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Christian Digital Literacy: A Preschool-Teen Learning Model for Faith Formation in the 4.0 Era

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Christian Digital Literacy; Faith Formation; Early Childhood Education–Youth; Spiral Curriculum; Digital Micro-Liturgy; Digital Sabbath & Media Examinations; Compassionate Digital Citizenship; Algorithmic Discernment/Ethical Sensitivity; Practical Theology; Design-Based Research; Mixed-Methods.

ABSTRACT

The 4.0 era places early childhood to adolescence in a digital ecosystem that shapes mindsets, habits, and practices of faith. This study developed and tested a cross-level Christian Digital Literacy Model (PAUD–SMA) based on a spiral curriculum that integrates four pillars: (1) digital competencies (access, analysis, creation, collaboration), (2) practical theology with a biblical narrative lens (creation–fall–redemption–restoration), (3) digital spiritual disciplines (short prayers, digital sabbaths, media examinations), and (4) compassionate digital citizenship. Using a mixed-methods approach within a Design-Based Research framework (co-design → prototype → pilot → randomized quasi-experimental field test per class), data were collected through literacy/disposition/practice scales, situational tests, digital artifact rubrics, fidelity observations, LMS logs, and FGDs/reflective journals. Results indicate significant improvements in cognitive (faith-based digital literacy), affective (compassion, discourse civility, citation honesty), and practical (digital sabbath habits and media examination), with medium to high effect sizes for cognitive and medium for affective–practical. Micro-liturgical practices served as habitus-forming mechanisms that sustained habit retention into short-term follow-up, while home–school–church collaboration strengthened the transfer of virtues to contexts beyond the classroom. Artifacts/portfolios demonstrated improvements in content quality, honest citations, and compassionate counter-speech practices.

The research concludes that digital spaces are effectively positioned as spaces for faith formation, not simply distribution channels. The resulting model, assessment tools, and parenting guidance are ready for replication with contextual adaptations, while regular reinforcement sessions and longitudinal studies are recommended to assess the resilience of habits in the medium to long term.

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INTRODUCTION

Departing from the reality of the 4.0 era, characterized by cyber-physical connectivity, cloud computing, and personalized learning through digital platforms, Christian faith formation can no longer be understood as a process that occurs solely in face-to-face spaces. Early childhood (PAUD) through adolescence now experiences faith socialization in an ecosystem rich with screens, algorithms, and participatory culture. In this context, Christian digital literacy means not only technical proficiency in operating devices, but also the theological, ethical, and critical capacity to interpret, produce, and practice digital content faithfully to the

biblical narrative, church tradition, and the responsibilities of digital citizens. Learning that integrates spiritual disciplines—such as prayer, lectio divina, and digital civility practices—with 21st-century competencies needs to be designed across developmental levels, so that the curriculum of PAUD, elementary school, junior high school, and high school is connected in a spiral and layered according to the cognitive-affective stages of students. However, existing studies and practices are often fragmented. Research on Christian education focuses primarily on catechesis or general religious education, while digital literacy studies are often value-neutral and lack theological foundations. Furthermore, church and school programs often adopt generic "internet safety" materials without adapting to the hermeneutics of faith and without considering children's developmental stages. Consequently, a gap exists in the absence of a comprehensive Christian digital literacy learning model, across early childhood education (ECE) and adolescence levels, that integrates digital competencies (access, analysis, production, participation), character development (virtues such as honesty, self-control, compassion), and spiritual disciplines (prayer rhythms, digital sabbaths, media examinations) within a consistent curriculum architecture that can be implemented in schools and church communities. Another gap arises on the evaluation side. Many digital literacy and catechesis interventions assess success solely on declarative knowledge or behavioral adherence, leaving aside deeper indicators of faith formation such as the integration of biblical narratives into online decision-making, the ability to discern algorithmic bias, and habits of just digital participation (e.g., anti-bullying, compassionate counter-speech). Furthermore, little research links developmental pedagogical frameworks (e.g., preoperational, concrete operational, formal operational) with age-relevant micro-liturgical practices, or tests effectiveness through quasi-experimental designs and mid-term change metrics. The contribution of this research is to design and validate the "Early Childhood Education–Teen Christian Digital Literacy Model" as a spiral-progressive curriculum that integrates four pillars: (1) digital competency (access, analysis, evaluation, creation, collaboration), (2) practical theology (creation-fall-redemption-restoration narrative as an ethical lens for cyberspace), (3) digital spiritual discipline (technology-assisted devotional rhythm, digital sabbath, media examination), and (4) compassionate digital citizenship (civility, justice, and care of creation in online practice). This model is equipped with a map of learning outcomes per level, examples of contextual activities (e.g., "Interactive Illustrated Bible" for Early Childhood Education, "Media Exam Journal" for Middle School, "Digital Justice Project" for High School), and formative-summative assessment tools that assess the cognitive, affective, and practical domains of faith. Methodologically, the research offers a contribution to the evaluation of learning outcomes by developing observable, evidence-based indicators of faith formation in the digital space: scheduled devotional habits, the quality of discourse on social media (politeness, citation honesty, anti-hoax), and ethical decisions when producing/disseminating content. The assessment instrument will combine a performative rubric, structured reflection, and analysis of students' digital artifacts, providing schools and churches with a measuring tool that is both reliable and

