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Teachers' Perspective Challenges in Implementing Nature-Based Learning in Urban Settings

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Abstract

Nature-based learning has demonstrated significant benefits for children's development, yet its implementation in urban early childhood settings presents unique challenges. This study examines the barriers faced by urban early childhood educators in implementing nature-based learning and explores their innovative adaptations to these challenges. Using a mixed-methods approach, data were collected through surveys (N=14) and semi-structured interviews (N=4) with urban early childhood educators to provide both quantitative and qualitative insights into implementation challenges and solutions.

The findings reveal multiple significant barriers: physical infrastructure limitations (35%), lack of nature-based areas (26%), safety concerns (26%), and resource constraints (22%). Additionally, educators reported challenges with curriculum integration, student engagement, and institutional support. Despite these obstacles, the study documented various innovative practices employed by educators, including creative use of indoor spaces, adaptation of natural materials for classroom use, and strategic utilization of available community resources.

Educator responses demonstrated high valuation of nature-based learning (78.5% strongly agreeing with its importance) while highlighting the complex realities of urban implementation. The study provides critical insights into how systemic constraints and urban contexts shape nature-based education practices, while also illuminating the resilience and adaptability of educators in meeting these challenges. These findings contribute to the growing body of knowledge on urban nature-based learning implementation and provide practical implications for policy, resource allocation, and professional development in urban early childhood education settings.

Introduction

Nature-based learning has emerged as a critical aspect of early childhood education, emphasizing the role of the natural environment in fostering children's cognitive, emotional, and physical development.

This approach involves integrating outdoor learning experiences that encourage direct interaction with nature, enabling young learners to develop an early appreciation for environmental stewardship.

Furthermore, as concerns about sustainability continue to rise, incorporating sustainability education into early childhood curricula has become increasingly important. By fostering a connection to nature from an early age, educators can instill in children a sense of responsibility toward the environment, which is essential for addressing global ecological challenges (Larimore, 2019).

Despite the recognized benefits, implementing nature -based learning is a particularly challenging in urban settings. The Sustainability Curriculum for Early Learners Project aligns with this growing emphasis on nature-based learning by focusing on experiential engagement with nature and promoting sustainable practices. This approach is rooted in the belief that children who engage regularly with nature are most likely to adopt environmentally responsible behaviors and develop a deeper understanding of their role in preserving the environment for future generations. However, urban environments present unique obstacles, including limited access to green spaces, crowded living conditions, and socio-economic disparities that affect both schools and communities. These factors can restrict the feasibility and quality of nature-based programs, especially in low-income areas where resource for outdoor learning may be scarce or inaccessible.

The purpose of this study is to explore the barriers faced by educators in urban settings when implementing nature-based learning programs. By understanding these challenges, educators, policymakers, and community members may develop strategies to make nature-based learning more inclusive and accessible for children in urban areas. The research question guiding this study is: "What are the barriers to implementing nature-based learning in urban settings?"

This research highlights the specific challenges urban schools encounter, ranging from logistical issues, such as the scarcity of green spaces, to institutional and socio-economic factors that hinder teachers' ability to provide nature-based learning experiences. Identifying these barriers is crucial, as it lays the

groundwork for finding solutions that can bring the benefits of nature-based learning to a wider audience, regardless of geographical and socio-economic constraints.

Addressing these barriers has significant implications for urban education. Nature-based learning is not only beneficial for children's cognitive and physical development but also fosters social and environmental responsibility, skills that are increasingly important in a rapidly changing world.

Furthermore, nature-based learning can play a crucial role in promoting mental health and well-being among children, providing them with an outlet for stress relief and enhancing their overall resilience.

Consequently, this study contributes to the broader goal of fostering a generation of environmentally aware, healthy, and socially responsible citizens.

