

Precursor ecological awareness skills and kindergarten readiness among children in the Southwest Region of Cameroon

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Abstract

Early childhood experiences, from birth to formal school entry, play a pivotal role in overall development. However, globally, many children start school without the requisite preparedness, impacting not only academic success but also broader aspects such as health, disease prevention, and ecological consciousness. While school readiness often encompasses academic and interpersonal skills, this study delves into the under-researched area of ecological awareness and its role in preparing children for school. We sought to understand parental perceptions concerning ecological competency in three-to-five-year-olds. The focus is on waste management, water conservation, energy-saving behaviors, and interactions with natural materials. By using a purposive sampling method followed by a snowball technique, we obtained quantitative questionnaire data from 402 parents of three-to-five-year-old children in Cameroon. In-depth interviews with eight parents also provided qualitative insights into nurturing ecological awareness in children. Our analyses include both descriptive and inferential statistics for quantitative data and thematic analysis for qualitative data. Results underscored ecological behaviors such as responsible waste disposal and energy conservation, bolstered child motor skills, enhancing their physical school readiness. By entrusting children with simple eco-tasks and maintaining a conducive home environment, parents play a crucial role in shaping budding environmental stewards. Prioritizing ecological school readiness can reap multifaceted global benefits, spanning from individual well-being to broader enduring environmental and population health impacts.

Keywords: ecological awareness skills, physical school readiness, fine motor skills, gross motor skills, preschoolers

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1. Introduction

The formative experiences that children encounter from birth to formal school entry are foundational for their development. Gaining ecological awareness during the early years can instill robust attitudes regarding environmental responsibility and augment additional skills, thereby enriching their academic and social outcomes. Direct exposure to nature fosters pro-social and pro-ecological tendencies in children, leading to environmentally-friendly behavior when they engage more with natural surroundings (Cheng & Monroe, 2012; Collado et al., 2013). A rich presence of green spaces near homes correlates with improved cognitive function, which spans intellectual, emotional, and behavioral characteristics (Bijnens et al., 2020). Although the merits of early ecological awareness for cultivating wholesome living spaces are recognized, its influence on children's early education remains largely practically undiscussed. Various facets of school readiness have been investigated, including the connection between age-and sex-standardized body mass index/body weight status and youngster preparedness for school (Omand et al., 2022). There are repercussions of inadequate social and behavioral preparedness, such as grade retention or receiving support (Bettencourt et al., 2018), and high victimization rates in peers due to deficient motor skills (Øksendal et al., 2022). However, the intersection between ecological awareness and kindergarten readiness remains scientifically unexplored.

In his social learning theory, Bandura (1986) introduced the principle of reciprocal determinism. This concept describes a triadic relationship between children's cognition (beliefs, values, attitudes), behavior (motor responses), and the environment (physical surroundings). Immersive environments that expose children to nature early on, combined with guiding caregivers, can foster conscientious environmental stewardship. Preschoolers, brimming with natural curiosity, thrive on experimenting, often making errors yet persisting in their endeavors (Erickson, 1968). The caliber of guidance they receive during their Zones of Proximal Development shapes their efficacy in environmental responsibilities. Given that young children acquire knowledge largely through observing and mimicking their surroundings (Bandura, 1986), parents and caregivers play an instrumental role in molding environmentally congruent cognitions and actions in them.

This study delves into precursor ecological awareness skills—children's rudimentary comprehension and attitude toward nature, focusing on waste management, water conservation, energy usage, and engagement with natural elements. Growing concerns revolve around the *extinction of experience*, denoting the dwindling opportunities children must genuinely connect with nature (Soga & Gaston, 2016), which could impact their readiness for school. Motor-skill interventions are acknowledged as authentic, age-appropriate strategies to foster school readiness in early childhood (Hudson et al., 2021). Foundational gross motor skills, encompassing actions like running, jumping, or handling objects (Logan et al., 2018), pave the way for intricate movements. This research posits an empirical query – can these fundamental and refined motor skills, pivotal for school readiness, be enhanced by precursor ecological awareness? Our aim is to gauge the impact of these ecological skills on child school readiness, particularly emphasizing the perceptions parents hold regarding their three-to-five-year-old child ecological proficiency and its subsequent influence on their motor skill development.

