insider accounts of how integration is experienced by teachers and young students rather than merely measuring its outcomes.

Critically, this study also reveals productive tensions that complicate a straightforwardly optimistic narrative. Teachers' accounts suggest that cultural integration, while beneficial, imposes additional planning burdens and requires cultural knowledge that is not systematically developed in Indonesian pre-service teacher education. The absence of formalised ethnoscience content in teacher preparation programmes, noted independently by all three teachers, represents a systemic gap that risks making cultural integration dependent on individual teachers' personal cultural capital rather than institutionalised professional competence. This finding resonates with Ladson-Billings' (2021) critique of culturally responsive pedagogy as a framework that is frequently celebrated at the policy level but inadequately supported at the level of teacher preparation and sustained professional development.

The contribution of local culture integration to children's holistic wellbeing, as defined by UNICEF's (2023) multidimensional framework, is particularly notable given Indonesia's uneven child welfare landscape. The KPPPA (2022) report identifies educational wellbeing, students' sense of competence, belonging, and positive affect toward school, as one of the most unevenly distributed

dimensions of child welfare across Indonesian provinces. The present study's evidence that culturally embedded IPAS instruction enhances belonging, reduces anxiety, and strengthens identity among Grade 1–3 students positions local culture integration as a viable, low-cost, and culturally legitimate intervention for narrowing this wellbeing gap. This implication warrants attention from Indonesian educational policymakers, child welfare planners, and international development agencies working toward SDG 3 (good health and wellbeing) alongside SDG 4.

Several limitations of the present study must be acknowledged. The phenomenological design, while appropriate for the study's aims, constrains transferability: findings reflect the specific cultural, institutional, and biographical contexts of participants in Yogyakarta and cannot be directly generalised to other Indonesian provinces with distinct cultural ecologies (e.g., Papua, Maluku, or Aceh). The study's temporal scope, one academic semester, limits observation of longitudinal wellbeing effects. Additionally, student voice data, while collected through FGDs, was constrained by the communicative capacities of young children (Grades 1-3), potentially introducing underreporting of complex affective experiences. Future research employing longitudinal mixed-methods designs across multiple provinces and cultural contexts would significantly strengthen and extend the present study's contributions.

Notwithstanding these limitations, the study's findings carry clear practical implications. For curriculum designers working within the Kurikulum Merdeka framework, the evidence supports the intentional incorporation of local cultural knowledge as a required, not optional, component of IPAS unit planning at lower primary level. For teacher educators, the findings provide a compelling empirical basis for integrating ethnoscience content, cultural mediation skills, and culturally sustaining pedagogical strategies into pre-service and in-service IPAS teacher education programmes. For school leaders and policymakers, the institutional practices documented at the two participating schools, formal curriculum mapping aligned with regional cultural policy, offer a scalable model for embedding SDG 4.7 commitments within school-level IPAS curriculum governance.

CONCLUSION

This phenomenological study reveals that the integration of local cultural values into IPAS learning for Grades 1-3 in Indonesian primary schools constitutes a pedagogically powerful and wellbeing-enhancing practice that extends beyond curricular enrichment to serve as a structural mechanism for achieving SDG 4 goals. Four interconnected themes, cultural embodiment of science concepts, student wellbeing through cultural familiarity, the teacher as cultural mediator, and alignment with SDG 4 and child welfare dimensions, collectively demonstrate that when teachers systematically connect IPAS content to students' lived cultural realities, early-grade students exhibit reduced science anxiety, increased participation, stronger identity affirmation, and a heightened sense of school belonging. These outcomes represent meaningful contributions to the holistic wellbeing of Indonesian children at a formative stage of development.

The study's primary limitation lies in its contextual specificity: the Yogyakarta setting, with its distinctive Javanese cultural ecology and supportive regional policy environment, may not fully represent the diversity of conditions under which Indonesian teachers implement IPAS across the archipelago. Longitudinal and multi-provincial research designs are needed to assess the durability and transferability of the wellbeing effects identified here. Furthermore, the reliance on teacher and student self-report data, while triangulated through observations and documents, would benefit from complementary psychometric measures of student wellbeing in future studies.

The practical and policy implications of this research are substantial. For the Indonesian Ministry of Education, Culture, Research, and Technology (Kemendikbudristek), the findings provide empirical grounds for mandating ethnoscience components in the national IPAS teacher competency framework and for revising pre-service teacher education standards to include cultural mediation skills. For international education development agencies supporting Indonesia's SDG 4 commitments, local culture integration in primary science instruction represents a context-appropriate, community-validated strategy for advancing educational quality, equity, and child wellbeing simultaneously, a trifecta of SDG alignment that merits sustained investment and policy attention.

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