

Pre-Service Teachers' Reflections on Child Development through Eco-Theological Project-Based Learning

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ABSTRACT

This study explores how pre-service primary school teachers interpret child development through their reflections following participation in an eco-theological Project-Based Learning (PjBL) experience. An exploratory qualitative design with an interpretivist perspective was employed, involving 43 pre-service teachers. Data were collected through written reflections comprising 12 open-ended questions addressing participants' learning experiences, observations of pupils, understandings of child development, and interpretations of the project experience. The reflections were analysed using inductive reflexive thematic analysis following the six-stage approach of Braun and Clarke. Four themes emerged from the analysis: (1) Multidimensional Understanding of Child Development, (2) PjBL as a Bridge between Theory and Practice, (3) Ecological, Social, Moral, and Spiritual Connectedness, and (4) Child-Centred Pedagogical Orientation. Participants' reflections revealed understandings of child development that encompassed cognitive, social, emotional, physical, moral, and environmental dimensions. They also described project and observational experiences as providing opportunities to relate developmental theory to practical contexts. Ecological experiences were interpreted in connection with social responsibility, moral values, and spiritual meanings, while reflections on pupils' behaviour demonstrated greater attention to individual characteristics, needs, and contextual explanations rather than immediate behavioural labelling. Overall, the findings illustrate how pre-service teachers make sense of child development and construct pedagogical meanings through reflection on eco-theological PjBL experiences. The findings represent participants' interpretations of their experiences and should not be interpreted as evidence of causal changes in child development or as proof of the effectiveness of PjBL.

Keywords: Primary School Teacher Trainees; Child Development; Project-Based Learning; Eco-Theological Education; Pedagogical Reflection.

BACKGROUND

The development of primary school children is a fundamental aspect of education because it encompasses cognitive, social, emotional, and physical-motor development, as well as children's ability to interact with their environment. These developmental characteristics influence how children learn, communicate, solve problems, and respond to learning experiences. Therefore, primary school education needs to address children's development holistically rather than focusing solely on academic achievement (Carrillo-López et al., 2023; Guo et al., 2023; Kaplánová et al., 2023). This condition requires pre-service primary school teachers not only to understand theories of child development but also to connect these theories with children's behaviours and learning experiences in authentic educational contexts (Arifin et al., 2024; Ismail & Jarrah, 2019).

One approach that can provide authentic learning experiences for pre-service primary school teachers is Project-Based Learning (PjBL). PjBL engages learners in investigating real-world problems through planning, collaboration, problem-solving, the development of products or actions, and reflection. These characteristics provide opportunities for learners to construct knowledge through direct experience and authentic problems (Zhang et al., 2025; Jeong, 2025). For pre-service primary school teachers, project-based experiences can also provide opportunities to observe children in situations that involve communication, cooperation, decision-making, creativity, problem-solving, and responsibility. Such experiences can therefore become a context in which theoretical concepts of child development are connected with observations of children in learning activities.

Environmental contexts can provide authentic problems for PjBL because environmental issues are closely related to children's everyday lives. Issues such as waste, hygiene, water, plants, and sustainability enable learning to be connected with local environments and everyday experiences. The land-based learning approach, for example, highlights the importance of connections to place, local knowledge, and sustainable practices in enriching environmental learning experiences (Datta et al., 2025). At the primary school level, environmental experiences may also provide opportunities for children to engage socially with their surroundings and develop understandings related to environmental issues (Wijaya & Prathiwi, 2021; Kesha et al., 2025). In the present study, however, these environmental dimensions are considered primarily as contexts observed and interpreted by pre-service primary school teachers rather than as outcomes directly measured among children.

Environment-based learning is not limited to ecological knowledge but can also involve attitudes, character, and actions. Experiences involving environmental management through processes of awareness, thinking, and doing can contribute to the development of ecological awareness (Purnami, 2020). Similarly, the eco-pedagogical approach positions the relationship between humans and nature as part of the development of ecological awareness and character among primary school pupils (Yunansah & Herlambang, 2017). Environmental experiences can therefore provide a learning context in which knowledge, social interaction, morality, and character are considered in an interconnected manner.

