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Investigating the Effects of Discovery Learning Using EcoExplorer on Daycare Pupils' Environmental Skills

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A B S T R A C T

Early childhood education, particularly in daycare settings in the Philippines, plays a pivotal role in shaping the foundation of a child's lifelong learning. However, integrating discovery learning into children's education in urban areas with limited space and opportunities for exploration remains a challenge, presenting numerous challenges that continue to hinder the environmental skills of our young learners. This study investigated the effectiveness of 'EcoExplorer' as supplementary material on daycare learners' environmental skills. Specifically, this study aimed to assess daycare learners' initial level of competence in environmental skills, measure their performance after using the supplementary material, and analyze the qualitative feedback about the material's usability and impact. A mixed-method approach was employed, integrating a pre-experimental one-group pretest-posttest design with qualitative feedback analysis. The study involved thirty daycare children who engaged with EcoExplorer for six sessions over one month. The findings revealed a statistically significant improvement in the pupils' knowledge and understanding of environmental concepts. Moreover, qualitative analysis of the feedback underscored the material's effectiveness in making learning engaging and interactive. These results suggest that EcoExplorer serves as a valuable supplementary resource for daycare education, highlighting the need for innovative instructional materials in early childhood settings.

R E S U M O

A educação infantil, particularmente em creches nas Filipinas, desempenha um papel fundamental na formação da base do aprendizado ao longo da vida de uma criança. No entanto, integrar a aprendizagem por descoberta na educação de crianças em áreas urbanas com espaço limitado e oportunidades de exploração continua sendo um desafio, apresentando inúmeros desafios que continuam a dificultar as habilidades ambientais de nossos jovens alunos. Este estudo investigou a eficácia do "EcoExplorer" como material suplementar nas habilidades ambientais dos alunos de creche. Especificamente, este estudo teve como objetivo avaliar o nível inicial de competência dos alunos de creche em habilidades ambientais, medir seu desempenho após usar o material suplementar e analisar o feedback qualitativo sobre a usabilidade e o impacto do material. Uma abordagem de método misto foi empregada, integrando um design pré-teste-pós-teste de um grupo pré-experimental com análise de feedback qualitativo. O estudo envolveu trinta crianças de creche que se envolveram com o EcoExplorer por seis sessões ao longo de um mês. As descobertas revelaram uma melhora estatisticamente significativa no conhecimento e compreensão dos alunos sobre conceitos ambientais. Além disso, a análise qualitativa do feedback destacou a eficácia do material em tornar o aprendizado envolvente e interativo. Esses resultados sugerem que o EcoExplorer serve como um recurso suplementar valioso para a educação em creches, destacando a necessidade de materiais instrucionais inovadores em ambientes de primeira infância.

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Introduction

Science in early childhood education is essential for establishing the foundations for a child's lifelong educational path. Despite the emphasis on developing cognitive abilities and creativity, implementing discovery learning methodologies in Philippine childcare facilities may need help to overcome obstacles. Discovery learning, which actively encourages students to explore and construct knowledge through self-guided inquiry, offers numerous benefits (Bustos-Orosa, 2022). It enhances memory formation by linking information to personal experiences and promotes more profound understanding and engagement (Odem-Yilmaz & Bilican, 2020). Although Rahmawati et al. (2021) and Ong (2024) demonstrated the effectiveness of discovery learning in formal education, the specific context of early childhood, especially those located in urban, near roads, and busy locations, raises concerns. The lack of natural spaces and environments for learning can hinder opportunities for hands-on exploration and focused learning activities.

Discovery learning is a constructivist educational theory that places students at the center of their learning experience, encouraging them to actively explore and construct knowledge through self-guided inquiry and problem-solving (Ozdem-Yilmaz & Bilican, 2020). This approach underscores the idea that learners are not passive recipients of information but rather architects of their knowledge (Gauvain, 2022). Both guided and unguided discovery learning approaches enhance the formation of event-based memories by linking information to experiences or events (Bustos-Orosa, 2022). Students can use recollections of the discovery activity to reconstruct the knowledge gained (Rahmawati et al., 2021). Implementing the discovery learning model in formal education expanded students' knowledge and test scores compared to a control group exposed to conventional teaching methods (Orine et al., 2024). Students actively participating in their learning are more likely to be fully engaged, attentive to the material, motivated, and capable of profoundly comprehending the topics instructed. Therefore, implementing learning strategies that encourage student activity, such as the discovery learning model, may effectively improve student achievement in science (Ozdem-Yilmaz & Bilican, 2020; Widolaksono et al., 2023).