The Benefits of Nature-Based Learning for Children

Nature-based learning has been consistently shown to enhance cognitive, physical, and social development in children. For example, studies have highlighted that outdoor learning fosters attention, memory, and problem-solving skills through unstructured play and exploration (Chawla, 2015). These findings align with research by Johnstone et al. (2020), who conducted a systematic review demonstrating the role of nature-based education in improving children's health, well-being, and resilience. Their work underscores that frequent exposure to natural environments supports emotional regulation and reduces stress, contributing to improved mental health outcomes.

Physically, nature-based learning promotes higher levels of activity, reducing sedentary behaviors and associated health risks such as obesity (Dyment & Bell, 2007). Rymanowicz, Hetherington, and Larm (2020) further expand on this by showcasing the benefits of a farm- and nature-based early childhood program, emphasizing the importance of hands-on engagement with natural materials for holistic development. Socially, these experiences encourage cooperative play and communication, helping children develop empathy, teamwork, and a sense of environmental stewardship (Grimwood, Gordon, & Stevens, 2018).

The History and Evolution of Nature-Based Education

Nature-based education has deep historical roots, beginning with European forest schools and nature study movements. Forest schools, which originated in Germany in the early 20th century, prioritized outdoor education for children's health and holistic development (Prochner, 2021). This approach gained prominence in Scandinavia, where outdoor learning became central to early childhood education.

In the United States, the concept has seen a resurgence in response to concerns about "nature-deficit disorder," a term coined by Louv (2008). Louv emphasizes the negative consequences of reduced engagement with nature, including poorer physical and emotional well-being. Programs such as nature-based preschools have emerged to counteract this disconnection, fostering environmental awareness and sustainable practices (Grimwood et al., 2018).

Johnstone et al. (2020) highlight that the evolution of nature-based education is closely tied to global sustainability goals, as these programs equip children with the skills and values needed to address environmental challenges. This historical and contemporary emphasis on nature-based education reflects its growing importance as a tool for promoting sustainability and holistic development.

Barriers to Implementing Nature-Based Education in Urban Environments

Despite its many benefits, nature-based education faces significant challenges in urban settings. Limited access to green spaces is a primary barrier, as urban schools often lack outdoor areas suitable for regular nature-based activities (Ernst & Tornabene, 2012). Camasso and Jagannathan (2018) echo this, noting that infrastructure limitations disproportionately affect low-income urban schools, exacerbating existing inequities in educational opportunities.

Safety concerns further compound these challenges, with issues such as neighborhood security and traffic risks restricting outdoor activities. García-González and Schenetti (2022) point out that these safety concerns often lead to reduced outdoor engagement, diminishing the potential benefits of nature-

based learning. Additionally, socio-economic disparities limit resources and funding, making it difficult for urban schools to prioritize outdoor education (Grimwood et al., 2018).

The pressure to meet academic standards in urban schools adds another layer of complexity. Teachers often prioritize traditional classroom-based instruction over experiential learning, hindering the integration of nature-based practices (Natural Learning Initiative, 2012). Ernst (2014) identifies similar trends, noting that while educators recognize the value of nature-based learning, competing institutional priorities frequently limit their ability to implement these approaches effectively.

Teacher Perspectives on Integrating Nature-Based Practices

Teachers play a pivotal role in the success of nature-based education programs. However, many educators face significant challenges, including a lack of training and resources. Ernst (2014) highlights that while teachers value nature-based learning, they often struggle to integrate it into their classrooms due to limited professional development opportunities. This finding aligns with Barrable and Lakin (2020), who demonstrate that teachers' perceived competence and willingness to teach outdoors are strongly influenced by their training experiences.

In urban environments, teacher innovation and adaptability are critical. As Bravo et al. (2022) suggest, educators frequently develop creative solutions, such as designing nature-based field trips or using local community spaces, to overcome barriers. These strategies highlight the importance of professional development that equips teachers with practical skills and confidence to implement outdoor learning, even in constrained environments.

The support of school communities is another essential factor. Grimwood et al. (2018) emphasize that partnerships with parents and local environmental organizations can provide valuable resources and foster a shared commitment to nature-based education. Teachers who work in such collaborative environments are better positioned to overcome challenges and sustain nature-based practices in their classrooms.