This dimension can be further considered through a religious perspective. In Islamic education, the relationship between humans and the environment can be understood not only as an ecological concern but also as a moral responsibility toward creation. Ecological values have been identified both explicitly and implicitly within Islamic Religious Education lessons at the primary school level (Yunitasari, 2019). Studies of eco-theology-based science education also indicate possibilities for connecting children's learning experiences with environmental issues through an eco-theological perspective (Hamzan, 2026). In this study, the term "eco-theological PjBL" does not refer to an established learning model. Rather, it describes a PjBL experience in which environmental issues are connected with theological and moral values. This distinction is important because the study examines the experience and reflections generated through such an integration rather than evaluating a formally established instructional model.

For pre-service primary school teachers, participation in such project-based experiences can provide opportunities to observe children in authentic learning situations. However, observation alone does not necessarily become professional knowledge. Pre-service teachers need to interpret what they observe by considering how children communicate, cooperate, solve problems, demonstrate responsibility, respond to their environment, and display differences in abilities and needs. Reflection therefore becomes an important process for connecting authentic experiences with concepts of child development and subsequent pedagogical considerations. Through reflection, experiences in the field can be examined, interpreted, and related to the pre-service teachers' developing professional understanding.

Previous research has examined child development, PjBL, environmental education, ecological literacy, nature-based learning, sustainability, and relationships between religion and the environment. Research on PjBL in environmental education has reported its relevance to environmental attitudes and awareness (Genc, 2015; Bramwell-Lalor et al., 2020; Yolcu, 2023; López & Palacios, 2024; Djordjevic et al., 2026). However, much of this literature focuses on learning outcomes, environmental attitudes, or changes among learners. Research involving pre-service teachers, meanwhile, has commonly examined pedagogical knowledge, teaching experiences, or the development of professional understanding. Less attention has been given to how pre-service primary school teachers interpret children's development through reflective accounts following project-based

experiences that integrate environmental contexts with theological and moral values. This gap is particularly relevant because children's behaviours in authentic project settings may provide pre-service teachers with opportunities to reconsider and deepen their understanding of child development beyond theoretical descriptions.

In light of this gap, this study aims to understand how pre-service primary school teachers interpret the development of primary school children following their participation in an eco-theological Project-Based Learning experience. The study does not seek to test the effectiveness of PjBL or to measure changes in children's ecological literacy, spirituality, or other developmental outcomes. Instead, it examines how pre-service primary school teachers observe and interpret children's behaviours, interactions, abilities, cooperation,

problem-solving, responsibility, and responses to their environment during the project experience. Accordingly, children's development constitutes the pedagogical focus of the study, eco-theological PjBL provides the context of the learning experience, and the pre-service teachers' reflections constitute the primary process through which their professional understanding is examined.

METHOD

Research Design and Overview

This study employed an exploratory qualitative design with an interpretivist perspective to explore how pre-service primary school teachers constructed meaning regarding child development through their participation in an eco-theological Project-Based Learning (PjBL) experience. The study was conducted within a Child Development course in a primary teacher education programme. The study focused on how participants interpreted their learning experiences, observations of children, and engagement with eco-theological PjBL. It did not aim to measure the effectiveness of PjBL, determine causal changes in children's development, or evaluate children's developmental outcomes. Accordingly, the primary unit of analysis was the written reflections and meaning-making of the pre-service primary school teachers, rather than the children observed during the learning process.

The learning and research process was conducted over six months and consisted of several interconnected stages: engagement with child development theories, observation of children in authentic educational contexts, interpretation of observed behaviours, design and implementation of an eco-theological PjBL project, and reflective writing. The overall process can be represented as:

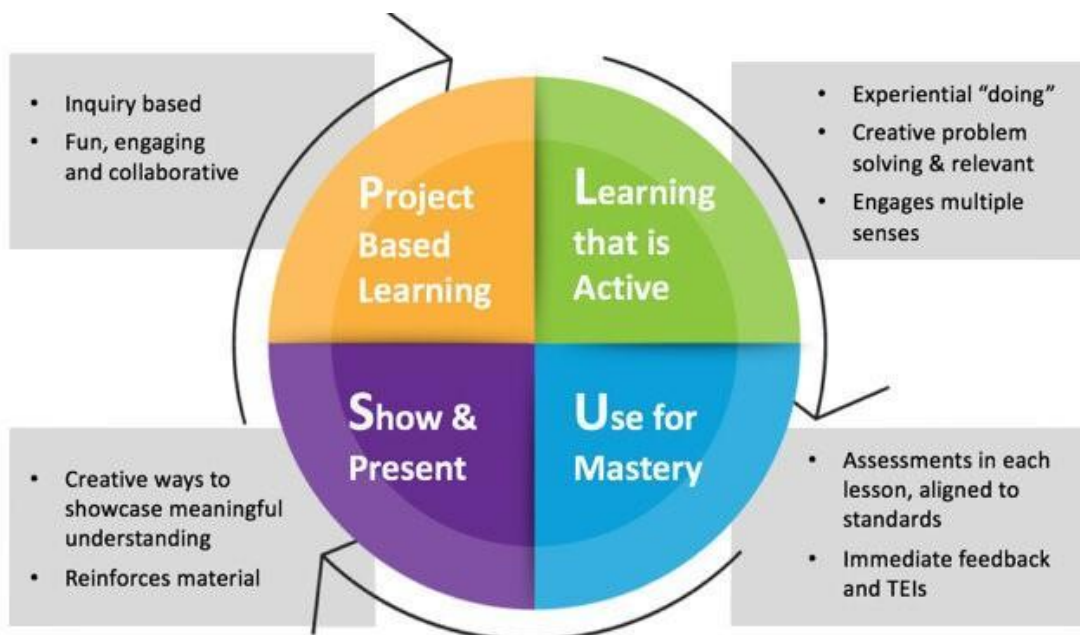


Figure 1: Process conducted

The eco-theological PjBL approach integrated environmental issues with theological, moral, and pedagogical values. Participants were encouraged to understand environmental preservation as part of human responsibility

toward God's creation. The projects incorporated values including gratitude for creation, environmental care, responsibility, discipline, cooperation, and nature conservation. Participants used a structured Eco-Theological Project Template consisting of project identity, project description, objectives, tools and materials, implementation stages, relationships with elementary school learning, eco-theological values, child development dimensions, project results, documentation, reflection, and conclusion.

The child development dimensions considered in the project included physical/motor, cognitive, language, social, emotional, moral/spiritual, personality, creativity, digital, and ecological aspects. These dimensions served as pedagogical planning and reflection categories, rather than as standardised instruments for measuring children's developmental outcomes.

Participants and Sampling

The participants were 43 pre-service primary school teachers enrolled in a Child Development course. A total of 52 students were enrolled in the course. Of these, 43 voluntarily agreed to participate in the research and provided informed consent for their written reflections to be used as research data. Therefore, the study did not employ total sampling. The final qualitative sample consisted of the 43 students who voluntarily participated and provided consent. Students who did not provide consent were excluded from the research dataset.

The participants were undergraduate students preparing for professional roles as primary school teachers. Their participation was embedded within the learning activities of the Child Development course, including observation, project development, project implementation, and reflective activities. For reporting and analysis, participant identities were replaced with codes such as P01, P02, P03, and so forth.

Six-Month Learning and Observation Process

The learning process took place over six months and integrated theoretical learning, observation, project development, project implementation, and reflection. At the beginning of the process, participants studied concepts and theories related to child development. These included cognitive, physical, language, social, emotional, moral/spiritual, personality, creativity, digital, and ecological dimensions of development. The theoretical learning provided participants with conceptual frameworks for interpreting children's behaviour and development. Participants subsequently observed children in authentic educational contexts. The observations were intended to help participants connect theoretical knowledge with naturally occurring behaviours and characteristics of children. Participants paid attention to observable behaviours such as communication, social interaction, cooperation, emotional responses, problem-solving, responsibility, moral behaviour, and responses to environmental situations.

The observation process was not conducted as a formal developmental assessment. Participants did not administer standardised developmental tests or produce diagnostic judgments concerning the children. Instead, participants were encouraged to interpret children's behaviours within their broader developmental and environmental contexts. For example, a child who was quiet, had difficulty socialising, or frequently remained alone was not necessarily interpreted simply as "shy" or "lacking confidence." Participants were encouraged to consider possible social-emotional characteristics, family and environmental conditions, previous social experiences, opportunities for interaction, and other relevant contextual factors. Developmental theories, including Piaget's theory of cognitive development, could provide conceptual perspectives for understanding children's developmental characteristics. However, such theories were treated as interpretive frameworks rather than diagnostic tools. A single behaviour was not considered sufficient evidence for determining a child's developmental stage or condition.

An ecological perspective was also incorporated to encourage participants to consider the relationships among the child, family, school, peers, community, and natural environment.