While Rahmawati et al. (2021) and Orine et al. (2024) demonstrated the benefits of discovery learning in formal education settings, the specific context of early childhood centers in cities may present unique limitations. Research indicates that younger children (early childhood period) struggle to grasp abstract scientific concepts without sufficient support (Silva & Araujo, 2024). Moreover, the lack of access to green spaces or natural environments, such as parks, forests, or beaches, can restrict opportunities for hands-on exploration and direct interaction with the physical world (Silva & Araujo, 2024). Additionally, the noise and pollution associated with urban areas may interfere with children's ability to concentrate and

engage in focused learning activities. Furthermore, Otero-Mayer et al. (2024) contend that unstructured discovery learning might not be appropriate for all learners, especially young children who need straightforward guidance and organized learning experiences to prevent uncertainty and cognitive overload. Particularly, discovery-based methods may not be able to promote basic scientific knowledge in urban environments when exploratory chances are already restricted.

Science skills, such as those related to the physical and natural environment, play a crucial role in early childhood development (Etokabeka, 2024; Santos et al., 2023). Birbili and Christodoulou (2024) emphasized that early exposure and questioning help children understand the world, fostering curiosity and cognitive growth. According to DepEd (2024), environmental skills refer to understanding, interacting with, and adapting to the physical world around us. This skill involves understanding the surroundings, interacting effectively with living and nonliving things, and sustaining their natural curiosity in their physical environment (DepEd, 2024). The environment is essential as children's first-hand experiences provide them with information about how something feels or looks like and, to some extent, how things function or work (Skalstad & Munkebye, 2021; Silva & Araujo, 2024). Discovery learning could not offer the same cognitive and developmental advantages in circumstances where direct engagement with nature is rare, though, compared with more natural surroundings.

Additionally, Bustos-Orosa (2022) and Ong (2024) assert that early development centers and schools must be remodeled into places that foster enthusiasm for science and scientific reasoning in young children. These early experiences can equip young children with the curiosity, critical thinking, and problem-solving essential for success in science and beyond. Discovery learning could not, however, provide the expected advantages in all situations without suitable adaptations. In urban environments, alternative teaching strategies combining organized direction with inquiry might offer a more efficient approach.

While King et al. (2020) assert that discovery learning fosters independent thought and analysis among students to acquire knowledge and comprehension, Fuente (2019) cautions that inadequate teacher guidance may hinder students' ability to establish significant connections between their discoveries and overarching scientific principles. Furthermore, Otero-Mayer et al. (2024) highlight that purely discovery-based approaches may not accommodate diverse learning needs, as some children require direct instruction and scaffolding to develop essential cognitive skills. Its constraints must be acknowledged to optimize the efficacy of discovery learning, especially in contexts where access to natural exploratory environments is restricted.

Framework of the Study

This study drew upon several educational theories that support the development and evaluation of the features of EcoExplorer as supplementary material designed to enhance daycare pupils' environmental skills. These theories include:

Discovery Learning Theory. This indicates that young learners best acquire knowledge by actively exploring and building understanding through hands-on experiences and investigative activities (Bruner, 1961, as cited by Ozdem-Yilmaz & Bilican, 2020). Independent play using EcoExplorer encouraged deeper understanding. Salam et al. (2023) highlighted the importance of allowing each student to explore, manipulate, and connect with what they see rather than passively absorbing knowledge.

The content comprises three organized phases of EcoExploration: (1) recognizing animals using toy simulators, (2) associating species with their respective landforms and aquatic environments, and (3) situating creatures inside their suitable habitats. These activities enable children to generate knowledge freely, hence supporting the inquiry-based learning approach advocated (Salam et al., 2023). The diorama type of material was selected above alternative discovery-based tactics for its accessible and adjustable format, which is appropriate for urban childcare environments where outdoor natural spaces are frequently restricted. The material employs a play-based, multisensory, and interactive methodology, enabling learners to actively engage with environmental themes in accordance with their cognitive and sensory development.

Piaget's Cognitive Learning Theory. This theory reinforces the design of EcoExplorer by highlighting that daycare learners actively generate knowledge through their experiences and interactions with the environment. Piaget's theory posits that early childhood is a pivotal phase for cognitive development, during which infants transition from sensory-motor exploration to preoperational reasoning, allowing them to classify, compare, and categorize environmental objects (Birbili & Christodoulou, 2024). The EcoExplorer framework corresponds with this developmental process by incorporating categorization exercises, guided inquiries, and problem-solving tasks that motivate children to organize and comprehend their environment systematically.