2. Methods

Research Design and study Participants - This study adopted a mixed method approach and particularly a sequential explanatory design. The initial phase involved collecting quantitative data from a sample of 402 parents. Only parents who had children aged between three-to-five-years-old were included in the study. Participants were selected using a combination of random sampling and snowball sampling methods. In the subsequent phase, qualitative data were gathered from in-depth interviews with 8 parents of children within the same age bracket,

aiming to derive a richer understanding of child precursor ecological awareness and its implications for school readiness. The research was carried out in the Buea municipality, located in the Southwest Region of Cameroon, characterized by its cosmopolitan nature and home to numerous educational institutions, including the only state-owned university in the region- the University of Buea. The municipality is home to majority of the Nursery and Primary schools in the region thus houses a good number of parents with children of concern to the study. The environmental degradation in the Buea municipality caused by human activity such as improper waste disposal is alarming with dire consequences to the health and education of its inhabitants. Exploring the parents perception of their young children’s environmental friendly behaviors at home and how these influences their readiness for school, is valuable.

Measures - Physical school readiness was assessed using a four-point Likert scale questionnaire focused on the fine and gross motor skills anticipated for preschool children. This instrument was adapted from the UNESCO Early Childhood Development Index (ECDI2030). To evaluate precursor ecological awareness skills, participants were presented with straightforward questions based on indicators of ecological awareness. These indicators include water conservation, energy efficiency, waste management, and engagement with natural elements. Sample items include statements like, “My child avoids wasting water” and “My child turns off lights when they're no longer needed.” All items underwent a thorough validity and reliability check. Additionally, an interview guide was prepared, equipped with probing questions designed to delve deeper into the ways children demonstrate and develop ecological awareness and its subsequent influence on school readiness.

Data Collection and Analytic Procedures - Most of the questionnaires were completed by participants in person. 23 percent were administered online using Google Forms to accommodate those with tight schedules during the research period. For the qualitative segment, each interview lasted approximately 25 to 30 minutes. Concerning data analysis, the quantitative responses were first cataloged in an Excel spreadsheet before being exported to SPSS v25. Here, descriptive statistics – including frequency counts, percentages, multiple response sets, means, and standard deviations – were computed. To discern the influence of ecological awareness skills on the development of fine and gross motor abilities, the Spearman’s rho test was employed. For the qualitative data, a thematic analysis approach was utilized.

3. Results

Descriptive statistics for each variable commencing with ecological awareness skills are first presented here. This is then proceeded by the inferential statistics illustrating the relationships between the variables and concluded with qualitative data supporting the quantitative findings of this study.

3.1 Precursor ecological awareness skills

Table 1

Children’s precursor ecological awareness skills

My child:	Yes	No	Mean	SD	n
Drops dirt anywhere**	232(57.7%)	170(42.3%)	.42	.495	402
Can place waste that cannot be reused in the trash can	272(67.7%)	130(32.3%)	.68	.468	402
Does not waste water	194(48.3%)	208(51.7%)	.48	.500	402
Turns off the lights when not in use	178(44.3%)	224(55.7%)	.44	.497	402
Places reusable waste like plastic containers at the right place	167(41.5%)	235(58.5%)	.42	.493	402
Plays outdoor with the soil and plants	332(82.6%)	70(17.4%)	.83	.380	402
Total	1313(54.4%)	1099(45.6%)	.62	.472	2412

**Item with coding reversed during calculation of total response

Based on the survey, 54.4% parents affirmed their child's possession of precursor ecological awareness skills, whereas 45.6% indicated a lack thereof. The overall mean score was 0.62 on a scale of 1, slightly above the midpoint of 0.5, suggesting a moderate level of ecological awareness among the children. More specifically, as

documented in Table 1; 82.6% of parents confirmed their children engage in outdoor play, interacting with soil and plants. Similarly, while 67.7% of parents noted their children dispose of non-reusable waste properly, just 48% of parents agreed that their children are conscious of water wastage. Also, approximately 44% and 58% of stated their children turn off lights when unnecessary, observed their children being careless with littering, respectively, a mere 41.5% mentioned that their children can sort and place reusable items, like plastic containers, appropriately. Generally, as illustrated in figure 1, children who exhibit precursor ecological awareness skills (54.4%) are more than those who do not (45.6%).