Following the observation and interpretation process, participants developed and implemented an eco-theological PjBL project using the structured project template. The project required participants to connect elementary school learning with environmental preservation and theological or moral values.

The project development process included:

1. Project preparation, including identification of an environmental issue, learning objectives, child development dimensions, materials, and relevant eco-theological values.
2. Project implementation, in which participants translated their ideas into learning activities or products appropriate for elementary school contexts.
3. Reflection, in which participants considered what they had learned about child development, environmental responsibility, moral/spiritual values, and their future role as teachers.

Through this process, participants occupied three interconnected roles: observers and learners, project designers and implementers, and reflective learners.

Eco-Theological Project-Based Learning

The eco-theological PjBL activities were designed to connect elementary school learning with environmental responsibility and spiritual or moral meaning. Participants were required to identify how their project related to environmental preservation as a form of responsibility toward God's creation.

The project template guided participants to identify:

- the project theme and identity;
- the target class or learning phase;
- learning objectives;
- materials and equipment;
- project preparation and implementation;
- learning subjects and content;
- learning activities and products;
- eco-theological values;
- relevant child development dimensions;
- project results and documentation; and
- student and teacher reflection.

The eco-theological values included gratitude toward God for creation, environmental care, responsibility, discipline, cooperation, and nature conservation. The developmental dimensions included physical/motor, cognitive, language, social, emotional, moral/spiritual, personality, creativity, digital, and ecological development. These dimensions were used to help participants design and reflect upon learning activities rather than to establish measurable developmental effects. The PjBL experience therefore served as a learning context in which participants could connect child development theory, authentic observation, environmental contexts, theological values, and pedagogical decision-making

Data Collection

The primary dataset consisted of 43 written reflections submitted by the participating pre-service primary school teachers after their learning, observation, and eco-theological PjBL experiences. Data were collected using 12 open-ended reflection questions (Q1–Q12). The questions were designed to elicit participants' interpretations of changes in their understanding of child development, their experiences with project-based learning, the

relationship between children and their ecological and social environments, their understanding of the teacher's role, and implications for their future teaching practice.

The 12 questions were:

Table 1: 12 Open-ended Reflection Questions

Code	Reflection Question
Q1	How did your understanding of child development change from the beginning to the end of the course? Explain the changes and the learning experiences that you consider most influential.
Q2	How did project-based learning help you understand the interconnectedness of different aspects of child development (cognitive, physical, language, social, emotional, moral, personality, creativity, digital, and ecological) as an integrated whole?
Q3	Describe the most meaningful experience you had while working on the project. Why did this experience change or deepen your understanding of child development?
Q4	How did the eco-theological approach influence the way you viewed the relationship between child development, the environment, society, and spiritual or moral values?
Q5	After taking this course, how do you analyse a child's behaviour or development differently compared with before taking the course? Explain with an example.
Q6	How did the learning experiences during the semester influence the way you view the role of teachers in supporting children's development?
Q7	Based on your experience during the course, how do family, school, peers, community, and the natural environment influence one another in relation to children's development? Explain based on your current understanding.
Q8	What was the greatest challenge you faced while participating in Eco-theological Project-Based Learning, and how did this challenge help you understand child development more deeply?
Q9	Did this learning experience influence your values, attitudes, or concern for children and the environment? Explain the changes you experienced and their causes.
Q10	How will the understanding you gained influence the way you design learning activities when you become a primary school teacher? Provide an example of its application.
Q11	From the entire course experience, which experience or activity contributed most to shaping your understanding of child development? Why was this experience particularly meaningful to you?
Q12	If you were asked to explain to another student how Eco-theological Project-Based Learning shaped your understanding of child development, what would you tell them? Explain comprehensively based on your experience throughout the course.

The reflection questions functioned as qualitative prompts rather than measurement instruments. In particular, questions concerning children's development elicited participants' interpretations of their observations rather than direct measurements of children's developmental status or change.

Ethical Considerations and Informed Consent

Ethical approval for the study was obtained from the participants' university prior to data collection. Before participation, students were informed about the purpose of the study, the nature of participation, and the use of their written reflections as research data.

Participation was voluntary. Of the 52 students enrolled in the course, 43 provided informed consent and agreed to the use of their reflections for research purposes. Students who did not provide consent were excluded from the research dataset.

The children observed during the learning process were **not research participants**. Their developmental outcomes were not directly measured, and no experimental intervention was conducted with them as research subjects. The children's presence served as an authentic educational context through which participants developed their understanding of child development. Participant confidentiality was maintained through the use of participant codes rather than names in the analysis and reporting.