In addition to cognitive development, nurturing environmental awareness in the early years is necessary. Studies demonstrate that this phase is pivotal for establishing environmental awareness and pro-environmental actions (White & Stoecklin, 2020). Young children cultivate a connection with nature through direct experiences, sensory inquiry, and play-based interactions. Organized, discovery-oriented resources—such as EcoExplorer—are essential for facilitating nature-based learning inside classroom contexts in urban situations with restricted access to natural settings.

Piaget's framework underscores the independent formation of knowledge, whereby children actively interact with their surroundings, modifying their comprehension in light of novel discoveries (Piaget, 1971, as cited in Birbili & Christodoulou, 2024). This corresponds with the EcoExplorer principles, which advocate for inquiry-based learning, inductive reasoning, and discovery techniques to assist young learners in freely exploring and internalizing environmental topics. EcoExplorer facilitates controlled yet open-ended experiences, enabling youngsters to cultivate a profound awareness of their environment while enhancing cognitive development through active discovery (Ernst & Tornabene, 2019).

Steiner's Theory of Learning emphasizes sensory-rich, hands-on learning, where children actively explore their environment to develop understanding. Rooted in Waldorf education, it promotes imaginative play and experiential learning, aligning with EcoExplorer's design (Stoltz et al., 2024). EcoExplorer fosters multi-sensory discovery, allowing children to classify animals, match habitats, and engage in guided exploration. This approach is especially valuable in urban daycare settings, where direct contact with nature is limited. Research supports nature-based, play-driven learning in enhancing environmental awareness and cognitive growth (White & Stoecklin, 2020; Torquati & Ernst, 2018).

These educational theories collectively validate and support EcoExplorer's approach to enhancing science skills, particularly environmental skills, through active discovery learning in the natural environment. They provide the theoretical framework for an educational strategy that actively engages students, fosters their curiosity, and deepens their understanding of physical and natural science.

Conceptual Approach and Development of EcoExplorer

The study employed the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation) as a structured framework for designing, developing, and assessing EcoExplorer's effectiveness following Ong and Ancheta's (2024) design framework in designing materials. The study employed structured and unstructured play approaches using the developed EcoExplorer, where young learners in the urban child center can follow their curiosities and interests. The study provided opportunities for young learners in an urban daycare setting to explore and connect scientific ideas with real-life experiences.

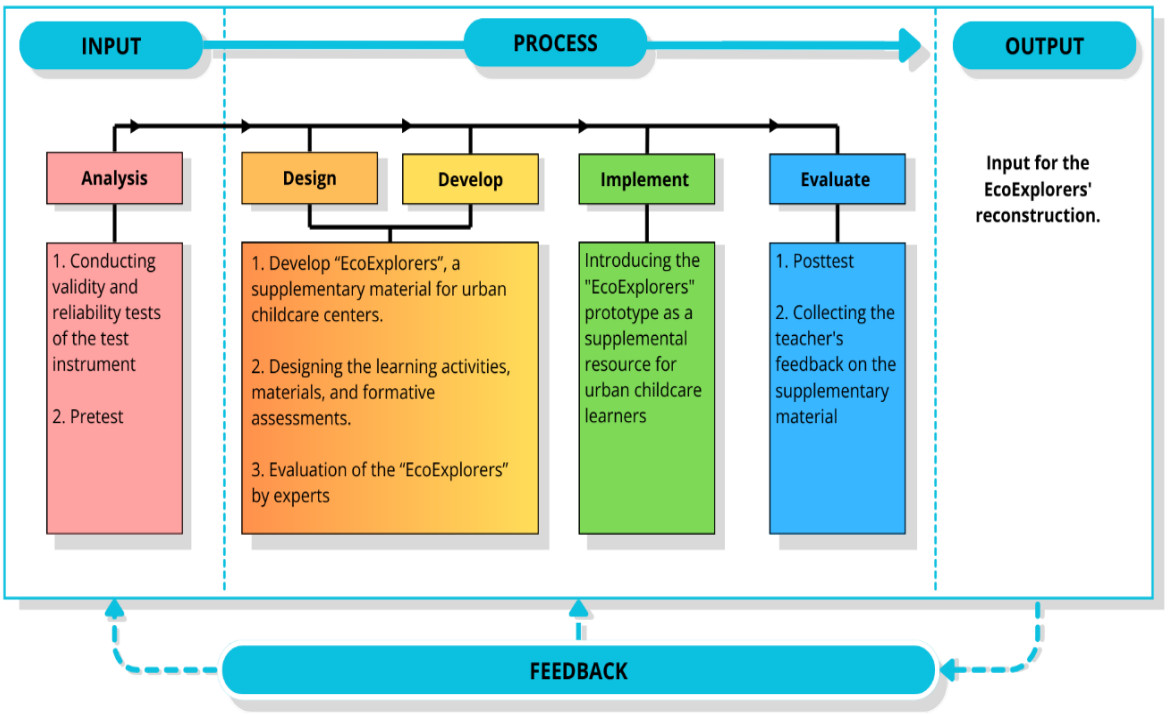
EcoExplorer was designed mainly to assist with the specific challenges of an urban childcare environment in which access to natural exploration areas can often be restricted. EcoExplorer offers a structured, flexible, hands-on learning experience using interactive play materials, including toy animals, habitat cards, and diorama frameworks, unlike conventional discovery-based approaches that could call for open outdoor surroundings. Its design guarantees that, in a controlled classroom atmosphere, young learners may actively participate in environmental exploration, therefore developing their scientific abilities free from