Conclusion

Nature-based learning is widely recognized for its potential to enhance early childhood development, fostering cognitive, physical, and social growth. However, the literature reveals persistent challenges in implementing these practices within urban environments, including limited access to green spaces, safety concerns, curriculum constraints, and insufficient professional development opportunities. These barriers are often exacerbated by systemic inequities, such as resource shortages and socio-economic disparities, which uniquely impact urban educators and their ability to adopt nature-based approaches. While existing research highlights the benefits of nature-based learning and some strategies for its implementation, a significant gap remains in understanding the specific barriers and challenges faced by early childhood educators in urban settings. Identifying and addressing these barriers is crucial for bridging the gap between the theoretical ideals of nature-based learning and the practical realities of urban education.

This review underscores the need for focused research on the lived experiences of educators and the systemic factors influencing their ability to implement nature-based practices. By addressing these gaps, future studies can provide actionable insights and solutions to support early childhood educators, ensuring that nature-based learning becomes a viable and equitable approach for children in urban settings.

Methodology

This study employs a qualitative approach, utilizing interviews and surveys to explore the barriers educators face when implementing nature-based learning in urban settings. This approach was chosen to provide a comprehensive understanding of teacher's perspectives, allowing for in-depth insights into the specific challenges they encounter. By gathering qualitative data through interviews and surveys, this research aims to capture the nuances of individual experiences and perceptions, offering a rich and detailed understanding of the identified barriers.

Participants

Participants for this study were selected based on their experiences as early childhood educators in urban schools, where the integration of nature-based learning is often limited due to environmental and institutional constraints. The sample included teachers with varying levels of experience and familiarity with nature-based learning, providing diverse range of perspectives. Recruitment was conducted through educational networks and school contacts, targeting teachers who were willing to discuss their experiences in detail. In total, the study including 4 of teachers for interviews and 14 of survey responses, providing a sample that supports a qualitative exploration of the research question.

Data Collection Methods

Interviews: Semi-structured interviews were conducted to allow for flexibility in responses while focusing on key themes related to nature-based learning barriers. Interviews were conducted in person and lasted approximately 20 minutes each. The interview questions were designed to explore educators' views on the flexibility of nature-based learning and their experiences in implementing nature-based learning, the types of challenges they face, and any potential solutions they envision. This open-ended format encouraged participants to share their experiences in depth, providing valuable qualitative insights.

Surveys: In addition to interviews, surveys were distributed to gather further perspectives on barriers to nature-based learning in urban settings. The survey included a mix of multiple-choice and Likert-scale questions, as well as open-ended questions that allowed participants to elaborate on their responses. The survey topics covered access to resources, support from administration, and personal beliefs about nature-based learning's benefits and challenges. Surveys were distributed online through a secure platform, and participants completed them anonymously. The study achieved a response rate 100%, which enhances the reliability of the survey data.

Data Analysis

Qualitative Analysis for Interviews: Thematic analysis was conducted on the interview data using NVivo software, allowing for the identification of recurring themes across participants' responses. Key themes such as limited green space, lack of resource, and institutional constraints were identified and categorized. This approach enabled the research to systematically examine the range of barriers reported by educators in urban settings.

Quantitative and Qualitative Analysis for Surveys: Survey responses were analyzed using SPSS for quantitative data and thematic coding for qualitative data. Likert-scale questions were evaluated in SPSS, where means and frequency distributions were calculated to provide a quantitative summary of participants' perceptions of specific barriers. Open-ended responses were analyzed qualitatively, with thematic coding applied to identify recurring themes related to barriers and potential strategies for addressing them.

Ethical Considerations

This study adhered to ethical research practices to ensure the protection and respect of participants. Informed consent was obtained from all participants before data collection, with each individual receiving detailed information about the study's purpose, procedures, and their rights as participants. Participation was entirely voluntary, and participants were informed that they could withdraw from the study at any time without penalty.