Data Analysis

The written reflections were analysed using **reflexive thematic analysis** following the six-phase approach described by Braun and Clarke (2021).

Phase 1: Familiarisation with the Data

The researchers repeatedly read the written reflections to become familiar with the dataset. Initial attention was directed toward statements concerning participants' understanding of child development, project-based learning, environmental experiences, moral and spiritual values, teacher roles, and future pedagogical practice.

Phase 2: Generating Initial Codes

Relevant segments of the reflections were coded inductively. Initial codes included, among others:

- multidimensional understanding of development;
- interconnected developmental dimensions;
- learning through direct experience;
- theory-practice integration;
- contextual interpretation of child behaviour;
- ecological influences;
- moral and spiritual awareness;
- environmental responsibility;
- teacher as facilitator;
- child-centred learning; and
- authentic learning activities.

Phase 3: Constructing Candidate Themes

Codes with conceptual similarities were grouped into broader categories. For example, codes concerning interconnected developmental dimensions were grouped under a category related to holistic understanding of child development. Codes concerning direct project experience and application of theory were grouped under theory-practice integration.

Phase 4: Reviewing and Refining Themes

Candidate themes were reviewed against the coded extracts and the broader dataset. The researchers examined whether each theme had sufficient conceptual coherence and whether it remained relevant to the research question. Overlapping categories were integrated where appropriate, while interpretations that could not be adequately supported by the data were revised.

Phase 5: Defining and Naming Themes

Four final themes were developed:

1. A Multidimensional Understanding of Child Development
2. PjBL as a Bridge between Theory and Practice

3. Ecological, Social, Moral and Spiritual Interconnections

4. A Child-Centred Pedagogical Approach

Phase 6: Producing the Analytical Narrative

The final themes were interpreted in relation to participants' written reflections and relevant theoretical perspectives. Selected quotations were used to demonstrate how the themes were grounded in participants' accounts. Importantly, the analysis distinguished between participants' perceptions and independently established developmental outcomes. Statements concerning children's behaviour were therefore interpreted as participants' observations and meaning-making rather than as evidence that the PjBL intervention caused changes in children's development.

Data-to-Theme Analytical Pathway

To strengthen analytical transparency, selected excerpts were traced through the process of participant quotation → initial code → category → final theme. The quotations below are translated from the participants' original Indonesian responses.

Table 2: Quotation of participants' responses

Participant	Question	Illustrative Quotation	Initial Code	Category	Final Theme
P01	Q1	“At the end of the course, my understanding changed drastically. I now understand that child development is a multidimensional process involving cognitive, physical, language, social, emotional, moral, personality, creativity, digital, and ecological aspects that cannot be separated.”	Development as multidimensional	Integrated developmental dimensions	A Multidimensional Understanding of Child Development
P02	Q2	“Project-based learning helped me understand that all aspects of child development are interconnected and occur simultaneously in one real experience.”	Interconnected developmental aspects	Holistic understanding	A Multidimensional Understanding of Child Development
P03	Q3	“By working on the project, we understood more because we practised it directly and gained experience rather than only understanding the material.”	Learning through direct project experience	Theory-practice integration	PjBL as a Bridge between Theory and Practice
P04	Q4	“When teaching moral values, it is not only about being polite to other people, but also about how children respect the natural environment. Harmony between oneself, others, the environment, and the Creator	Moral values connected with environmental care	Ecological-moral-spiritual interconnectedness	Ecological, Social, Moral and Spiritual Interconnections