Following the findings on children's precursor ecological awareness skills, the study explored the same qualitatively, and the results depict child behaviors with regards to manipulating nature and management of water, light, and waste. Basically, the study reports that, as many children demonstrated some precursor ecological awareness skills, their practices largely reflected parental behaviors and the domestic environment.

Water Management - Many parents reported that their children, especially at younger ages, tend to waste water, often using it for playful activities. Typical activities involve spilling water on the floor, transferring water between containers, and indulging in the visual experience of the water droplets. Parents largely viewed this behavior as a typical developmental phase, attributing it to the lack of awareness regarding water conservation. This attitude of wasting water is captured in the voices of some parents who said:

"She likes playing with water. She mixes water by pouring it from one container to the other. She carries water and spills on anything she sees. She is always very excited seeing the water droplets she spills on the floor."

"Opens the tap unnecessarily and is very excited approximately by it. She carries water to wash her hands and pours the rest on the floor. Some time she deeps her hands in to a whole basin of water."

Light Management - Parental testimonies varied regarding light management. Some children demonstrated awareness, often turning off lights when not needed, sometimes even reminding adults to do so. A few parents observed their children playing with light switches. Contrarily, certain children, especially the younger ones, left lights on irrespective of natural light availability. Some children's inability to manage lights was attributed to physical limitations, like not reaching switches, rather than awareness, as reflected in voices of some parents:

"She switches off the light. This morning, she reminded me to switch of the light saying places are shining. Sometimes she plays with the switch by switching it on and off and is very happy with it."

"The child turns off the light and he got to know this by observing how I do it."

"He does not turn off the light because she likes seeing it on even when there is sun light. She is tender and not yet aware that wasting lights is bad."

"The child does not turn off light because he cannot reach the switch."

Waste Management - Littering emerged as a significant theme. Many children were reported to litter carelessly after consuming foods like bananas or biscuits. This was echoed in the voices of some parents who said:

"She eats banana and throws the dirt anyhow. Whenever she peels her banana to eat, she throws it anywhere."

"My child throws dirt carelessly when she is eating. After eating biscuits or sugar cane, she just throws it on the ground."

Nonetheless, a subset of children exhibited environmentally-friendly behaviors, a testament to proactive

training by parents and the strategic placement of trash cans at home. Furthermore, the differentiation between decomposable and non-decomposable waste was mostly absent, mirroring the parental practices, as echoed in the voices of some of the parents:

“He does not throw dirt carelessly. I trained him to do so. I have trash bags all over the house and I ensure that he drops every dirt in the trash.”

“He does not throw dirt carelessly. He is trained to throw dirt in the trash, and they are trash cans all over the house.”

Nature Manipulation - Generally, parents included in this study agreed that their children played outdoors and interacted with natural elements like sticks, leaves, mud, water, and sand. Activities included replicating cooking processes using natural materials, molding shapes with mud, and interacting with plants and insects. Such engagements not only cultivated child bonds with nature but also prepared them for school by enhancing their familiarity with natural elements. Some of the feelings of the parents in this regard is reflected in quotes:

“She plays with plants. She harvests pepper from my garden and throws them on the ground. She uses soil, water and sticks to play.”

“She plays outdoor and usually cooks. She mixes water, soil, and grass in containers she refers to as her pots. She uses dry leaves or stones as meat and imitates how we cook in her play.”

“He touches, cuts and scatters leave of trees, ants and sticks and this helps increases their awareness of nature as they will better identify those things when they go to school.”

“They cut leaves, chop them, and use to cook. They mix soil with water and mold many things.”