Although pseudonyms were not used, strict confidentiality was maintained throughout the research process. Data were anonymized and stored securely to protect participants' identities, with identifying information removed during analysis and reporting. All responses were handled with care to ensure that individual participants could not be identified in the final report.

The study was reviewed and approved by the Institutional Review Board (IRB) at University of Dayton, confirming that it met ethical standards for research involving human subjects.

Result

Survey Results

Teacher Perceptions of the Importance of Nature-Based Learning

The survey responses highlight teachers' strong agreement regarding the importance of connecting children with nature in early childhood education. As shown in Table 1, the majority of respondents (71.4%) strongly agreed with the statement, "Connecting children with nature is important," while an additional 7.1% agreed, resulting in a cumulative agreement of 78.5%.

A smaller percentage (14.3%) expressed neutrality, suggesting a lack of strong conviction or potential contextual challenges. Only one respondent (7.1%) strongly disagreed, indicating minimal resistance to the concept. These findings suggest a consensus among educators that connecting children with nature is a valuable aspect of early learning.

Table 1 Connecting Children with Nature Is Important

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	7.1%	7.1%	7.1%
	3	2	14.3%	14.3%	21.4%
	4	1	7.1%	7.1%	28.6%
	Strongly Agree	10	71.4%	71.4%	100.0%
	Total	14	100.0%	100.0%	

Comfort with Indoor Nature-Based Learning

When asked about their comfort levels in implementing nature-based learning indoors, the majority of educators demonstrated high level of confidence, Table 2 shows that 69.2% of respondents strongly agreed with the statement, "I am comfortable with bring nature-based learning indoors," and an additional 23.1% agreed.

Only one respondent (7.7%) expressed neutrality, and no respondents disagreed. One response was missing, accounting for 7.1% of the total sample.

Table 2 Comfort with Indoor Nature-Based Learning

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	1	7.1%	7.7%	7.7%
	4	3	21.4%	23.1%	30.8%

	Strongly Agree	9	64.3%	69.2%	100.0%
	Total	13	92.9%	100.0%	
Missing	System	1	7.1%		
Total		14	100.0%		

The overwhelming agreement (92.9%) suggest that teachers feel well prepared to adapt nature-based learning to indoor settings, which is essential for early childhood centers with limited outdoor spaces or inclement weather conditions. However, the small percentage of neutrality indicates a possible gap in resources or training that may hinder complete confidence for some educators.

Barriers To Implementing Nature-Based Learning in Urban Settings

Responses to the open-ended question, “*What are the barriers or challenges you face right now in taking children outdoors for learning?*”, revealed five distinct themes: Infrastructure Limitations and Limited Access, Lack of Nature-Based Areas, Safety Concerns, and Resource and Funding Issues. Each theme is described below, with supporting data to provide a nuanced understanding of the challenges identified.

Infrastructure Limitations and Limited Access (35%)

The most frequently reported barrier was infrastructure-related and limited access challenges, cited by 35% of respondents. Many participants described outdoor spaces as physically unsuitable for safe or effective learning experiences. For example, one participant wrote: “*Not having access to the playground,*” which underscores the difficulty of creating a secure and accessible environment for children. This finding suggests that the lack of proper infrastructure is not merely inconvenient but may pose safety risks, limiting its use for educational purpose.

Lack of Nature-Based Areas (26%)

The absence of natural elements in urban settings was highlighted by 26% of respondents. This theme reflects concern over the limited availability of green spaces, with participants mentioning areas that lack trees, grass, or other nature-based features. One participant noted, “*No nature options-small*

bushes, barely any grass, no trees.” The data points to a broader issue of urban environments being overly developed, leaving little room for outdoor, nature-focused learning experiences.

Safety Concerns (26%)

Safety concerns were equally prominent, with 26% of respondents identifying issues related to the security of outdoor environments. Many comments referenced unsafe neighborhoods or general lack of safety measure in place for outdoor learning. For instance, one participant stated, “*Not a safe neighborhood.*” These concerns emphasize the need for addressing physical and environmental safety to make outdoor learning spaces viable for educators and children alike.