		is important for healthy child development.”			
P05	Q5	“Now I do not only look at children's behaviour, but also try to understand the causes, such as family or environmental factors.”	Looking beyond observable behaviour	Contextual interpretation of behaviour	A Child-Centred Pedagogical Approach
P06	Q6	“The teacher is not only someone who teaches, but also guides, understands children's needs, and supports different aspects of their development.”	Teacher as guide and facilitator	Holistic teacher role	A Child-Centred Pedagogical Approach
P07	Q7	“Family, school, peers, community, and the natural environment all influence children's development.”	Multiple developmental contexts	Ecological influences	Ecological, Social, Moral and Spiritual Interconnections
P02	Q8	“The greatest challenge was connecting theory with practice, but this challenge increased my understanding.”	Theory-practice challenge	Experiential learning	PjBL as a Bridge between Theory and Practice
P04	Q9	“The learning influenced my values and increased my concern for children and the environment.”	Increased care and awareness	Moral and ecological awareness	Ecological, Social, Moral and Spiritual Interconnections
P05	Q10	“I will design learning activities using real activities, such as simple projects in the school environment.”	Authentic learning design	Active and contextual pedagogy	A Child-Centred Pedagogical Approach
P06	Q11	“The project activity was the most helpful because it provided direct learning experience.”	Experiential project learning	Learning through direct experience	PjBL as a Bridge between Theory and Practice
P07	Q12	“The learning helped me understand child development comprehensively, including academic, social, moral, and environmental aspects.”	Holistic meaning-making	Integrated developmental understanding	A Multidimensional Understanding of Child Development

The analytical pathway illustrates that themes were constructed through successive stages rather than being assigned directly to individual quotations. The coding process moved from participants' specific statements toward broader categories and, subsequently, toward the four interpretive themes.

Reflexivity and Trustworthiness

Reflexivity was maintained throughout the research and analytical process. The researchers recognised that their prior knowledge and assumptions concerning child development, PjBL, environmental education, and theological values could influence the interpretation of participants' reflections. To address this issue, the researchers maintained an analytical trail connecting the original reflections with initial codes, categories, and final themes. The researchers repeatedly returned to the original participant responses during theme development and refinement to ensure that interpretations remained grounded in the data.

Trustworthiness was supported through several procedures. First, the research process and participant selection were explicitly documented. Second, the complete set of reflection questions was provided to make the data-generation process transparent. Third, the analytical pathway from quotation to code, category, and theme was documented through illustrative examples. Fourth, participant quotations were used to demonstrate the empirical grounding of the interpretations. Fifth, the researchers distinguished participants' perceptions from independently measured developmental outcomes. The study also maintained conceptual consistency by using the term pre-service primary school teachers throughout the manuscript. The terms "trainee teachers," "prospective teachers," and "pre-service teachers" were not used interchangeably where they could create ambiguity regarding the participant group. Finally, the interpretation was deliberately bounded by the qualitative design. The findings describe how pre-service primary school teachers constructed and developed their understanding of child development through the learning experience. They do not establish that eco-theological PjBL produced measurable changes in children's cognitive, social, emotional, moral, spiritual, or ecological development.

RESULTS

Overview of the Emergent Themes

Analysis of the 43 written reflections generated four interrelated themes concerning how pre-service primary school teachers interpreted child development through their eco-theological PjBL experience. The themes were: (1) a multidimensional understanding of child development, (2) PjBL as a bridge between theory and practice, (3) ecological, social, moral, and spiritual interconnections, and (4) a child-centred pedagogical approach. These themes represent participants' meaning-making rather than measured changes in children's development.

Table 3: Overview of Emergent Themes

Theme	Main Focus	Illustrative Evidence
1. A Multidimensional Understanding of Child Development	Development was understood as involving interconnected cognitive, physical, language, social, emotional, moral, personality, creativity, digital, and ecological dimensions.	P01: "Child development is a multidimensional process..."
2. PjBL as a Bridge between Theory and Practice	Direct observation and project activities helped participants connect developmental concepts with authentic educational experiences.	P03: "We practised it directly and gained experience rather than only understanding the material."
3. Ecological, Social, Moral, and Spiritual Interconnections	Participants connected child development with family, school, community, nature, environmental responsibility, and theological values.	P04: "Harmony between oneself, others, the environment, and the Creator is important..."
4. A Child-Centred Pedagogical Approach	Participants reported greater attention to context, individual differences, children's needs, and the teacher's role as a facilitator.	P05: "I also try to understand the causes, such as family or environmental factors."

The eco-theological PjBL activities provided participants with opportunities to observe, design, implement, and reflect on learning activities in authentic educational contexts. Figure 1 presents selected documentation of the project activities conducted during the learning process.



Figure 2: Eco-theological Project Learning Context

Note: The photographs document learning and project activities and are presented as contextual evidence of the learning process, not as measures of children's developmental outcomes.

Multidimensional Understanding of Child Development

Participants described child development as broader than academic or physical growth. Their reflections referred to several dimensions that operate together in children's everyday experiences. P01 explained that child development involves “cognitive, physical, language, social, emotional, moral, personality, creativity, digital, and ecological aspects that cannot be separated.” This indicates that participants interpreted development as a multidimensional and interconnected process rather than as separate developmental domains.