the limitations of outside access. EcoExplorer is also a useful and sensible tool for raising environmental awareness among daycare students. It integrates sensory-rich activities, guided exploration, and scaffolded learning in line with early childhood cognitive development ideas.

Figure 1 illustrates the conceptual framework of the investigation. The ADDIE approach was used in the development, evaluation, and expert assessment of the content and features to enhance its design and other attributes.

Figure 1.

Conceptual Framework of the Study



This study aimed to explore the effectiveness of EcoExplorer as supplementary activity material to enhance environmental skills through a discovery learning approach in an urban daycare setting. Specifically, it is designed to determine the proficiency of daycare learners in environmental abilities before and after the introduction of supplemental materials, to ascertain any significant differences in outcomes, and to examine teachers' comments about the supplementary materials.

Methodological Procedure

This study used a pre-experimental research design using a one-group pretest-posttest framework. Pre-experimental research or "pseudo-experiment" is the most suitable strategy for pilot testing the EcoExplorer supplementary material since they are in early childhood and are still preparing for formal education (Cash, 2016, p. 7). Although the absence of a control

group drives up inquiries regarding internal validity—the prospective effect of maturation or other influences on learner performance—ethical and practical reasons led this strategy to be analyzed adequately. Using a control group would have meant depriving certain learners of additional learning resources, possibly negatively impacting them. Furthermore, considering the exploratory character of the study, its main goal was to evaluate EcoExplorer's feasibility and early performance instead of proving clear causality.

Thirty childcare learners engaged in the study. Specific inclusion criteria guided the selection of participants: (1) they were enrolled in the childcare program at the time of the study; (2) they were granted parental permission for participation; and (3) they were present for both the pretest and posttest sessions. The City Social Welfare Development Office coordinated the selection process. Formally, the researchers asked the relevant authorities for authorization and obtained parental approval by written communication. Among qualified learners, the research guaranteed perfect participation (100%).

Every student underwent EcoExplorer under controlled circumstances with the goal of reducing any implementation biases. Over six planned sessions spanning one month, the intervention consisted of all students participating in identical activities at equal times. Teachers guaranteed uniformity in application by using a set teaching guide.

Ethical Considerations

The research adhered to rigorous ethical requirements. Essential approvals were obtained from relevant agencies, including the City Social Welfare Development Office. Official communication secured parental consent; all participants were assured that their data would be managed with anonymity. The study complied with established data security requirements, therefore ensuring that all collected data was utilized solely for academic purposes. The data were securely discarded per ethical research protocols after the study's conclusion. During the research process, child safety was prioritized; researchers and teachers maintained a non-intrusive, supportive learning environment. Teachers were provided with briefings on safeguarding protocols to ensure the well-being of each participant.

Instrumentation and Data Collection

The study followed the phases in the ADDIE model in designing and evaluating the EcoExplorer. In the **Analysis phase**, the researchers identified daycare learners' competence levels through pretesting. The material included a validated 20-item researcher-developed assessment used in both the pretest and post-test. The assessment included themes from Pre-Kindergarten 2 Curricular Theme 4, derived from the ECCD Learning Resource Packages for

Pre-Kindergarten (ECCD, 2015). The validity results ($\tilde{x}$=5) further validated the consistency of test questions, ensuring an accurate assessment of learners' competency levels. Pilot testing of the tool is conducted at the same level for children who were not included in the research. The calculated Cronbach alpha value of 1.108 indicates that the material test questionnaire has exceptional reliability. Consequently, the internal validity of the inquiry is strong. Thus, the questions exhibit consistency and are interconnected.