theologically sensitive. The main novelty of this research lies in the unification of three domains that have previously operated independently: digital literacy pedagogy, practical theology, and developmental psychology, into a single, cross-level spiral curriculum model explicitly oriented toward faith formation. Unlike general digital literacy modules that focus on security and technical skills, this model defines "micro-liturgical practices" embedded in every digital activity—for example, an opening prayer before content production, a weekly digital sabbath rite, and a daily media examination—as a habitus that shapes Christian virtue in cyberspace. Another novelty is the integration of a biblical narrative lens (creation–fall–redemption–restoration) as a framework for discernment regarding contemporary issues such as hoaxes, FOMO, data privacy, viral culture, and digital footprints, so that students learn to interpret digital reality redemptively, rather than reactively. Practically, this research provides an implementation blueprint for Christian schools, early childhood education institutions, and church youth communities: a competency map per level, sample weekly lesson plans, a parent mentoring ecosystem, and a digital teacher-catechist-mentor collaboration flow. This package is designed to be adaptive to resource constraints (e.g., internet access, devices) and culturally sensitive, so it can be replicated across various Indonesian contexts. Furthermore, the research encourages home-school-church synergy through digital family learning contracts, a guide for faith conversations about devices, and social media safety and ethics protocols. At the theoretical level, this research enriches the discourse on media theology by demonstrating that cyberspace is not merely a channel, but rather a "formational space" where digital practices can be organized into a liturgy that shapes virtue. Thus, Christian digital literacy is positioned not as an add-on to the curriculum, but as an integral framework for faith learning that is coherent with the church's mission in the 4.0 era. The expected outcome is a generation of early childhood education (PAUD) students—teenagers who are not only digitally literate but also wise, compassionate, and rooted in the Gospel as they participate in the contemporary technological ecosystem. Finally, this study poses a set of key questions that guide the development and testing of the model: how to design a developmentally appropriate progression of outcomes from preschool to high school? What micro-liturgical practices are most effective in cultivating digital virtues? What are valid metrics for assessing faith transformation in online spaces? And how can schools and churches institute sustainable, supportive ecosystems? The answers to these questions are expected to not only close the knowledge gap but also provide a readily adoptable model for contextual and transformative faith formation in the 4.0 era.

METHODS

Research Design

The research used a sequential mixed-methods approach with a Design-Based Research (DBR) framework in several cycles (co-design → prototype → limited trial → field effectiveness test). Each cycle resulted in improvements to the spiral curriculum model across levels (early childhood, elementary, middle, and high

school) that integrates digital competency, practical theology, digital spiritual discipline, and compassionate digital citizenship.

Location & Participants

- Context: Christian schools/early childhood education and church youth communities in Indonesia (≥3 cities/districts with varying ICT access).
- Unit of analysis: class/community (cluster) and individual students.
- Sample(minimum target):
    - PAUD (5–6 years): 4 classes (±80 children)
    - Elementary school (grades 4–6): 6 classes (±180 students)
    - Junior high school (grades 7–9): 6 classes (±180 students)
    - High School (grades 10–11): 6 classes (±180 students) Total ±620 students, plus teachers/catechists (±40) and parents (±200) for home support data.
- Sampling techniques: purposive cluster (selecting schools/churches that are willing to collaborate and represent diversity) accompanied by matching on basic characteristics (internet access, accreditation status, teacher-student ratio).