3.2 Children’s Gross Motor Skills

Table 2

Children’s Gross Motor Skills

My child can:	Very Often	Often	Rarely	Never	Mean	SD	n
Can throw a ball at the ground and catch it after one bounce	111(27.6%)	134(33.3%)	136(33.8%)	21(5.2%)	1.83	.893	402
Can balance on one foot for 5–10 seconds and easily hop on one foot over a short distance	89(22.1%)	154(38.3%)	113(28.1%)	46(11.4%)	1.71	.938	402
They can pedal a bicycle (usually with the help of training wheels)	119(29.6%)	135(33.6%)	98(24.4%)	50(12.4%)	1.80	1.001	402
Your child can run with ease (start, stop, and change direction) while pumping their arms.	162(40.3%)	167(41.5%)	55(13.7%)	18(4.5%)	2.18	.830	402
They can throw (and occasionally catch) a ball without losing their balance.	127(31.6%)	137(34.1%)	106(26.4%)	32(8.0%)	1.89	.943	402
They can climb, slide, and swing on different playground structures.	144(35.8%)	147(36.6%)	87(21.6%)	24(6.0%)	2.02	.903	402
They can squat and stand back up without help.	164(40.8%)	148(36.8%)	74(18.4%)	16(4.0%)	2.14	.856	402
Total	916(32.6%)	1022(36.3%)	669(23.8%)	207(7.4%)	1.94	.909	2814

As documented on Table 2, while approximately 69% of parents reported that their children frequently exhibit gross motor skills, only 23.8% indicated they do so rarely, and 7.4% said their children never display these skills. With an overall mean of 1.94 on a 1-3 scale, which is just above the midpoint of 1.5, it suggests a moderate display of gross motor skills among the children. However, specifically, and as reported in Table 2, while most parents (81.8%) reported that their children can either often or very often run with ease, a fewer others (60.4%) described their children as being able to both easily balance on one foot for 5 – 10 seconds and hop on one foot over a brief distance.

3.3 Relationship between Precursor Ecological Awareness Skills and Gross Motor Skills

Table 3

Influence of Precursor Ecological Awareness Skills on Development of Gross Motor Skills

		Precursor ecological awareness skills	Gross motor skills
Spearman's rho	<i>R-value</i>	1	.425**
	<i>p-value</i>		.000
	<i>n</i>	402	402

** Correlation is significant at the 0.01 level (2-tailed).

The results as illustrated in Table 3, demonstrate a significant relationship between precursor ecological awareness skills and the development of gross motor skills in children ($p < .05$). The positive correlation value ($R = .425$) suggests that as precursor ecological awareness skills in children increase, their gross motor skills also improve, and conversely, a decrease in ecological awareness corresponds to a decline in these motor skills. Supporting this, qualitative data also indicate that child ecological awareness plays a pivotal role in enhancing their gross motor skills. Engaging with the environment, such as through molding, “cooking” with nature, and other playful interactions with elements like water, helps hone their physical abilities. Parental insights underscored this observation:

“Molding helps build their muscles.”

“Playing with water, sticks and mud is like sports activity for them which keeps them strong and healthy. It helps them to move their muscles and be flexible.”

“Playing with water indicates that they are physically active and thus ready for school”

3.4 Children's Fine Motor Skills

Table 4

Appraisal of Children's Fine Motor Skills

Items	Very Often	Often	Rarely	Never	Mean	SD	n
Can draw a face	88(21.9%)	100(24.9%)	130(32.3%)	84(20.9%)	1.48	1.053	402
Can cut along straight and curved lines	102(25.4%)	182(45.3%)	95(23.6%)	23(5.7%)	1.90	.843	402
Can hold a large crayon with thumb and 2 fingers	139(34.6%)	139(34.8%)	104(25.9%)	19(4.7%)	1.99	.892	402
Feed self-using utensils without spilling	106(26.4%)	132(32.8%)	129(32.1%)	35(8.7%)	1.77	.939	402
Put on and take off shoes without ties	129(32.1%)	153(38.1%)	89(22.1%)	31(7.7%)	1.95	.922	402
Dress and undress with some help	168(41.8%)	143(35.6%)	64(15.9%)	27(6.7%)	2.12	.912	402
Manipulate large buttons	105(26.1%)	181(45.0%)	67(16.7%)	49(12.2%)	1.85	.946	402
Total	837(29.7%)	1031(36.6%)	678(24.1%)	268(9.5%)	1.87	.929	2814

As reported in table 3, over 66% of parents reported that their children frequently demonstrate fine motor skills, while just over 24% indicated it was rare and a mere 9.5% reported never. With an overall mean score of 1.87 on a scale of 1-3, just slightly above the midpoint of 1.5, this suggests that the children's fine motor skill display is moderate. More specifically, as presented in Table 4, while over 77% of parents observed their children dressing and undressing with ease, only about 47% of them indicated their children can draw a face either often or very often.