The pretest revealed that no learners were at the Poor nor the Failing level, indicating the students had a good awareness of different animals, their habitats, and various land and water forms. This suggests that learners had a strong foundation in environmental concepts, which supports early environmental awareness. However, there were still competencies at the Average, Good, and Excellent levels, which indicated that the learners had a fair grasp of the environmental concepts and were likely to perform better in assessments and tests. Despite the good foundation before the daycare program, the center still resides in the urban area, where limited resources and a place for discovery need to be supplemented. Therefore, the research team developed the EcoExplorer to supplement the competencies to sustain the educational skills of young learners.

Figure 2.

Physical appearance and logo of EcoExplorer from the top angle

The **Design phase** included the analysis of the level of competence, which had been the basis of the material content and pedagogical design. Likewise, the theoretical principles in discovery learning were incorporated into the activities. The researchers designed each activity to be engaging, interactive, and relevant to the learners' lives while adapting to their

varied learning styles and abilities. Five instructors, consisting of early childhood subject experts, technical experts, and a school administrator, then validated the EcoExplorer to ensure its effectiveness and alignment with the principles of discovery learning.

During the **Development** and **Implementation phases**, the researchers created a diorama framework suitable for five (5) to six (6) learners, allowing the pupils to interact with their peers while learning. EcoExplorer features three (3) phases of play. The first step is identifying the various creatures using toy animals. The second level focuses on Water and Landforms. Cards were distributed with descriptions of the various landforms and water formations. Each session was conducted under identical conditions, ensuring all participants experienced the topic similarly. Teachers adhere to standard guidelines for executing tasks and maintaining educational integrity throughout the sessions.

Pupils will subsequently determine the land and water formations depicted on each page. It is necessary for them to identify it by obtaining its name and placing it in its perfect habitat. This material facilitated students' independent exploration of various landforms and water bodies. It has also facilitated the development of pupils' environmental skills, literacy, and matching abilities. The final stage pertains to animals' habitats. After acquiring knowledge, identifying, and naming the diverse species, landforms, and water types, it is time to relocate the organisms to their natural environments.

Figure 3.

Phases of Play in the EcoExplorer

Learners were given guide cards with various photographs of animals on them, and they had to discover toy animals that looked precisely like the ones in the pictures. Then, a question was posed, "Where does this animal live?" The learners were instructed to place the toy animal

in the habitat that they were familiar with. The discovery learning exercises were organized into six sessions and executed over one month.

In the **evaluation** phase, the posttest results for the environmental skills of daycare pupils were obtained and will be presented in the next section. Similarly, teacher qualitative feedback was collected to better understand the impact of the supplementary material. These comments were gathered in interviews. After the collection, the researcher transcribed, coded, and analyzed the themes according to Braun and Clarke's (2006) thematic analysis framework.

Figure 4.

Guide cards of the EcoExplorer

Results and Discussion

Environmental Skills Before and After EcoExplorer Implementation

Table 1 displays the results of daycare children's environmental skills before and after EcoExplorer's implementation. Based on the data gathered, no pupils received scores in the Fail or Poor categories in either the pretest or posttest. This suggests that all the daycare students have a fundamental comprehension of animals, ecosystems, and terrestrial and aquatic formations.

After the supplemental, no students remained at the Average level, indicating that the five students at the Average level during the pretest improved their knowledge and

comprehension of the assessed subjects. This illustrates favorable learning results. Initially, 13 pupils were at the Good level before the introduction of EcoExplorer; however, only 4 out of 30, or 13.33%, maintained the Good level once the supplemental activity material was introduced. This indicates a successful supplement that markedly enhanced the knowledge and comprehension of most students who were previously at a Good level. This indicates that all participants had significant learning improvements and advanced to the Excellent level after the supplemental intervention.

Primarily, 12 students were at the Excellent level; however, after the supplemental assessments, 26 out of 30 students, or 86.67%, now attain the Excellent level. The outcome indicates that the extra material has rectified previously existing knowledge gaps. Ozdem-Yilmaz and Bilican (2020) and Gauvain (2022) discovered that interactions with nature favorably affect children's cognitive, social, and emotional development, reinforcing the idea that experiences offered by EcoExplorer may improve several facets of child development.

Table 1.

Proficiency of Daycare Learners in Environmental Skills

Proficiency Level	Pretest (%)	Posttest (%)
Fail	0	0
Poor	0	0
Average	5 (16.67%)	0
Good	13 (43.33%)	4 (13.33%)*
Excellent	12 (40.00%)	26 (86.67%)*

*Significant at 0.5 alpha

Statistical Analysis and Effect Size

A more significant cohort achieving Excellent indicates a more robust overall understanding of environmental science. This enhanced comprehension equips pupils well for future environmental studies. The research by Otero-Mayer et al. (2024) and Funete (2019) corroborates these results, indicating that a well-structured supplemental program may enhance the engagement and enjoyment of scientific learning for preschool children, therefore cultivating favorable attitudes toward science that may help their future education.