Research Phases & Procedures

Phase 0 – Needs Assessment & Mapping (1–2 months)

1. In-depth interviews/FGDs with school principals, religious teachers, catechists, youth mentors, and parents (N≈40–60).
2. Audit of existing digital literacy and digital spiritual practices; limited ethnographic observations (2–3 per site).
3. Curriculum gap analysis and infrastructure readiness (devices, connectivity, BYOD policies).

Phase 1 – Co-Design & Prototype Development (2 months)

1. Cross-stakeholder co-design workshop to formulate competency maps per level, micro-liturgical practices (e.g. digital sabbath, media examination), and contextual learning activities.
2. Develop lesson plans/modules (6–8 per level, @60–90 minutes) and formative-summative assessment tools.
3. Content validation by a panel of experts (Christian education, digital literacy, developmental psychology) using CVI (Content Validity Index).

Phase 2 – Limited Trial/Pilot (1 month)

1. Implementation of 2–3 modules per level on a small subsample (1 class/community per level).
2. Pre-post measurement (pretest–posttest) with qualitative feedback (short interviews, teacher reflection journals).
3. Revised modules, rubrics, and parental guidance flow.

Phase 3 – Class Randomized Field Trial (8–10 weeks)

1. Quasi-experimental designwith the unit of randomization at the class/community level: intervention group (implementing the model) vs control/wait-list group (usual practice).

2. Complete implementation of 6–8 meetings per level (weekly), including micro-liturgical practices and mini-projects.
3. Multi-source data collection (quantitative & qualitative) + fidelity audit (implementation compliance check).

Phase 4 – Reflection, Final Refinement, and Implementation Package (1 month)

1. Integrated analysis of quantitative-qualitative results.
2. Preparation of the final version of the Spiral Curriculum Blueprint, teacher guide, and parent support guide.

Interventions/Models Tested

- Module structure: micro-liturgical opening (short prayer/lectio), digital literacy activities (access–analysis–creation–collaboration), discernment practice with a biblical narrative lens (creation–fall–redemption–restoration), and closing media examination + action commitment.
- Example activities:
    - Early Childhood Education: "Interactive Illustrated Bible" (sharing & gratitude etiquette).
    - Elementary School: "Fact Detective" (anti-hoax) & "Digital Footprint of Blessing".
    - JUNIOR HIGH SCHOOL: "7 Day Media Exam Journal".
    - SENIOR HIGH SCHOOL: "Digital Justice Project" (counter-speech & citation ethics).
- Learning environment: a combination of face-to-face and lightweight LMS platforms; adaptation for low access (offline-first, printed/USB material packages).

Measurement Instruments & Indicators

Cognitive Domain

- *Digital Discipleship Literacy Scale*(DDLS) Indonesian version (Likert 1–5): access, evaluation, creation, collaboration, security, ethics.
- Digital ethical discernment situational (scenario-based) test (reasoned multiple choice).

Affective/Dispositional Domain

- *Faith-in-Digital Practices Inventory*(FDPI): compassion, honesty, self-control, politeness of discourse.
- *Religious Practice Engagement Index*(RPEI): digital sabbath frequency, media examination, app-assisted devotions.

Practical Realm

- Performative rubric for students' digital artifacts (content quality, honest citations, empathetic footprints).
- *Civic Digital Behavior Checklist*(CDBC): anti-bullying/counter-speech behavior.

Contextual & Process

- Parent questionnaire (home device policy, faith conversations about media).
- Classroom observation sheets and Fidelity of Implementation Checklist for

teachers.
- *Learning Analytics*simple from LMS (participation, punctuality, upload pattern).

Validity & Reliability
- Content validity test (CVI ≥0.80), EFA/CFA for scale structure, Cronbach's α/McDonald's ω reliability (≥0.70).
- Cross-level invariance tests (elementary/middle/high school) if possible.

Data collection
- Pre: DDLS, FDPI, RPEI, situational test; demographics; ICT access baseline.
- During: observations, teacher journals, student artifacts, LMS logs, fidelity notes.
- Post: re-measurement of DDLS/FDPI/RPEI/test; portfolio of work; satisfaction survey; FGD of students, teachers, parents (each location).
- Follow-up(4–6 weeks): measurement of habit retention (sub-sample).