PjBL as a Bridge between Theory and Practice

The project experience was frequently described as an opportunity to connect concepts learned in the course with direct experience. Participants particularly valued observation, project implementation, and reflection. P03 stated that project activities enabled them to understand more because they “practised it directly and gained experience rather than only understanding the material.” Similarly, P11 identified project activity as the most helpful course experience because it provided direct learning experience. Thus, participants positioned PjBL as an experiential context in which theoretical knowledge about child development could be interpreted through authentic situations.

Ecological, Social, Moral, and Spiritual Interconnections

Participants also interpreted child development in relation to children's surrounding environments. Family, school, peers, community, and nature were viewed as interconnected influences. P07 stated that “family, school, peers, community, and the natural environment all influence children's development.” The eco-theological dimension added moral and spiritual meaning to these environmental experiences. P04 connected respect for others with respect for the natural environment and described harmony between “oneself, others, the environment, and the Creator” as important for healthy development. P09 similarly reflected that the learning experience influenced personal values and increased concern for children and the environment. These statements indicate how participants incorporated ecological responsibility and theological meaning into their interpretation of child development.

A Child-Centred Pedagogical Approach

The fourth theme concerned participants' interpretation of children and the teacher's role. Rather than viewing children's behaviour in isolation, participants reported considering contextual factors. P05 stated, “I do not only

look at children's behaviour, but also try to understand the causes, such as family or environmental factors.” This perspective was accompanied by a broader understanding of the teacher's role. P06 explained that the teacher is “not only someone who teaches, but also guides, understands children's needs, and supports different aspects of their development.” The reflections therefore positioned teachers as facilitators who observe, interpret, and respond to children's diverse developmental needs.

Relationship among the Themes

The four themes were interconnected rather than sequential. Participants' multidimensional understanding of development provided a conceptual basis for interpreting observations; PjBL connected this understanding with experience; the eco-theological perspective expanded interpretation toward ecological, social, moral, and spiritual relationships; and these understandings informed a more child-centred view of teaching. The relationship represents participants' reflective meaning-making, not a causal model of children's developmental change.