A paired samples t-test was conducted between Daycare pupils' pretest and posttest measures. With a p-value of 0.00001, which is less than ($p = <0.05$), the result demonstrates a statistically significant improvement. However, statistical significance alone does not convey the magnitude of improvement. To address this, Cohen's d was estimated based on the shift in proficiency levels. The substantial increase in the proportion of students reaching the Excellent

category (from 40% to 86.67%) and the decline in the Good category (from 43.33% to 13.33%) suggest a large effect size. Based on ordinal effect size estimation methods, Cohen's d was approximately 1.8, indicating a very large educational impact. This suggests that the observed gains in learning were statistically significant and practically meaningful.

Ong and Ancheta (2024) assert that students reassess their prior beliefs and behaviors when assimilating new concepts, which aligns with the observed improvement in posttest scores. Widolaksono et al. (2023) also emphasize that exposure to contemporary educational methodologies fosters cognitive growth and enhances learning outcomes (Birbili & Christodoulou, 2024; Orine et al., 2024).

Effectiveness of Experiential Learning in Early Childhood Education

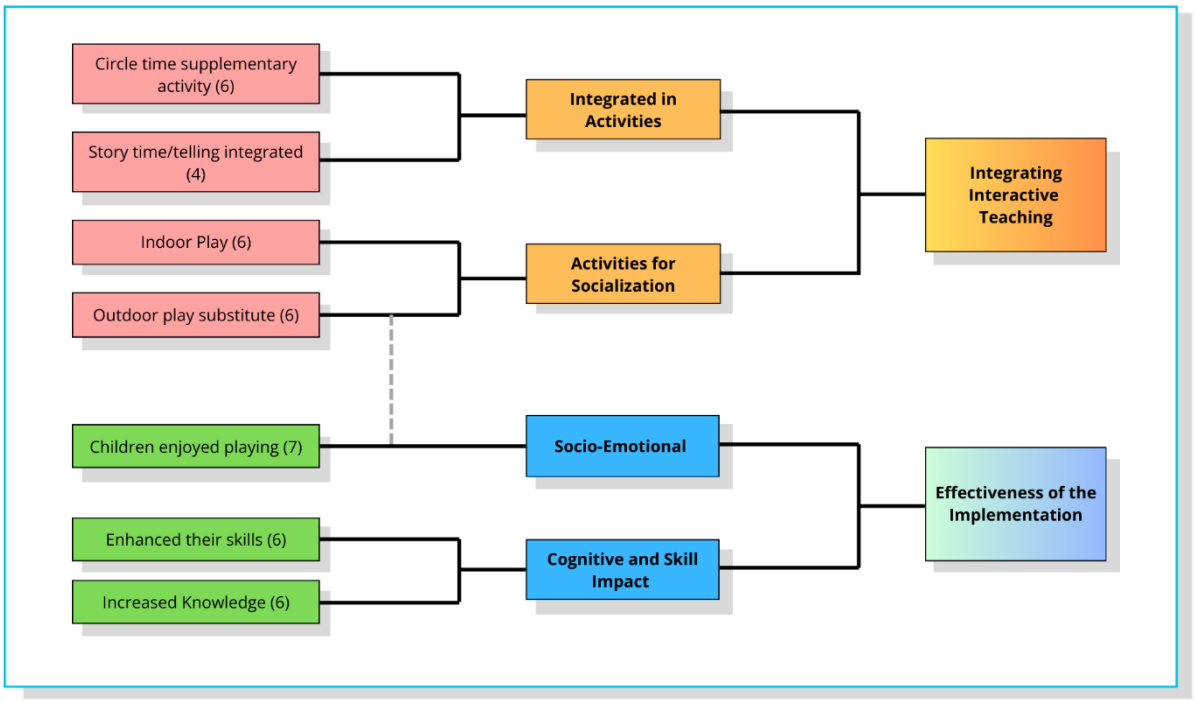
The significant increase in daycare learners' scores using the EcoExplorer underscores the effectiveness of experiential learning in strengthening information retention and conceptual understanding. The large effect size further supports that EcoExplorer substantially impacted learners' cognitive development, reinforcing the importance of discovery-based learning approaches in early childhood education. Furthermore, the role of teacher supervision must be recognized—teachers aided in the implementation of EcoExplorer, and their support may have contributed to students' advancement. The intervention's systematic design, along with established execution protocols, reduces variability in teacher influence.