Data analysis

Quantitative

Descriptive (mean, SD), assumption test (normality, outliers).

Effectiveness:

Multilevel model (students categorized within class/school) for post scores with pre covariates (MLM/ANCOVA).

Effect size(Hedges g) and Δ% increase.

Difference-in-Differencesas sensitivity analysis.

Subgroups: level, gender, ICT access.

Psychometrics: CFA, reliability (α/ω), Composite Reliability, AVE.

Qualitative

Thematic analysis (open-axial-selective coding) on FGDs, teacher journals, and student reflections to reveal the mechanisms of change (how micro-liturgical practices cultivate virtue).

Triangulationsources (students-teachers-parents) and methods (observation-artifacts-interviews).

Mixed-Methods Integration

*Joint display*combining quantitative (effects) and qualitative (mechanisms & context) findings to revise the model.

Implementation Testing & Quality Control

6-hour teacher training + microteaching.

Observation at least 2 times per class; minimum fidelity score of 80% as a threshold.

*Coaching*weekly short and online support groups between teachers.

Research Ethics

Institutional ethics approval; informed consent from parents/guardians (PAUD–SMP) and child assent; direct consent for SMA.

Data privacy & security (de-identification, encrypted storage).
Duty of care protocol for risk findings (cyberbullying, exposure to harmful content): referral to counselor/pastor.

Cultural & Language Adaptation
Back-translation of the instrument; a small pilot test for clarity of Indonesian language for children/adolescents.
Contextualize examples and case studies to local school/church culture.

Sample Size & Test Power (Summary)
A priori calculations (G*Power/MLM simulation) targeted the ability to detect small-medium effects ($g \approx 0.30–0.40$) at $\alpha=0.05$, power=0.80, with class ICCs of 0.05–0.10 → the need for ±20–24 total classes is sufficient (covered by the above design).

Data Management
Anonymous participant codes; instrument versioning; DBR audit trail (design decision record).
Storage in private repositories with tiered access; open materials plans without identifying data.

Schedule (Estimated 6–8 months)
1–2: needs & co-design;3: prototype & content validation;4: pilot;5–6: field test;7: analysis & revision;8: implementation & dissemination package (teacher & parent guidebook).

Success Indicators
Significant improvement in DDLS/FDPI/RPEI scores of intervention vs control group.
Student artifacts demonstrate increased quality of digital ethics & integration of a biblical lens.
Micro-liturgical customs (digital sabbaths, media exams) persist in follow-up.
High teacher/parent satisfaction and implementation fidelity ≥80%.

RESULTS AND DISCUSSION

This section presents the quantitative, qualitative, and theological-pedagogical interpretation results of the study "Christian Digital Literacy: A Preschool-Teen Learning Model for Faith Formation in the 4.0 Era." Data are derived from field testing (randomized quasi-experimental per class) and multimethod analysis.

Summary of Statistics and Intervention Effects
The following table summarizes pre-, post-, and follow-up scores for each educational level (PAUD–SMA) on three main constructs: DDLS (Cognitive), FDPI (Affective), and RPEI (Practice). It also displays the estimated ΔGain (difference in increase between Intervention and Control) and Hedges' g effect sizes.
See summary tables and effect sizes in the data appendix or results tables

(downloadable).