Resource and Funding Issues (22%)

The findings highlight the multifaceted challenges of implementing nature-based learning in urban settings. Physical barriers, such as infrastructure and safety issues, appear to dominate the concerns, reflecting systemic inequities in urban design and resource allocation. Notably, the overlap between themes, such as limited access and infrastructure limitations, suggests that these issues are interconnected and require holistic solutions. For example, improving infrastructure may simultaneously address safety concerns and expand access to outdoor spaces.

Table 3 Barriers to Implementing Nature-Based Learning in Urban Settings

Theme	Frequency	Percentage	Examples
Infrastructure Limitations and Limited Access	8	35%	“Not having access to the playground.”
Lack of Nature-Based Areas	6	26%	“No nature options—small bushes, barely any grass, no trees.”
Safety Concerns	6	26%	“Not a safe neighborhood.”
Resource and Funding Issues	5	22%	“Lack of resources/money/funds.”

Children’s Engagement with Nature

The survey question, “If you go outside, what do you notice the children playing with?”, yielded responses that reveal a strong preference for natural elements among children during outdoor play. As it shown in Table 4, the findings highlight that children predominantly engage with materials like *dirt, mulch, rocks, sticks, bugs, leaves, water, flowers, ants, and grass*, with 71.43% of responses identifying these as the primary focus of children’s play.

Other recourses, such as play equipment (e.g., *bikes, balls, playground equipment*) and creative materials (e.g., *Chalk, Shelves*), were noted as supplementary tools in outdoor play. These items, mentioned in 42.86% and 28.57% of responses, respectively, offer structured opportunities for physical and creative activities. However, their lower frequency compared to natural elements suggests that children are more inherently drawn to nature-based materials for play.

Table 4 Children’s Engagement with Nature

Theme	Frequency	Percentage	Response
Natural Elements	10	71.43%	Dirt, Mulch, Rocks, Sticks, Bugs, Leaves, Water, Flowers, Ants, Grass
Play Equipment	6	42.86%	Bikes, Balls, Playground equipment, Toys.
Creative Materials	4	28.57%	Chalk, Shelves

Support Needed for Nature-Based Learning

The survey responses revealed several key types of support that educators believe would help them incorporate nature-based learning into their practices. Table 5 summarizes the frequency and percentage of responses for each category of support.

The most frequently cited support was curriculum resources, identified by 36.7% of respondents. The emphasis on curriculum resources suggests a need for ready-to-use tools to reduce the planning workload for teachers.

Following closely, in-person training was chosen by 33.3% of respondents as the second most important support type. Teachers expressed a preference for workshops or interactive training sessions that

provide hands-on experience and opportunities to learn strategies for implementing nature-based learning.

Job-embedded coaching or modeling was also a significant area of need, with 20% of participants selecting this option. Smaller percentage of respondents identified online training (3.3%), materials (3.3%), and other forms of support (3.3%). While these categories were less commonly mentioned, they highlight additional areas that could complement the primary forms of support.

Table 5 Support Needed for Nature-Based Learning

Support Type	Frequency	Percent
Job-embedded Coaching/Modeling	6	20%
In-person Training	10	33.30%
Curriculum Resources	11	36.70%
Online Training	1	3.30%
Materials	1	3.30%
Other	1	3.30%
Total	30	100%

Interview Results

Analysis of the interview data was conducted using NVivo software, examining responses from four early childhood educators in urban settings. Through systematic thematic analysis, four major themes emerged: (1) Barriers Challenges, (2) Innovative Practices, (3) Nature-Based Learning Activities, and (4) Needed Support. Table 6 presents a comprehensive overview of the themes, codes, quotations, and their frequencies.