Teacher's Feedback and Thematic Analysis

Consequently, the teacher's interview responses disclosed two themes that emerged regarding the implementation of the EcoExplorer. Ecoexplorer is emphasized as a method of integrating instruction, as the teacher's feedback pertains to the incorporated activities and the supplementary material as a socialization aid. Conversely, the efficacy of EcoExplorer's implementation was underscored by socio-emotional factors, including the students' emotions as observed by the instructors and their influence on their cognitive and skill development.

Figure 4.

Thematic Scheme with the emerging categories



Integrating Interactive Teaching

Teachers underscore the content's significance in enhancing daycare learners' holistic development. The various activities expose learners to diverse opportunities to engage actively with environmental concepts. Interactive teaching methods, such as hands-on experiments, outdoor explorations, and interactive simulations, enable students to experience and interact with the natural world firsthand. The participant employs a range of activities such as circle time, storytime, indoor play, and outdoor play to teach physical and natural environments. The significance of interactive teaching is that it helps students socialize with their classmates and develop their physical and mental skills. It is also a helpful way to teach physical and natural environment skills. One of the teachers stated:

> *"...yung circle time nila getting to know each other, tapos yung story time nila and sa mga play it's either outdoor or indoor dun nadedevelop yung physical skills nila pero bukod sa mga yan sympre nagagamit ko rin yang mga activities na yan sa pagtuturo ng physical and natural environment (...During their circle time, students familiarize themselves with one another. Subsequently, throughout their storytelling and recreational activities, whether conducted inside or outdoors, their physical abilities improve. In addition to this, I use these activities to educate children about the physical and natural environment.)"*

The initial coding process revealed repeated terms related to “socialization,” “mobility,” “engagement,” and “cognitive growth.” These codes were grouped into the broader theme of interactive teaching. Supporting studies, such as those by Santos et al. (2023), affirm that play-based learning fosters environmental awareness and enhances cognitive abilities. The activities associated with the EcoExplorer can simultaneously target many abilities rather than concentrate on a single one. The integration of interactive teaching enriches a hands-on learning environment that promotes children’s mobility, discovery, and interaction with the natural world. Furthermore, the study conducted by King et al. (2020) supports the concept as the study highlights significant improvements in children's environmental knowledge and attitudes following play-based learning interventions. Additionally, children demonstrate increased curiosity about the natural world, greater appreciation for the environment, and a stronger sense of environmental responsibility (Silva & Araujo, 2024).

Circle-time discussions about upcoming outdoor activities, story time with nature themes, and structured or unstructured play sessions outdoors contribute to this type of learning (Skalstad & Munkebye, 2021). Interactive pedagogical techniques for instructing on the physical and natural surroundings strongly align with Jean Piaget's cognitive development theory. Experiential learning and active participation in the environment enhance children's comprehension by providing diverse interactive activities, including circle time discussions, nature-themed storytelling, and both indoor and outdoor play sessions. Educators create opportunities for children to explore and engage with their surroundings, thereby promoting cognitive development. This resonates with the findings of Otero-Mayer et al. (2024) and Birbili and Christodoulou (2024) that children who participated in these interactive activities showed significant improvements in cognitive skills such as problem-solving, critical thinking, and language development.

Effectiveness of the Implementation

Teachers recognize the efficacy of using EcoExplorer as an ancillary resource. The analysis identified “comprehension of surroundings,” “connection with curriculum,” and “value formation” as recurring sub-themes. It enabled a more profound comprehension of the surroundings. At the same time, the teachers further emphasized the intersection of the EcoExplorer with the curriculum's emphasis on valuing God's creation, a concept examined in Quarter 4. One of the teachers stated that the EcoExplorer positively influences the environmental skills of daycare pupils, mentioning:

“Yung sa ginamit niyong supplementary mas nakikilala pa nila yung environment kase part din yun namin sa quarter 4, knowing what god has created us mas nadadagdagan yung kaalaman nila. (The supplemental resources used facilitated their understanding of the

environment, since it is also integral to our Quarter 4 curriculum. Their knowledge is developing through the understanding of God's creations)".

The feedback indicates that the application of EcoExplorer has resulted in notable improvements in socioemotional, cognitive, and abilities essential for establishing competencies in both physical and natural environments. This linkage strengthens the material's relevance and promotes the integration of environmental education with overarching educational objectives (Etokabeka, 2024). Furthermore, through engaging activities and hands-on experiences, daycare pupils have demonstrated notable improvements in their ability to recognize, understand, and interact with the natural world. This innate curiosity and active engagement with their surroundings allow children to gain fresh insights into unfamiliar objects and environments, facilitating their learning process (Bustos-Orosa, 2022). Bruner (1961), corroborated by the research of Ozdem-Yilmaz & Bilican (2020), asserts that pupils' cognitive development is enhanced by engaging in activities that simultaneously facilitate learning. Allowing pupils to respond independently is crucial for their exposure to new experiences.