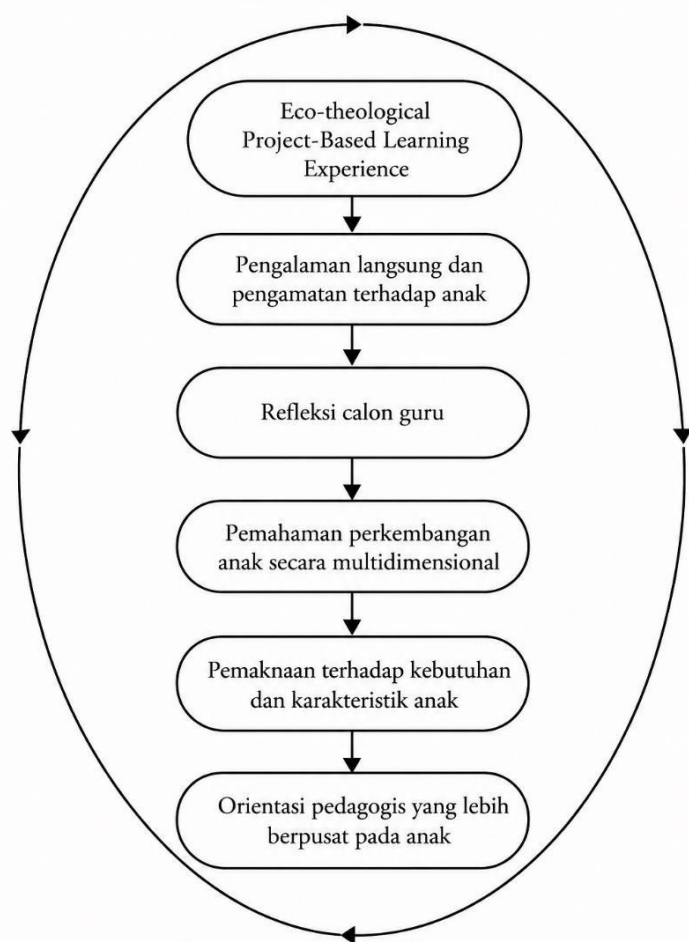


Figure 3: Thematic Relationship Emerging from Participants’ Reflections

The figure illustrates the thematic connections that emerge from trainee teachers’ reflections on their learning experiences. The process begins with the Eco-theological Project-Based Learning Experience, which provides a project-based learning experience with an ecological context and theological values. This is followed by direct experience and observation of children, enabling trainee teachers to observe the children’s behaviour, interactions, abilities and responses. The results of these observations then form the basis for the trainee teachers’ reflection. Through this reflective process, trainee teachers develop a multidimensional understanding of children’s development, including an understanding of children’s characteristics and needs. This understanding is further linked to the interpretation of children’s needs and characteristics, which is reflected in a more child-centred pedagogical approach. The arrows encircling the entire sequence

indicate that this process is reflective and continuous, rather than an experimental cause-and-effect relationship. Thus, the diagram represents the pattern of thematic relationships identified in the participants' reflective data

DISCUSSION

The findings indicate that pre-service primary school teachers interpreted child development through a broader and more contextual perspective after engaging with observation, eco-theological PjBL, and reflective activities. The four themes demonstrate how theoretical knowledge, authentic experience, ecological context, and pedagogical reflection were brought together in participants' meaning-making.

Child Development as a Multidimensional Process

The first theme shows that participants did not interpret child development solely in terms of academic achievement or physical growth. Their reflections incorporated cognitive, social, emotional, moral, creative, digital, and ecological dimensions. This interpretation is consistent with holistic perspectives of child development, which emphasize that developmental domains are interconnected rather than functioning independently. The finding is important for primary teacher education because teachers frequently encounter children's development through everyday behaviour and classroom interactions rather than through isolated developmental domains. The reflections suggest that the learning experience provided participants with a conceptual framework for interpreting these different dimensions together. However, this finding concerns the participants' understanding and should not be interpreted as evidence that children's development itself changed.

PjBL as an Experiential Link between Theory and Practice

The second theme highlights the role of direct experience in helping participants interpret theoretical concepts. Participants repeatedly identified observation, project activities, and reflection as meaningful because these activities allowed them to connect course concepts with authentic situations. This is consistent with previous discussions of Project-Based Learning as an approach that emphasizes active, contextual, and experiential learning (Genc, 2015; Kiliç, 2010). In this study, however, PjBL should be understood primarily as a learning context for the pre-service teachers. The study did not test whether PjBL was more effective than another teaching approach. Instead, the findings show how participants themselves interpreted the experience as useful for connecting theory with practice.

Eco-Theological Meaning-Making

The third theme extends the discussion beyond conventional environmental learning. Participants interpreted environmental experiences through relationships among children, society, nature, moral responsibility, and the Creator. This reflects an eco-theological orientation in which care for the environment can be connected with ethical and spiritual meanings (Caduto, 1998; Altmeyer, 2021). The finding also corresponds with literature emphasizing connections between environmental learning, social responsibility, and values (Bramwell-Lalor et al., 2020; Foley et al., 2023). Importantly, the present findings demonstrate participants' interpretations of these connections. They do not establish that the children involved became more environmentally aware, morally responsible, or spiritually developed.

Toward a Child-Centred Pedagogical Orientation

The fourth theme indicates that participants increasingly described teaching in terms of understanding children's needs and interpreting behaviour within its context. Rather than focusing only on observable behaviour, their reflections considered family, school, peers, and environmental factors. This orientation is compatible with ecological perspectives of child development, in which children's development is understood through interactions between individuals and their surrounding contexts. The finding also has implications for teacher preparation. PjBL combined with observation and reflection can provide opportunities for pre-service teachers to practise interpreting children's experiences before making pedagogical decisions. The teacher is consequently represented not only as a transmitter of knowledge but also as an observer, facilitator, and supporter of diverse developmental needs.

Overall Interpretation and Study Boundary

Taken together, the four themes suggest that eco-theological PjBL functioned as a reflective learning context through which pre-service primary school teachers connected child-development theory with authentic observation, environmental experiences, moral-spiritual values, and child-centred pedagogy. The main contribution of the study therefore lies in understanding how future teachers construct meaning across these dimensions. The interpretation remains bounded by the study design. The evidence comes from participants' written reflections and does not include standardized developmental assessments, longitudinal measures, or independent evaluation of children's outcomes. Accordingly, the findings should be understood as evidence of pre-service teachers' reflective learning and meaning-making rather than as evidence of direct developmental effects on children.

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