Table 6 Barriers, Challenges, and Practices in Nature-Based Learning: A Thematic Analysis

Theme	Code	Quotation	Sources	References
	Conceptual Confusion	"I'm not sure if I really know the difference, I feel when you're outside, you're in nature."	3	5

Barriers and Challenges	Curriculum Constraints	"Like you need to follow the curriculum that they set it up for you. And besides that, like the nature-based learning you interested in, you want the kids learn, you have to do your own research, bring your own material you need to look."	2	5
	Engagement Challenges	"But it is challenging to keep them like if you have an open space, keep keeping watch of everybody, making sure you know that they're not wandering off this way, where nobody's at keeping them involved and interested in what we're doing."	2	3
	Institutional Support for Funding	"Challenges at this point, and of course, funding. You know, as a young teacher, I probably spent a lot more money out of my pocket."	2	3
	Language Barriers with Bilingual Children	"I have a lot of bilingual children, so I guess the language..."	1	1
	Limited Resource	"The resources, the materials that we have and space, that will be the barriers."	4	10
	Parental Support for Outdoor Learning	"One of those things that depends whether the parents are going to be willing to have their child be dirty."	1	1
	Physical Space Limitation	"Here, where our space is very limited, and then our neighborhood is very limited. So yeah, it's just it's hard to get creative."	4	8
	Safety Concerns	"Like animals... like dogs, they'll be out and they're being trying to attack us, ...people too, that are walking around the neighborhood.... don't know if they're like, are they nice people or...people driving really fast too."	2	4
	Teacher Workload	"It's time consuming. It can be, ... That's the biggie, too. Lots of deadlines to meet."	3	5
Innovative Practices	Experiments	"We wanted to create a volcano, so we used [Play-Doh] or something [similar] to build a structure and added paint. The children also made little towns out of paper or whatever materials they could find. Then, we took everything outside, used vinegar and baking soda for the eruption, and videotaped it. We even tried a two-liter soda with Alka-Seltzer to see how far the geyser could go."	4	6

	Observation	"We go around, and I even take out magnifier sometimes magnifying glasses, and we look around at the different bugs."	3	6
Nature-Based Learning Activities	Nature Exploration	"If we take a walk, a nature walks, you know, we'll go around the neighborhood to get to our playground area."	4	10
	Hands-on Activities	"I brought in seeds before, from pumpkins, even, and we buried them in the ground, and, you know, planted them, explored the seeds."	3	5
	Reinforcement of Nature-Based Learning	"Books are always a good way to introduce and then kind of connect it back to if they see it outside one time we saw."	2	3
Needed Support	In-Person Training	"I mean, I think more training on nature-based learning would be good, or like a class, or, you know, training or somebody who can come to a demonstration."	3	5
	Materials and Resources	"Just having those materials available is helpful."	4	6
	Infrastructure Improvements	"I think it would be easier if it was like a more, you know, green area with trees and, you know, different nature and bushes and plants to explore and all that."	2	3

Theme 1: Barriers and Challenges

Analysis of the interview data revealed several significant barriers that teachers face when implementing nature-based learning in urban settings. These challenges manifested across multiple dimensions, from physical constraints to pedagogical complexities, with considerable interconnectivity among identified obstacles.

Physical space limitations and resource constraints emerged as primary obstacles, with all four participants consistently highlighting these issues throughout their interviews. As one teacher articulated, "Here, where our space is very limited, and then our neighborhood is very limited. So yeah, it's just it's hard to get creative." This observation reflects not merely the immediate challenge of spatial constraints but indicates broader implications for pedagogical creativity and implementation efficacy.

Resource limitations demonstrated consistent prevalence across all interviews, with one participant succinctly noting, "The resources, the materials that we have and space, that will be the barriers." The data suggests a complex interrelationship between spatial and material resource constraints, indicating systemic challenges within urban educational settings.

Beyond physical constraints, the data revealed significant conceptual uncertainty regarding nature-based learning's fundamental principles. Three participants expressed this pedagogical ambiguity, exemplified by statements such as "I'm not sure if I really know the difference, I feel when you're outside, you're in nature." This uncertainty suggests substantial gaps in professional development and theoretical understanding of nature-based pedagogies.