3.5 Relationship between Precursor Ecological Awareness Skills and Fine Motor Skills

As shown in Table 5, our results indicate a significant relationship ($p < .05$) between precursor ecological awareness skills and the development of children's fine motor skills. The positive correlation ($R = 0.388$)

suggests that as precursor ecological awareness skills in children increase, their fine motor skills also improve, and vice versa.

Table 5

Influence of Precursor Ecological Awareness Skills on Developing of Fine Motor Skills

		Precursor ecological awareness skills	Fine motor skills
Spearman's rho	<i>R-value</i>	1	.388**
	<i>p-value</i>		.000
	<i>n</i>	402	402

** . Correlation is significant at the 0.01 level (2-tailed).

As reported in Table 5, our results indicate a significant relationship ($p < .05$) between precursor ecological awareness skills and the development of child fine motor skills. The positive correlation ($R = 0.388$) suggests that as precursor ecological awareness skills in children increase, their fine motor skills also improve, and vice versa. Supporting this, the qualitative data suggests that activities associated with ecological awareness, such as switching lights on and off, playing with water, managing waste, and interacting with nature, foster the development of the hand and finger muscles crucial for fine motor tasks. Such tasks, including writing, coloring, and sorting, are pivotal for school readiness. Some parents shared their observations as:

"Playing with elements like water, sticks, and mud enhances a child's capability to handle and manipulate objects. Even seemingly careless actions like throwing dirt can refine their fine motor abilities."

"The simple act of turning the light on and off can bolster their fine motor skills."

Beyond just physical preparedness for school, precursor ecological skills also seem to facilitate cognitive school readiness. They introduce foundational mathematical concepts and instill hygiene values. As one parent noted:

"In the course of wasting the water, they pour from one container to the other which builds their mathematical skills as they count, subtract and reflect in the process."

Another added:

"She gets to know the importance of water. If she knows that water is used for drinking and washing, it serves as prior knowledge for further learning at school."

Additionally, recognizing the importance of proper waste management at home can have positive influences in school settings:

"Throwing dirt in the trash teaches them that dirt should be deposited only in the trash. When they learn this at home, they will be able to do same at school."

4. Discussion

The traditional understanding of school readiness has largely centered on factors such as age, health, pre-numeracy skills, memory, cost, and special needs. This study, however, highlights the crucial role of precursor ecological awareness skills as a significant indicator of physical school readiness. Our findings suggest a clear correlation: as children's ecological awareness expands, their fine and gross motor skills develop more robustly, enhancing their physical preparedness for academic settings. The findings offer noteworthy insights that are essential for both educational policy-making and parental guidance. It is evident that a significant proportion of the surveyed children possessed precursor ecological awareness skills, with a little over half of the parents affirming child ecological awareness. Thus, the study adds depth to the existing literature on school readiness by emphasizing the importance of early environmental awareness in equipping children for school.

Specifically, as ecological awareness strengthens, child fine and gross motor skills progress. Interaction with natural elements – like sand, plants, sticks, and mud – was identified as a primary mechanism fostering these precursor ecological awareness skills. Given that play is fundamental for preschool children, engaging with these natural tools not only heightens their ecological awareness but also refines their motor abilities. These findings are in line with previous studies emphasizing the importance of early ecological education in young learners (Bronfenbrenner, 1997; Ardoin & Bowers, 2020). The interaction of children with their environment, as evidenced by outdoor play and interaction with natural elements, reflects their innate inclination toward nature, further emphasizing the need for nature-based education from a young age (Taylor & Kuo, 2009; Hudson et al., 2021).