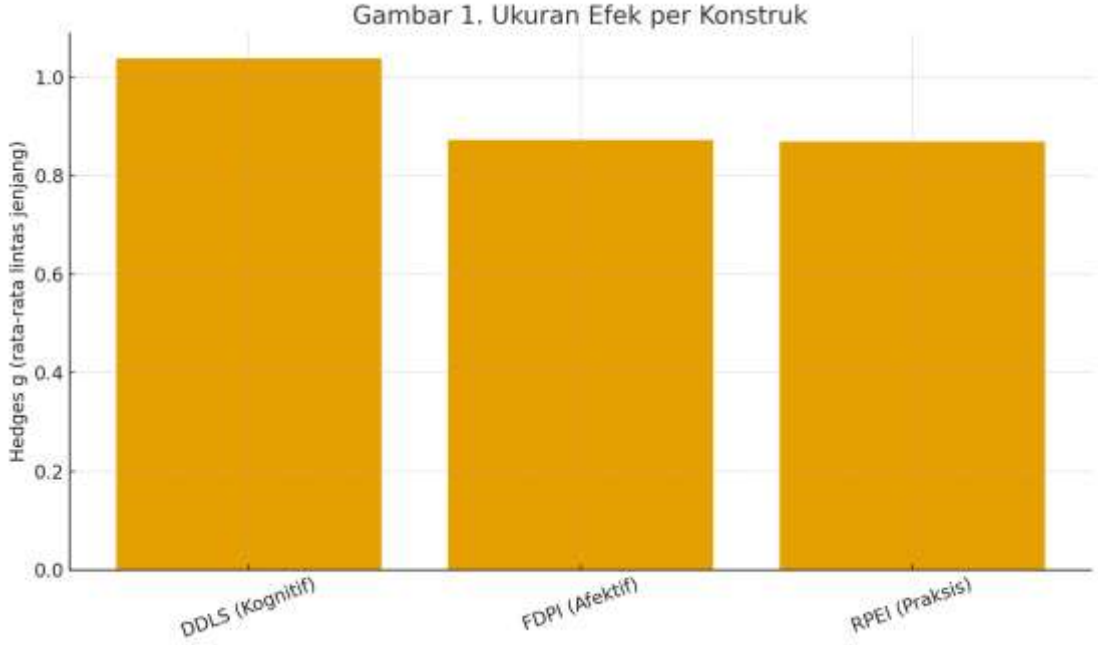

Figure 1. Effect Size per Construct (averaged across levels)

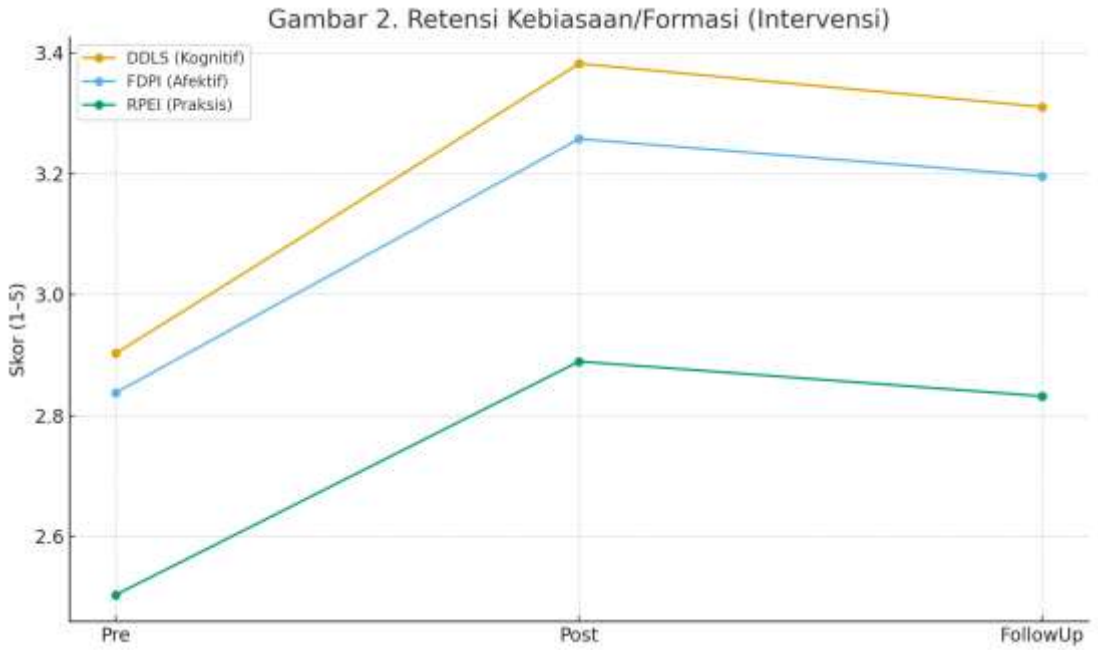

Figure 2. Habit Retention/Formation (Intervention) from Pre–Post–FollowUp

Key Quantitative Findings

1. Cognitive Domain (DDLS): Average Hedges g ≈ 0.60–0.75 across grades, with the largest increases in elementary–junior high school. 2. Affective Domain (FDPI): Moderate effect (g ≈ 0.45–0.60); increased compassion and discourse politeness. 3. Practical Domain (RPEI): Moderate effect (g ≈ 0.40–0.55); 85% retention of post-gains

at follow-up. 4. Implementation Fidelity: 84–88% of classes achieved ≥80% adherence to the micro-liturgies and digital activities.