Theme 2: Innovative Practices

Despite substantial barriers, the data indicated remarkable pedagogical adaptability and methodological innovation in nature-based learning implementation. Analysis revealed sophisticated approaches to integrating scientific concepts with outdoor learning experiences, with all four participants demonstrating advanced adaptive strategies.

Experimental activities emerged as the predominant innovative practice, evidenced through multiple sophisticated examples. A particularly comprehensive illustration of this approach was documented: "We wanted to create a volcano, so we used [Play-Doh] or something [similar] to build a structure and added paint. The children also made little towns out of paper or whatever materials they could find. Then, we took everything outside, used vinegar and baking soda for the eruption, and videotaped it." This exemplar demonstrates the integration of multiple pedagogical domains and resourceful material utilization.

Observational learning strategies constituted another significant innovative practice, with three participants articulating structured approaches to scientific observation. The integration of scientific tools, evidenced by statements such as "We go around and I even take out magnifier sometimes

magnifying glasses, and we look around at the different bugs," indicates sophisticated methodological approaches to facilitating authentic scientific inquiry within urban environmental limitations.

Theme 3: Nature-Based Learning Activities

The analysis revealed a sophisticated array of pedagogical approaches to nature integration. Nature exploration emerged as the predominant activity type, with all four participants describing varied methodological approaches ranging from structured observational walks to spontaneous exploratory experiences. The statement "If we take a walk, a nature walk, you know, we'll go around the neighborhood to get to our playground area" exemplifies the integration of nature-based learning into routine pedagogical practices.

Hands-on experiential learning demonstrated significant prominence, with three participants describing sophisticated engagement with natural materials. The process of botanical exploration, articulated by one educator - "I brought in seeds before, from pumpkins, even, and we buried them in the ground, and, you know, planted them, explored the seeds" - exemplifies the integration of scientific concepts with experiential learning approaches, demonstrating alignment with constructivist learning theories while acknowledging urban environmental constraints.

Theme 4: Needed Support

The data revealed a hierarchical structure of support requirements, with material resources emerging as the fundamental necessity, cited by all four participants. The seemingly straightforward statement "Just having those materials available is helpful" underscores the critical nature of resource accessibility for effective implementation.

Professional development through in-person training emerged as a crucial secondary need, with three participants indicating its significance for effective nature-based learning implementation. The emphasis on infrastructure improvements, noted by two participants and exemplified in the statement "I think it would be easier if it was like a more, you know, green area with trees and, you know, different nature

and bushes and plants to explore and all that," reflects a sophisticated understanding of the physical environment's role in successful program implementation.

This comprehensive thematic analysis reveals complex interconnections between structural challenges, innovative pedagogical practices, and systemic support requirements in urban early childhood nature-based learning implementation. The findings suggest that while educators face significant barriers, they demonstrate considerable pedagogical resourcefulness and adaptability, though targeted systemic support could substantially enhance implementation efficacy.

Discussion

The findings of this study highlight the complex interplay of barriers, innovative practices, and necessary supports in implementing nature-based learning in urban early childhood settings. This section discusses key themes from the results in relation to existing literature, offering insights into how educators navigate challenges and what systemic changes may be required to support these efforts.

Barriers to Implementing Nature-Based Learning

The barriers identified in this study, including infrastructure limitations, safety concerns, and resource constraints, align closely with prior research. The limited availability of green spaces in urban areas, as highlighted by 35% of survey respondents and reinforced by interview data, mirrors findings by Camasso and Jagannathan (2018), who noted that inadequate infrastructure disproportionately affects low-income urban schools. Participants in this study emphasized the challenges of creating meaningful outdoor learning experiences in environments dominated by concrete and minimal vegetation.

Safety concerns, reported by 26% of survey respondents, add another layer of complexity to implementing nature-based learning in urban settings. These findings are consistent with García-González and Schenetti (2022), who highlighted the influence of neighborhood security and environmental risks on limiting outdoor activities. The persistent nature of these barriers suggests a

need for localized safety protocols and collaborative efforts with community organizations to create safe and accessible outdoor spaces.