Summary

This study addressed a significant research gap in early childhood education by examining the use of EcoExplorer, a supplementary resource that facilitates discovery learning in urban daycare settings, specifically focusing on improving children's environmental abilities despite the limited space and opportunities for exploration. Although educational supplements in childcare environments are well acknowledged, there is less data about the use of discovery learning for abilities related to the physical and natural world. A mixed method employing a pre-experimental approach with qualitative analysis of the feedback was used to provide an enhanced understanding of the material's supplemental impacts. Validated pretests and posttests were conducted to assess the environmental abilities of children aged 3 to 4.

Data was gathered from an urban childcare center with thirty (30) students. The quantitative analysis included averaging, frequency counts, and pre-posttest evaluation of the verified material, whilst the qualitative data was subjected to theme classification and content analysis. This study sought to evaluate the effectiveness of 'EcoExplorer' as an ancillary resource for enhancing daycare learners' environmental competencies through discovery learning, offering significant insights for academic inquiry and practical implementation in early childhood education.

Based on the data gathered, the following findings were presented:

The pretest findings indicated that daycare pupils have a good to exceptional comprehension of thoughts related to the physical and natural world, with no students

receiving failing or poor scores. However, a limited percentage have attained mastery at the levels of good and exceptional; hence, supplemental material is beneficial.

Following the implementation of the EcoExplorer, there was a statistically significant improvement in pupils' scores, with 86.67% attaining an excellent level compared to 40% before providing the supplementary material activities.

The teacher's feedback emphasized the effectiveness of the material when incorporated and utilized with interactive teaching methods during circle time, storytime, indoor play, and outdoor play to impart environmental skills while simultaneously promoting socialization and enhancing the skills of pupils.

The EcoExplorer supplementary activity material aligned well with the curriculum's focus on appreciating God's creation (Spiritual learning) and improved the daycare pupils' environmental skills.

Conclusions

Based on the findings of the study, the following conclusions are made:

The daycare pupils had a strong foundational knowledge of environment concepts before the supplementary material, which is crucial for promoting environment stewardship from a young age.

The EcoExplorer supplementary material was highly effective in improving pupils' knowledge and understanding of environmental concepts, addressing any existing knowledge gaps.

Interactive teaching methods that engage students through hands-on experiences, discovery learning, and inquiry-based activities effectively teach environmental skills and nurture well-rounded development.

The EcoExplorer supplementary material, which aligns with theories of cognitive development and learning through play, provides ample opportunities for students to connect abstract scientific ideas with concrete, real-world experiences.

Recommendations

Based on the conclusion of the study, the following recommendations are made:

Continue implementing the EcoExplorer supplementary or similar programs to maintain and further improve pupils' environmental skills.

Allocate sufficient resources and time for unstructured play and exploration in the curriculum to foster students' natural curiosity and connect abstract concepts with concrete experience.

Ensure that the curriculum continues to focus on appreciating God's creation and fostering a connection with nature to support environmental stewardship.

Conduct further research to explore the long-term impact of the EcoExplorer supplementary on students' academic performance, critical thinking skills, and environmental awareness.

Limitations and Delimitations of the Study

First and foremost, the study employed a pre-experimental design, which used a one-group pre-test-posttest framework to measure skills before and after exposure to EcoExplorer, providing a basis for effectiveness. The study has a small sample size of 30 daycare students, which may not be representative of a larger population of early childhood learners. However, efforts were made to ensure that the researchers targeted the needed learners in urban areas with limited exposure to the physical and natural environment.

Furthermore, the study also incorporated expert validation of the supplementary material by early childhood subject specialists, technical experts, and a school administrator to enhance EcoExplorer's credibility and instructional quality. Structured sessions using EcoExplorer were carefully designed to maximize engagement and learning retention within the timeframe. The study further strengthened its methodology by employing a validated 20-item researcher-developed assessment tool, which underwent pilot testing to confirm reliability and internal consistency.

Additionally, the inclusion of qualitative teacher feedback through teacher interviews provided deeper insights into the material's impact, complementing the quantitative findings and ensuring a more comprehensive evaluation. Finally, ethical considerations, including parental consent and data confidentiality, were strictly followed to maintain the integrity and professionalism of the research process.

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