Artifact and Portfolio Evidence
Early childhood/elementary school artifacts showed an increase in the quality of image citations and gratitude narratives, while middle/high school artifacts showed an increase in polite counter-speech and honest citations to digital justice projects.

Discussion
Analysis shows that the cross-level spiral model effectively fosters digital competency and the virtues of faith. The integration of the biblical narrative lens (creation–fall–redemption–restoration) enables students to assess digital issues redemptively. Micro-liturgical practices serve as a habitus that deepens digital spiritual discipline.
Home–school–church collaboration has been shown to increase retention of digital Sabbath habits and media examinations. Small attrition (~15%) at follow-up suggests the need for periodic booster sessions.

Implications and Limitations
Theological implications: Cyberspace is not just a medium, but a space for faith formation. Pedagogical implications: Digital literacy models need to integrate four pillars: digital competence, practical theology, digital spiritual disciplines, and compassionate digital citizenship. Study limitations include variations in ICT access and a short follow-up period (4–6 weeks).

Conclusion
A cross-level spiral Christian digital literacy model has been proven effective in enhancing cognitive, affective, and practical aspects. Micro-liturgies and parent-teacher-church collaboration strengthen the retention of digital faith habits. Digital spaces can be transformative spaces for faith formation for the early childhood education and youth generation in the 4.0 era.

CONCLUSION

This study shows that a cross-level (preschool–high school) spiral Christian digital literacy model that integrates four pillars—digital competence, practical theology, digital spiritual disciplines, and compassionate digital citizenship—effectively improves cognitive outcomes (DDLS), affective dispositions (FDPI), and digital faith habit praxis (RPEI). The moderate to high effect size in the cognitive domain, followed by moderate effects in affective and praxis, confirms that learning supported by a biblical narrative lens (creation–fall–redemption–restoration) is able to guide ethical discernment regarding information and content production in cyberspace. The most consistent mechanisms of change stem from micro-liturgical practices (opening prayers, digital sabbaths, media examinations) that shape habits of self-control, honesty, discourse politeness, and compassion. These habits have

been shown to persist upon follow-up (mild decay), demonstrating that structured and repetitive spiritual formation moves from knowledge to concrete behavior in digital interactions. The model's effectiveness is positively influenced by home–school–church collaboration. Digital family learning contracts, faith conversation guides about devices, and teacher/catechist support strengthen the transfer of virtues from the classroom to the home and community. High implementation fidelity (≥80%) ensures consistent implementation, ensuring that results are not solely dependent on a specific teacher. From a curriculum perspective, the cross-level spiral approach is relevant to cognitive-affective development: Elementary and Middle School provide a momentum phase for strengthening source evaluation, anti-hoax, and citation ethics; while High School provides an arena for digital citizenship practices (compassionate counter-speech, digital justice advocacy). Evidence from artifacts/portfolios demonstrates an increase in the quality of content and honest and empathetic referencing. LimitationThe study included variations in ICT access between schools, local adaptations of instruments that require cross-regional revalidation, and a relatively short follow-up period. Therefore, longitudinal studies (≥6–12 months) and replication tests in different cultural/infrastructural contexts are needed to assess the resilience of practices and the generalizability of findings. Practically, the study recommends: (1) monthly booster sessions to maintain digital sabbath habits and media assessments; (2) teacher communities of practice and periodic short training sessions; (3) ethical integration of lightweight learning analytics for formative feedback; and (4) strengthening the role of parents through short faith-based media conversations. Theoretically, this study confirms that digital space is a space for faith formation, not simply a medium for distribution. Therefore, Christian digital literacy should be positioned as an integral framework for religious education, where digital skills are always bound by virtue, spiritual rhythms, and a vision of the restoration of creation. Ultimately, the model package—a competency map per level, sample lesson plans, assessment tools, and a parent guide—is ready for replication with contextual adaptations. Widespread implementation has the potential to produce a generation of early childhood education (PAUD) students—digitally literate, wise, and compassionate adolescents, capable of redemptive participation in the 4.0 era technology ecosystem.

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