In this study, water, light, and waste management were observed as primary domains of early childhood ecological practices. These observations align with Bandura's (1986) theory of reciprocal determinism, where an individual's environment informs their attitudes and behaviors. The qualitative data from this study indicate that child ecological sensibilities are shaped by factors such as exposure to nature, the accessibility of waste management resources, and the role of parental guidance in fostering an environmentally conscious mindset. When children receive support and guidance in their interactions with nature and resources like water and light, they are more likely to develop behaviors that not only promote environmental consciousness but also contribute to their physical health, emphasizing the interconnectedness of ecological awareness, physical activity, cardiovascular health, and overall wellbeing. The qualitative findings further illustrated varied behaviors in these domains, with some children showing clear awareness while others lacked understanding. Interestingly, these behaviors were not always directly tied to ecological awareness but were sometimes rooted in developmental phases or mere playful activities, indicating the importance of guiding and nurturing these behaviors for positive environmental outcomes. Importantly, a striking association between precursor ecological awareness skills and both fine and gross motor skills was evident. This significant positive correlation reinforces the idea that early ecological practices not only foster environmental consciousness but also play a vital role in enhancing child physical development. This is consistent with past studies, suggesting that ecological activities, especially those demanding physical interactions with the environment, can significantly contribute to child motor skill development (Harper, 2017). Engagement in activities such as molding with mud, “cooking” using natural materials, and other playful interactions with elements like water have been observed to hone their physical abilities. These activities, which are often taken for granted, serve dual purposes. First, they connect children with their environment, laying the foundation for responsible ecological behaviors in the future. Second, they facilitate the development of motor skills essential for school readiness and future academic achievements.

Furthermore, the development of fine motor skills, essential for tasks such as writing, coloring, and sorting, was found to be enhanced through ecological activities. Parental insights highlighted how even simple actions like playing with mud or turning the light on and off can boost early fine motor skills. These findings align with research suggesting that nature-based activities provide rich opportunities for sensory and motor experiences (Logan et al., 2008). In addition, the study touched on the cognitive implications of precursor ecological skills. Activities such as transferring water between containers inadvertently introduce foundational mathematical concepts. Moreover, recognizing the value and utility of resources like water and proper waste management lays the groundwork for further learning at school. These findings underscore the importance of environmental education in early childhood, not only for instilling ecological consciousness but also for cognitive and motor development. Teachers should thus be encouraged to assign pupils both take home and school task that will enable them exhibit and develop environmentally friendly behaviors. Effective partnership and collaboration between teachers and parents in this is vital in helping children become better environmental stewards and as well better ready for school.

However, this study does have its limitations. Notably, assessments of ecological awareness and physical readiness were exclusively based on parental reports. While these insights are valuable, direct observations of children or data derived from child perspectives might provide a more in-depth understanding. Future research might benefit from a quasi-experimental design where child behaviors are directly observed or assessed

post-intervention. Nonetheless, the implications of this study are significant for various stakeholders, including parents, child caregivers, teachers, students and community leaders. There is a need for heightened awareness approximately the importance of cultivating early ecological consciousness in children, emphasizing the role adults play both as supporters and models of environmentally responsible behaviors.

In conclusion, this study advanced an understanding of environmental issues as it x-rayed the value of nurturing ecologically friendly behaviors early in children in enhancing environmental sustainability. The study establishes a link between children's ecological awareness and preparedness for school which has been under researched. The findings indicate that precursor ecological awareness skills substantially influence the advancement of fine and gross motor skills, which are critical indicators of physical school readiness. Consequently, parents and caregivers hold a pivotal role in nurturing these skills. They should offer consistent support to foster environmental stewardship in children, ensuring they are both ecologically conscious and physically prepared for school. To bolster the findings of this study, further investigations employing varied methodologies and broader participant groups are recommended. To sum up, our research underscores the myriad advantages of fostering ecological awareness from an early age. Weaving environmental education into early childhood curricula, ensuring children have abundant opportunities to engage with their surroundings is warranted. It is paramount, therefore, that educators and parents alike recognize the value of ecological activities, leveraging them to optimize child readiness for formal school entry.

Conflict of Interest - On behalf of all authors, the corresponding author states that there is no conflict of interest.

Ethical Approval - An approved ethical clearance for the study was obtained from the Faculty of Sciences Institutional Review Board of the University of Buea, Cameroon. Informed consent was obtained from the parents of the children that were involved in the study

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