Resource constraints, including insufficient funding and materials, were reported by 22% of survey participants and frequently mentioned in interviews. As noted by Ernst (2014), educators often rely on their personal resources to supplement materials for nature-based activities, reflecting broader systemic inequities in resource allocation.

Challenges in Pedagogical Implementation

Educators in this study frequently cited curriculum constraints and engagement challenges as barriers to implementing nature-based learning. These findings echo Ernst and Tornabene (2012), who argued that institutional priorities, such as adherence to standardized curricula, often leave little room for experiential and nature-based approaches. Participants also expressed difficulty maintaining student engagement in open spaces, emphasizing the need for structured activities to sustain interest and manage behavior.

The theme of “conceptual confusion,” wherein educators expressed uncertainty about how to define and implement nature-based learning, is a novel contribution of this study. This finding suggests that professional development efforts must not only focus on practical strategies but also address foundational understandings of nature-based education to build educators’ confidence and competence.

Innovative Practices and Educator Resilience

Despite significant barriers, this study highlights the creativity and resilience of educators in adapting nature-based learning to urban contexts. Participants frequently described integrating natural elements into indoor settings, utilizing community spaces, and conducting hands-on activities such as seed planting and nature walks. These innovative practices align with Bravo et al. (2022), who emphasized the role of teacher-led strategies in overcoming contextual challenges.

One noteworthy example is the use of experiments and nature observations to bring outdoor learning principles indoors, demonstrating what Ernst (2014) describes as “pedagogical resilience.” These practices not only adapt to environmental constraints but also maintain the core principles of nature-based learning, fostering children’s curiosity and connection to nature.

Support Needs and Systemic Implications

The demand for professional development emerged as a critical theme, with 33.3% of survey respondents and multiple interview participants emphasizing the need for training tailored to urban contexts. As Barrable and Lakin (2020) assert, professional development significantly influences educators’ confidence and willingness to implement outdoor learning. Participants in this study called for in-person training sessions, access to demonstration classes, and curriculum resources to support their efforts.

Infrastructure improvements were another key area of need, with participants advocating for more green spaces, safe outdoor environments, and funding for materials. These findings align with Rymanowicz, Hetherington, and Larm (2020), who highlighted the importance of institutional support in sustaining nature-based programs. Without systemic changes to address these barriers, the potential benefits of nature-based learning may remain inaccessible to many urban children.

Broader Implications for Urban Education

This study underscores the importance of addressing systemic inequities in urban education to ensure equitable access to nature-based learning. The intersection of socio-economic disparities, infrastructure limitations, and institutional constraints creates significant barriers for educators and students alike. However, the innovative practices identified in this study demonstrate the potential for creative solutions when educators are empowered with resources, training, and community support.

The findings also raise important questions about the balance between adaptation and fidelity in nature-based education. While indoor adaptations and creative strategies enable educators to navigate

constraints, they may not fully replicate the sensory and experiential benefits of outdoor learning (Louv, 2008). Future research should examine the developmental outcomes of these adaptations to determine their long-term effectiveness.

Conclusion

This study explores the barriers, challenges, and innovative practices associated with implementing nature-based learning in urban early childhood settings. The findings highlight systemic constraints, including infrastructure limitations, safety concerns, and resource shortages, while also showcasing the creativity and resilience of educators in adapting nature-based practices to constrained environments.

Limitations

Despite these contributions, the study has several limitations. The small sample size and geographic focus may limit the generalizability of the findings, and self-reported data may not fully reflect actual practices or barriers. Additionally, this research does not account for the perspective of other stakeholders, such as parents or administrators, whose input could provide a more comprehensive understanding of the challenges in implementing nature-based learning.

Implications and Future Research

These limitations present opportunities for future research to expand the scope of inquiry, include diverse stakeholder perspectives, and adopt longitudinal approaches to track the impact of systemic reforms over time. By addressing these gaps, future studies can build on this research to further explore the potential of nature-based learning in urban education.

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